



Center for Research in Economics, Management and the Arts

# Behavioral Taxation: Opportunities and Challenges

Working Paper No. 2021-25

CREMA Südstrasse 11 CH - 8008 Zürich [www.crema-research.ch](http://www.crema-research.ch)

# Behavioral Taxation: Opportunities and Challenges

Benno Torgler<sup>1,2,3\*</sup>

<sup>1</sup> School of Economics and Finance, Queensland University of Technology, 2 George St,  
Brisbane QLD 4000, Australia

<sup>2</sup> Centre for Behavioural Economics, Society and Technology (BEST), 2 George St, Brisbane  
QLD 4000, Australia

<sup>3</sup> CREMA – Centre for Research in Economics, Management, and the Arts, Südstrasse 11,  
CH-8008 Zürich, Switzerland

## Abstract

*The field of behavioral taxation dates back at least to the 1950s. In this contribution I will explore the opportunities and challenges in the area, with a particular focus on tax compliance. I will focus on the data required to make further progress, discussing what can be improved when working with surveys and how the field could benefit from open government data initiatives. I focus on collaborative efforts among scientists as well as with the government or the tax administration and examine many potential areas of exploration. The opportunities currently emerging due to digitalization provide not only interesting avenues for collaborations but also a natural method of using tools such as lab and field experiments. In addition, I will discuss potential dangers faced by the field of behavioral economics that also threaten the field of behavioral taxation.*

---

\* Paper prepared as an invited contribution for a special issue in FinanzArchiv/Public Finance Analysis entitled “Behavioral Taxation”. Email: [benno.torgler@qut.edu.au](mailto:benno.torgler@qut.edu.au) . For valuable comments or research support thanks are due to Ho Fai Chan and Alison Macintyre

## Introduction

Behavioral taxation emerged as a field from the psychological analysis of economic behavior pioneered by scholars such as George Katona who demonstrated the power of combining psychology and economics. For example, Katona (1947, p. 459) emphasized that “[p]sychological factors and traditional economic factors are interwoven in one unified pattern and must be studied together to understand economic behavior”. He was first trained in experimental psychology in the 1920s but became interested in economics after living through Germany’s hyperinflation in 1923, publishing an article that explained inflation a result of mass hysteria. As the article received considerable attention, he decided to study economics. His intellectual development was strongly influenced by both the Gestalt psychologist Max Wertheimer and the economist Gustav Stolper (Katona 1975). He left Germany in 1933 shortly after Hitler came to power and in 1946 founded the Survey Research Center at the University of Michigan, where he directed the Economic Program of the Center from 1946 to 1972 during his appointment as a professor of economics and psychology at the University of Michigan, until his retirement in 1972 (Wärneryd 1982). Katona’s research agenda held that psychological considerations need to be included in order to understand economic processes: “[i]t makes a difference in our understanding of economic processes if we focus our attention on the human actors and on the psychological analysis of their decision formation and action, for economic processes are the result of people’s behavior and are influenced by different patterns of behavior” (p. 4). Katona (1947) saw the importance of combining macro-economic data with micro data from households or firms. His goal was to better understand the dynamics as aggregated or average values can be misleading, whereas micro data can provide insights into the formation of individual decisions (e.g., why people do X, Y, Z). Thus, he was critical of the inertia of large numbers as individual differences can cancel each other out: “But possibly sometimes the dice are loaded; atmospheres or climates of opinion influence many people at the same time in the same direction so that deviations add up. Only empirical research can determine which of these situations prevails at a given time” (p. 454). Katona was driven by the importance of measuring factors such as motives, attitudes, or expectations. For example, he stressed that “[w]e must measure expectations; that is, determine their direction, elasticity, and frequency distribution. We must, further, explain expectations; that is, relate them to other factors that arouse them” (Katona 1947, p. 451). Thus, for Katona, the tools of economic psychology were *empirical*. The use of surveys is central to economic psychology; moreover, survey data can supplement other financial data as survey data allow us to measure intermediate

variables that deliver a better understanding of economic events. Katona influenced the field of fiscal psychology, which was then a new branch of public finance promoted by Günter Schmolders and his students at the Cologne Research Institute (Kölner Forschungsstelle für empirische Sozialökonomik). The research group was focused on a behavioral approach to the economic problems of taxation, savings, and inflation (van Raaij 1991), applying surveys extensively in their quest to understand “motivation and emotional layers of the mind of taxpayers and other citizens” (Schmolders 1959, p. 340). Although the roots of fiscal psychology can be traced back to, for example, the work of Amilcare Puviani (1854-1907) on fiscal illusion – who, according to Schmolders (1959) already described “most of the phenomena modern fiscal psychology embraces” (p. 340) – he felt that field of public finance at that time was “rooted in genuine, if primitive, knowledge of human behavior” (p. 341). He therefore put a lot of emphasis on studying aspects such as tax mentality or tax morale via surveys (see Schmolders (1951/1952, 1960, 1962, 1970):

[t]he only other way [besides estimates of tax compliance] of measuring the degree of negative compliance or tax resistance is to compose a true picture of the tax-mindedness of people by ascertaining its elements. There are certain relations between a person’s community-mindedness, generosity in family, club, or social matters, understanding of and cooperation in public affairs, and personal readiness to comply with the painful common obligations of a similar nature, such as taxpaying (Schmolders 1959, p. 342).

Schmolders’ group conducted international comparative survey studies with a focus on Europe, concluding that taxpayers should be treated with great caution and respect if the administration hopes to maintain and cultivate tax morale or to reduce tax compliance costs (Strümpel 1969) (for a discussion see also Torgler 2007). Burkhard Strümpel (1969) also played a very important role in the development of behavioral taxation and economic psychology during the 70s and 80s, engaging in pioneering work in other areas such as subjective well-being or work values; he “confronted the traditional approach with empirical data” (p. 18). As van Raaij (1991) pointed out, Strümpel ‘loved’ data” (p. 18), and

[t]his untraditional approach and way of thinking provided valuable new insights into the economic behavior and values of people and their development over time. Burkhard was a strong promotor of interdisciplinary research. Often he had to ‘fight’ in committee meetings of economists or psychologists for this valuable approach (p. 18)

We have come a long way since then. Behavioral taxation is a blooming field that applies a large number of methods (e.g., surveys, lab experiments, field experiments, or natural

experiments) and has maintained high level of interdisciplinary engagement, where scholars from various fields not only contribute to knowledge improvement, but are also able to effortlessly (relative to other fields) collaborate. The difficulty in obtaining reliable data in the field (e.g., in the area of tax evasion) required scholars to be inventive and open-minded to various sets of possible methods (e.g., the early use of lab experiments in the 1980s), which may also have helped such collaborations. Contrary to other fields – which tend to specialize and become narrower as they progress – behavioral taxation embraced the fact that each method had advantages and shortcomings. Similarly, the complexity of the topic itself also required scholars to acknowledge that a lot can be learned from other fields when advancing or when synthesizing available knowledge. For example, Alm (1999) and Alm and Torgler (2011) refer to the importance of applying a full house of theories, each trying to explain different individuals at different times. Governments need to apply a multi-faceted approach towards tax compliance that acknowledges a broad range of factors and motivations to explain tax compliance. Thus, Alm and Torgler (2011) refer to three paradigms that need to be considered, pointing out that tax compliance is not driven by the “punishment paradigm”, which relies on detection and punishment, but also the “service” and “trust” paradigms that emphasize the importance of better provision and services to taxpayers. Braithwaite (2001) classifies five motivational postures or beliefs/values: (1) commitment, (2) capitulation, (3) resistance, (4) disengagement, and (5) game playing which then leads to different regulatory strategies (self-regulation, enforced self-regulation, command regulation (discretionary and non-discretionary) (Braithwaite 2002). Citizen commitment to comply reflects beliefs about the desirability of a system, and feelings of moral obligation with respect to acting in the interest of the collective. Capitulation reflects the acceptance of government structures and organizations as legitimate authorities and the feeling that the government agencies are a benign power as long as one acts properly and defers to their authority. Resistance reflects doubts about the intentions of the government to behave both cooperatively and benignly towards citizens, which produces citizens who are watchful, who fight for their rights, and attempt to curb the state’s power. Disengagement indicates that disenchantment is more widespread and citizens have moved beyond seeing any reason to challenge government. Finally, game playing occurs when people see the law as something to be molded to suit one’s purposes instead of respecting it as a way of delineating what is acceptable and what is not. The slippery slope framework is a highly successful approach for synthesizing different elements such as enforcement and voluntary tax compliance (Kirchler et al. 2008). In addition, the framework generates insights into the dynamic interaction between power and trust and

offers a structure for responsive regulation that increases tax compliance. Thus, research in the area of tax compliance has convincingly argued that successful tax collection is not just the exercise of power (Alm et al. 2010, Kirchler 2007, Torgler 2007). In order to achieve commitment, coordination, and cooperation, it is necessary to understand and apply – at the right place and time – the right mix of those elements that, in the spirit of Boulding (1981), we can term “love” and “fear”. In recent years (relative to the history of taxation), many government agencies and administrations are placing more emphasis on integrating the “love” aspect, especially given that citizen consent to conform and comply with the rules reflects identification with the state’s or authority’s objectives (Boulding 1981). Maintaining a high level of social norms is essential to the guarantee of a sustainable level of commitment and cooperation (Torgler 2007). An increase in social norms increases the moral costs of behaving illegally and therefore reduces the incentives to be non-compliant in the future. Human behavior in general is not driven solely by external (material) inducements and sanctions (Ostrom 2005); intrinsic values are a key source of a citizen’s motivation to be compliant. Evidence in the area of behavioral economics has demonstrated that many individuals are motivated by social norms and intrinsic motivation, and that individuals are capable of learning social norms (Ostrom 2005, Torgler 2007, Alm et al. 2010). Thus, efficient regime or policy changes require an understanding of whether citizens’ intrinsic motivation to act honestly is encouraged or crowded out by the suggested changes. Threats may motivate immediate compliance but can be problematic when it comes to producing long-term commitments (Cialdini 2007). However, Ostrom (1990) has shown through her work on managing successful common-pool resources that various design principles are required. Wilson (2019, pp. 117-120) offers a nice summary of these principles: 1) strong group identity and understanding of purpose, 2) proportional equivalence between benefits and costs, 3) fair and inclusive decision-making, 4) Monitoring agreed-upon behaviors, 5) graduated sanctions, 6) fast and fair conflict resolution, 7) local autonomy, and 8) polycentric governance. Such factors are highly applicable in the setting of behavioral public finance or behavioral taxation.

However, this paper is not a conspectus of the available literature on behavioral taxation or an historical overview of behavioral taxation. Several important works have surveyed this area; for example, the books by Lewis (1982) and Kirchler (2007); or articles focused on tax compliance from Andreoni et al. (1998), Cuccia (1994), Alm (1999, 2012, 2019), Torgler (2002). A valuable overview on behavioral economics and taxation is offered by Weber et al. (2014). This contribution is more closely aligned to an opinion piece, and my goal is to

hopefully indicate the opportunities and challenges we currently face. The core focus will be on data requirements as well as collaborative efforts, as any attempt to do more would quickly get out of control. Setting this focus will also allow me to point to the research areas that may need developing, without the necessity of being all-inclusive, which again would be an impossible task. Therefore, this contribution may hopefully serve as a good starting point for this special issue on behavioral taxation. I would like to express my thanks to Martin Fochmann for the encouragement to develop this paper, and for facilitating such an opportunity. Parts of what I share here are based on a keynote given at the first Behavioral Taxation Workshop, which was held on March 27/28 2019 at the University of Cologne by Martin Fochmann, Frank Hechtner, and Peter Mohr.

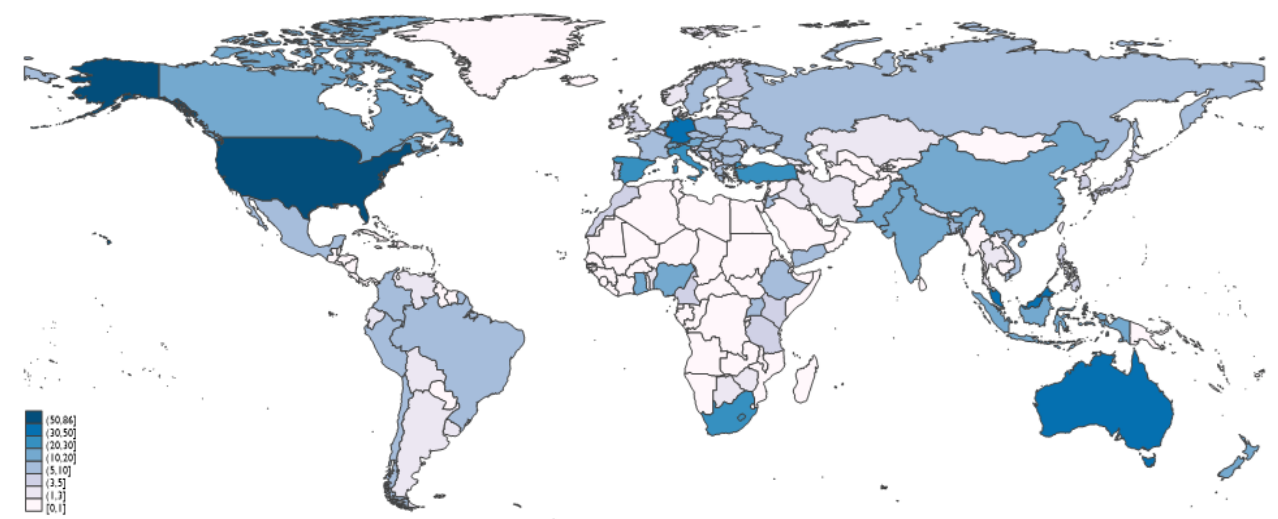
## **Data Requirements**

### **The Power of Surveys**

Despite the fact that surveys have been at the core of behavioral taxation research since its beginning, more needs to be done if we are to truly understand aspects such as attitudinal and behavioral dynamics, cultural and institutional differences, or tax contextual differences – in other words, all aspects outlined by the ‘Cologne School of Tax Psychology’ when behavioral taxation became a field. In general, evidence is still heavily skewed towards the US and some European countries (Figure 1), although more studies from other countries are emerging. Figure 1 is based on data collected up to June 16, 2021 from the Web of Science, Scopus, and EconLit. First, we searched in *Title* and *Topic* for publication records with the term “tax” and either “compliance”, “evasion”, or “morale”, resulting in a total of 5,423 publications. In the Scopus database, we searched and collected the publication records using the same search options on *Article Title*, *Abstract*, and *Keywords*. A total of 5,134 publications were recorded. In the EconLit database, we repeated the same process with the *Basic Search* option (in *Abstract Document title*, *Document text*, *Subject headings* etc.) and collected 10,608 publication records. A total of 9,636 unique publication records (including books, journals, theses etc.) were collected from those three databases. Next, we conducted basic filtering for manual verification. As keyword tagging is available for publication records from EconLit (subject terms) and Scopus (author keywords, index keywords), we tagged the publication records with the keywords of interest (e.g., “longitudinal survey”, “survey-based”, “using a survey”, “representative survey” to avoid capturing literature survey papers). Finally, we

conducted manual verification for the publication records that were tagged. Overall, we identified a total of 889 tax compliance papers that have used survey data (mostly journal articles, N= 671). The country is identified by searching the name of the country as well as the demonym (e.g., Australian) in the title and abstract. As this is a “brute force” approach we may not be able to capture studies that have conducted cross-country analyses (those that did not explicitly mention the country). Table 1 reports countries for which there are ten or more survey studies. It is evident that the US clearly dominates the number of survey studies, followed by the UK. Interestingly, the numbers are quite high for countries such as Malaysia, Turkey, and South Africa. Australia also accounts for a large number of studies, possibly due to the Centre for Tax System Integrity at the ANU that ran from 1999 to 2005. The Centre developed interesting datasets and surveys such as the *Graduates’ Hopes, Visions and Actions Survey*, *Community Hopes, Fears and Actions Survey*, and a survey investigating *The Australian Tax System: Fair or Not?* (see Braithwaite 2001, Mearns and Braithwaite 2001, Braithwaite, Reinhart and McCrae 2004, Braithwaite and Ahmed 2005, Braithwaite and Reinhart 2005, Braithwaite and Reinhart 2013). *Figure 2* also shows how the number of survey studies has evolved over time. We are still observing a positive trend in the use of this tool, which indicates that there is still a lot that can be explored with survey data.

**Figure 1**  
*Surveys Conducted Around World on Tax Compliance*



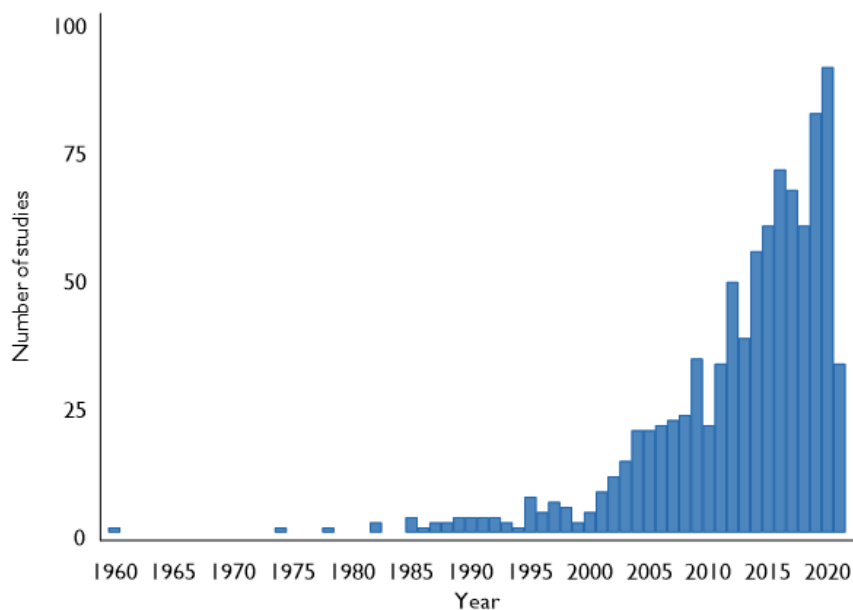


**Table 1***Countries with 10 or more Survey Data Studies*

Countries	Number of Survey Studies
United States of America	85
United Kingdom	66
Malaysia	47
Australia	40
Germany	32
Turkey	26
Spain	25
Italy	24
South Africa	23
Nigeria	22
Indonesia	22
Canada	20
Switzerland	20
India	18
Austria	16
China	14
New Zealand	13
Netherlands	12
Pakistan	12
Ghana	12
Greece	11
Poland	11
Mexico	10
Slovakia	10
Brazil	10
Vietnam	10

**Figure 2**

*Yearly Number of Surveys Exploring Tax Compliance/Evasion*



Torgler (2016a) explains the advantages and downsides to international data used to explore tax morale; for example, given that there are now as seven waves available (1981–1984, 1990–1994, 1995–1998, 1999–2004, 2005–2009, 2010–2014, 2017–2021) for the World Values Survey (see, e.g., Torgler 2007 for an overview)<sup>1</sup>, these data are vital in helping to understand values and belief systems across 80 countries and over time – but such large scale datasets are weak in understanding tax-related contextual factors. Such data have been used to explore cross-cultural or institutional differences *between* countries, while also linking to experimental evidence (Alm and Torgler 2006) or *within* country differences, examining countries such as Switzerland, Belgium, or Spain who provide within country cultural and institutional heterogeneity (Torgler 2005a, Torgler and Schneider 2007). Such data can also be used to explore interesting historical case studies such as the adjustment process after the German Reunification, which can be seen as a natural experiment (Torgler 2003a; Feld, Torgler and Dong 2008; Möhlmann 2014), Russia during its transition (Alm, Martinez-Vazquez and Torgler 2006), Spain after the Franco period (Martinez-Vazquez and Torgler 2009) or implications of joining the European Union (Torgler 2012). Thus, in the future more studies

<sup>1</sup> For other survey sources, see also the Afrobarometer (Ali et al. 2014), the Latinobarómetro (Torgler 2005b, Berens 2020), the International Social Survey Programme (ISSP) (Torgler 2005a, 2005c) or the European Social Survey (ESS).

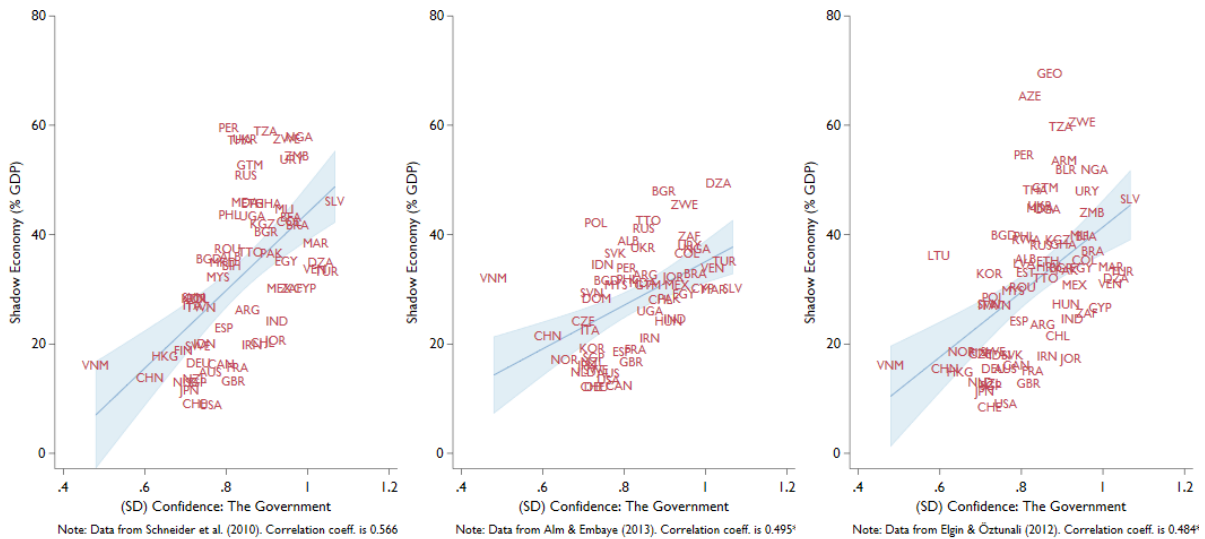
connecting it to historical or cultural contexts can be investigated, although they can be seen as “narrative” or descriptive studies, as many unobservable factors may play a role that is hard to control for with such survey data.

Such large cross-country datasets also allow identification of cross-cultural robustness with respect to important key factors (e.g., trust in the government in the area of tax compliance Torgler 2007), or when exploring cross-cultural robustness of specific factors that have been prominently discussed in the behavioral economics literature (e.g., pro-social norms or conditional cooperation, see Frey and Torgler 2007). Furthermore, the large number of countries with available data also provides a good opportunity to explore those value or attitudinal factors at the macro level, linking them to common public finance variables such as the shadow economy (Torgler and Schneider 2007, 2009) or tax performance (Bird et al. 2006, 2008). Such a macro approach has been successfully applied in other economics settings (e.g., when exploring the link between culture and growth, see Gorodnichenko and Roland 2011). Moreover, using micro data to derive a macro country or regional variable has the advantage of exploring interesting variables. For example, if I am interested in understanding how societal uncertainty affects tax compliance, I could calculate the SD of various factors of interest using the individuals data sets and variables such as trust or social norms. In the next two figures, I simply show results of a correlation analysis between various shadow economy proxies and the level of uncertainty or diverse opinion (higher diversity = higher SD) looking at trust in the government (Figure 3) and trust in the civil service (Figure 4) using WVS data of the first six waves. The standard deviations of the confidence measures were calculated by first computing the standard deviations of the individual observations in each survey wave and then the standard deviations were averaged across all years. For all three shadow economy proxies, the correlations are quite high – which indicates that it is necessary to reduce the level of uncertainty with respect to the quality of institutions – and they are also statistically significant. Uncertainty about others’ actions is a problem when citizens believe that others are not going to contribute to the public good (Torgler 2003b). Good institutions on the other hand reduce such uncertainty or ambiguity by providing a structure for interaction. They establish trust and reflect useful procedures from the past, acting as ‘storehouses of knowledge’ (Kasper and Streit 1999); consequently, greater certainty in the political process is generated. Ensley and Munger (2001) point out “if rules are not formalized, the players may spend too much time arguing over the rules and less time competing in productive activities” (p. 116). Such a simple

correlation analysis could be extended and explored in more detail by controlling for confounding factors.

**Figure 3**

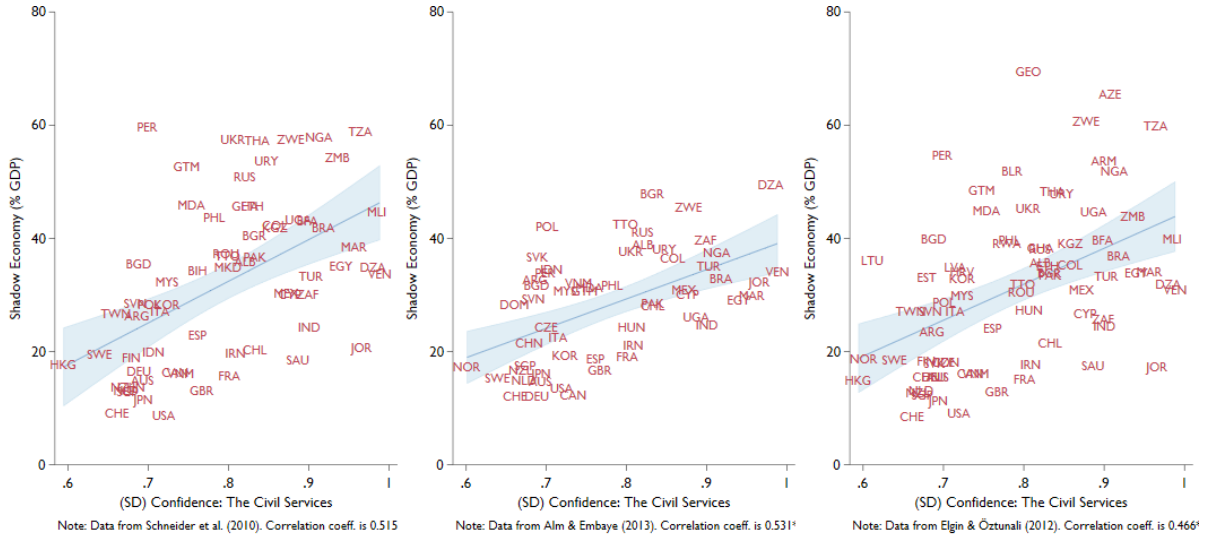
**Confidence in Government Uncertainty and Shadow Economy**



Notes: Shaded areas represent 95% CI. Elgin and Öztunali (2012) use the most classical economics approach, modeling a two-sector dynamic general equilibrium economy to explicitly estimate the size of the shadow economy. Alm and Embaye (2013) propose a more empirically based method. The basic premise is that the shadow economy is a key influence on the demand for currency, hence driving to some extent the currency demand of a country. The method then calculates the currency demand impact for a set of variables that are known to influence the demand for cash, such as the interest rate and level of urbanization. However, the key challenge in these models is to properly take into consideration the interdependencies between the various drivers of currency demand in the formal and informal economy across time and between different countries. Alm and Embaye (2013) account for this factor by using a dynamic panel method, namely a GMM estimator. Finally, Schneider et al. (2010) use a similarly empirical, but more methodologically comprehensive approach to work out the size of the informal economy. Recognizing the limitations of working with any single indicator, they use a Multiple Indicators Multiple Causes (MIMIC) model, incorporating a number of different approaches into a unified model. However, this freedom comes at a cost: the approach can neither claim the rigorous micro-foundation of the Elgin and Öztunali (2012) approach, nor can it explicitly control for the endogeneity issues addressed by Alm and Embaye (2013).

**Figure 4**

Confidence in Civil Services Uncertainty and Shadow Economy



Notes: Shaded areas represent 95% CI

However, Torgler (2016a) points out that in the area of tax compliance it has been impossible to work with longitudinal data in the spirit of important initiatives such as the German Socio-Economic Panel (SOEP), and Household, Income and Labour Dynamics in Australia (HILDA), the European Community Household Panel or the British Household Panel (BHPS)/Understanding Society. Those surveys observed the same individuals over a substantial period of time, collecting very detailed data of individual and household characteristics and allowing to understand how values, attitudes, or behaviors change throughout an individual life cycle or due to exogenous shocks (Frijters et al. 2011, Frijters et al. 2004, Beaton and Torgler 2018, Etilé et al. 2020). Cross-country evidence indicates that socio-demographic factors or exogenous shocks matter (Torgler 2007); thus, it would be worth checking whether some of the questions relevant to behavioral taxation can be integrated into those panel surveys (the sooner the better as the real value of such datasets is appreciated many years later once enough yearly datapoints are available).

## **Open Government Data Initiatives**

As open government data initiatives become more predominant (see, e.g., Attard et al. 2015), it would be wonderful to see more data released by tax administrations. A good example is the ATO Longitudinal Information Files (Alife), first released in 2019 by the Australian Taxation Office. This dataset covers 10 percent of the population and consists of a sample of annual longitudinally linked individual tax and superannuation records. The advantage of such a large sample size is that it allows detailed exploration of a large set of sub-groups, which may have valuable policy implications, and could help with the exploration of positive or negative individual and environmental shocks or changes. For example, such data could be very valuable when tackling external societal shocks such as the SARS-CoV-2 pandemic that relied heavily on compliance, cooperation, and trust (Chan et al. 2020a, Chan et al. 2020b). By applying a behavioral economics approach, Alm et al. (2020) indicate how government policies in the response to the pandemic may affect citizens' tax compliance behavior. In the end, the government is the key producer and collector of data for many different domains that are relevant to behavioral taxation.

Behavioral insights can provide important information in areas for which tax administrations have valuable data. A natural focus is to examine firm conditions and their dynamics in the first couple of years (e.g., survival), in particular looking at smaller firms who have significantly higher growth rates but also a greater propensity to exit the industry than larger firms (Audretsch 1991). Such uncontrolled growth becomes a threat and can affect compliance, putting pressure on management's abilities and administrative processes (e.g., formalization of systems and record keeping), requiring adaptation to the changing environment for survival of the firm (see Churchill and Lewis 1983). Tax administration data can provide the foundation for life-cycle analyses, which would allow a better understanding of the most likely crises at different stages or phases of growth (Scott and Bruce 1987, Greiner 1998). Such data can be complemented with survey data to understand issues around leadership, personal characteristics such as Big 5, impatience and irritability, competitiveness, entrepreneurial spirits, feelings of responsibility or duty, work values, risk preferences, the need for autonomy, control aversion, tolerance of ambiguity, locus of control, overconfidence etc. – all of which may set the conditions and boundaries of success (Begley and Boyd 1987, Greiner 1998, Sagie and Elizur 1999, van Praag 2003, Cressy 2008, Ahn 2010, Åstebro et al. 2014, Gutierrez et al. 2020). For example, Chadwick and Raver (2020) have shown that psychological resilience in entrepreneurs has been highly advantageous to firm survival as they

are less vulnerable to stressful circumstances. A related – yet underexplored area – is control aversion, which refers to the dislike of perceived interference in a business by outsiders (Cressy and Olofsson 1997, Mueller 2004). Thus, an owner’s priorities with respect to retaining control of their companies could affect firm and compliance decisions. Young small business may not just be subject to choice under uncertainty but also choice under novelty, which can cause business and innovation failures (see, e.g., Potts 2010). Under novelty and adaptive changes, new rules and heuristics must be acquired, while inertia or status quo biases may hinder such adaptive processes. In general, those factors may also be linked to trusting behavior in terms of external advice (e.g., seeking advice from a taxation agency due to control aversion). Insights generated could help tax administrations in how to assist small businesses, and this could be tested with field experiments. Another urgent avenue of exploration is the issue of tax compliance (or how to tax) the powerful, rich and sophisticated non-state organizations and wealthiest individuals (Frijters et al. 2021, Gangl and Torgler 2020). Past and current history has shown that they tend to find ways to distort a system to their own advantage (see, e.g., Finer 1999). Fiscal and distributional consequences of global tax avoidance and tax evasion produce huge problems and it worth exploring how the field of behavioral taxation can provide insights in tackling solutions.

### **The Need for Contextual Information in Surveys**

In general, more contextual surveys are needed in behavioral taxation (Torgler 2016a). We have wonderful examples such as the US Taxpayer Opinion Survey (Smith 1990, 1992; Sheffrin and Triest 1992; Alvarez and Brehm 1998, Krause 2000, Forest and Sheffrin 2002; Torgler 2003b; Torgler, Demir, Macintyre and Schaffner 2008; Torgler, Schaffner, and Macintyre 2010), that could be extended using behavioral taxation insights and applied systematically and consistently to a large number of other countries and environments<sup>2</sup>. A common set of questions related to biases or aspects around time discounting, loss aversion, ambiguity or risk aversion (often used in lab experiments) can be included in a survey structure. In general, a large number of very interesting surveys have been conducted, but those are relatively small-scale ones (see, e.g., Kirchler 1997, Kirchler 1998, 1999, Muehlbacher and Kirchler 2013, Olsen et al. 2019). Developing a larger-scale surveys in the spirit of the World

---

<sup>2</sup> Similarly, the Survey of Tax Practitioners and Advisers conducted in 1986 provides a good basis for extension, adjustments, and applications (see <https://www.icpsr.umich.edu/web/ICPSR/studies/8884/summary>).

Values Survey could be quite beneficial for the behavioral taxation literature. Survey data can then also be combined with experimental data, although such combined approaches are not often seen (for exceptions, see Cummings et al. 2009, Fochmann et al. 2021<sup>3</sup>). Fochmann et al. (2021) took advantage of a large survey conducted by the Ministry of Finance of North Rhine-Westphalia (Germany). The dataset consists of 22,220 taxpayers who completed the survey, which also allows measurement of the exact date and time of participation (digital time stamp). Their core innovation was to explore the relevance of background emotions; that is, emotions triggered by the surrounding experience that are not directly linked to the actual decision-making process (e.g., filling out the tax form). This is an interesting study, as we do not know enough empirically whether and to what extent factors such as habits or rule oriented actions affect tax compliance. Habits or rule-oriented behaviors would make taxpayers' behavior more invariant to external factors such as weekly mood cycles, weather conditions, etc. It has been argued that people tend to rely on heuristics or rule-based or rule-governed mechanism when making complex choices and paying taxes is no exception (Torgler 2003b). Those rules also help in isolating or eliminating (or finding) important choice variables for a large set of different decisions we make in our lives<sup>4</sup>. However, Fochmann et al. (2021) find evidence that external factors matter. In their study they differentiate between days of the week usually associated with positive emotions (weekend days and Friday) and days usually linked to less positive emotions (weekdays without Friday), matching this with other external factors such as weather conditions (precipitation dummy) or taking into account potential selection effects. As a dependent variable they explore tax compliance attitudes. Interestingly, they find that the weekend dummy variable was negatively correlated with tax compliance attitudes. They also find a "Blue Monday effect", namely that compliance attitudes are higher on Mondays than other workdays. To get an idea about the effect size they argue that the increase in compliance attitudes due to workdays would cause 410,000 additional tax returns to be fully compliant. This indicates that such effects cannot be neglected. They also complemented the survey with an experimental study that primes positive and aversive incidental emotions via pictures. Interestingly, here they also found that tax compliance was lower after positive incidental priming than aversive incidental priming. Those findings support the research avenue that tries

---

<sup>3</sup> Alm and Torgler (2006) also compare their findings with previous experimental evidence.

<sup>4</sup> For example, Herbert Simon (1996), one of the core pioneers in behavioral economics refers to his choice when finding a house in Pittsburgh in his autobiography *Models of My Life*: "Just before this visit, I had drawn on a map of Pittsburgh a circle of one mile radius around the Carnegie Tech campus, for I was resolved to walk to work instead of commuting, and had checked the census tract data to discover which portions of this area were inhabited by college-educated, middle-class families. I looked in these portions for a house we could afford" (pp. 136-137).



to understand how compliance factors such as perceived levels of deterrence are affected by our emotions and how priming via images and videos affect the tax compliance process (see also Macintyre et al. 2021, Gangl et al. 2016). Overall, more evidence is needed to understand how contextual and environmental conditions affect taxpayers' decisions.

## **Collaborative Efforts**

### **Collaboration among scientists**

Collecting cross-country and panel evidence at the survey and experimental level requires a collective effort among scholars. Such initiatives are challenging but not impossible. We have seen successful large-scale cooperation during COVID-19 – within a very short period of time, scholars were able to organize large-scale surveys. For example, Fetzer et al.'s (2020) survey covered 58 countries, including over 100,000 respondents between late March and early April 2020 and was initiated rather early in the pandemic<sup>5</sup>. Van Bavel et al. (2020) launched a collaborative international project in April 2020, which collected large-scale datasets from many nations, resulting in a sample of 67 countries (N= 46,769). Another successful example of joint large-scale cooperation in the area of behavioral taxation was conducted in 44 countries across five continents (N=14,509), using experimental scenarios to test the slippery slope framework (Batrancea et al. 2019).

There are future opportunities for collaboration via creation of open-source platforms dedicated to behavioral taxation research that could extend excellent general initiatives such as OSF<sup>6</sup>, which already facilitates sharing of data and research. Another frequently consulted data archive is the Inter-university Consortium for Political and Social Research (ICPSR). Platforms such as ResearchGate also provide great opportunities for uploading and sharing material. However, establishing a specialized platform on behavioral taxation would provide good opportunities to easily identify data sources and potential collaborations in that area of research, offering an environment to help each other out and benefit from a micro-cosmos of heterogeneous and interdisciplinary scholars. By facilitating transparency, scholars could learn

---

<sup>5</sup> For more details, see [OSF | Global Behaviors and Perceptions in the COVID-19 Pandemic](#). For a study that used the data, see also Chan et al. (2020c),

<sup>6</sup> See <https://osf.io/>.

from each other and improve elements around reproduction, replication, and revelation that shape scientific rigor and accountability (Pagan and Torgler 2015)<sup>7</sup>. However, there are obvious and natural barriers to sharing own data. An Editorial in *Nature Communication* published in 2018 entitled *Data Sharing and the Future of Science*<sup>8</sup>, for example, stresses: “[If I want to publish high-impact work, don’t I need to collect new data? Is it the act of collecting original data that makes a study novel?” (p. 1). However, an open science initiative depends on the willingness of a research community to share data. Work in progress data could be shared, for example, to specific group of trusted members that could be consulted for feedback. Such opportunities may be particularly valuable for scholars who have fewer resources, possibilities, and infrastructures available for an academic exchange. As many unsolved challenges in the area of behavioral taxation are related to lower income countries (e.g., how to move from a bad equilibrium to a good one, or how to understand the link between culture, compliance and institutions in regions such as Africa), collaboration with scholars in those countries is essential for deriving new and valuable insights. Those scholars are in a better position to understand the beliefs, attitudes, value systems, or climates – and contextual factors are extremely important in behavioral taxation. For example, shadow economy activities can be a sign of government failure (e.g., bureaucratic inefficiencies) where resources are badly utilized in the formal economy; therefore, the shadow economy fills the gaps in the legal economy (see studies from Hernando de Soto (1989, 2000) on Lima).

As more and more evidence has been generated in the area of behavioral taxation, meta-studies will become increasingly important. A good example of such an initiative is the work by Antoine Malézieux to collect experimental data covering more than 250,000 tax compliance decisions by more than 16,000 subjects from 19 countries and 95 nationalities (Alm and Malézieux 2021, Malézieux and Torgler 2021). In general, behavioral taxation can learn from various initiatives (see also *Nature Communication* Editorial 2018) such as the Human Connectome Project<sup>9</sup> that makes diffusion and anatomical neuroimaging data openly available to examine and explore. Such an initiative contributes to the mapping of the human brain, which is a huge challenge, as many studies have small samples sizes in the range of 20 to 50 individuals. Connectome, on the other hand, has collected data from over 1100 healthy young

---

<sup>7</sup> See also <https://socialsciences.nature.com/posts/64919-changing-the-way-we-communicate-scientific-findings>. Torgler (2016a) also refers to the usefulness of utility programs that automatically document data analysis projects (see, e.g., Schaffner 2016).

<sup>8</sup> <https://www.nature.com/articles/s41467-018-05227-z>

<sup>9</sup> See [Human Connectome Project | Mapping the human brain connectivity](#)

adults. Another example is the Genome Aggregation Database<sup>10</sup>, with its goal of aggregating and harmonizing exome and genome sequencing data. Citizen science projects have made important contributions in the area of space exploration, geography, ecology (e.g., ornithology, entomology, conservation biology, marine biology), meteorology, microbiology, or public health (see, e.g., Cooper 2016). For example, the Long-Term Ecological Research (LTER) sites<sup>11</sup> aims to construct a wide ecological community via making their 30 years of observations publicly available; by providing and maintaining large-scale experiments; and by trying to develop context and deep knowledge of places. The LTER brings together a collaborative team of interdisciplinary scientists that allows monitoring and exploration of ecological environments over several years to understand the implications of disturbances. Such initiatives can inspire equivalent strategies for social science.

## **Collaboration with the government or the tax administration**

### *Field Experiments*

In general, collaboration in the area of behavioral taxation with the government provides wonderful opportunities for field experiments (Torgler 2016a). However, when looking at field experiments worldwide (see Figure 4 which is an updated version based on Torgler 2016a) we can see an even stronger concentration between countries (compared to survey studies). The US, several European countries, and Australia dominate the field experiment literature. This is also evident when developing “study Lorenz curve” using % of countries at the horizontal axis and % of cumulative papers at the vertical axis, thereby constructing a country-paper inequality proxy that measures countries with one or more field experiments or survey studies (Figure 5). As one can see the Gini coefficient is higher for field experimental studies<sup>12</sup>. Figure 5 also shows us that, in particular, field experiments in lower income countries are needed, more so than survey studies. Development economics has been extremely successful in conducting field experiments; the field of behavioral taxation may be able to learn from their experience and the type of experiments. However, development economics has profited from closely

---

<sup>10</sup> See [About gnomAD | gnomAD \(broadinstitute.org\)](#)

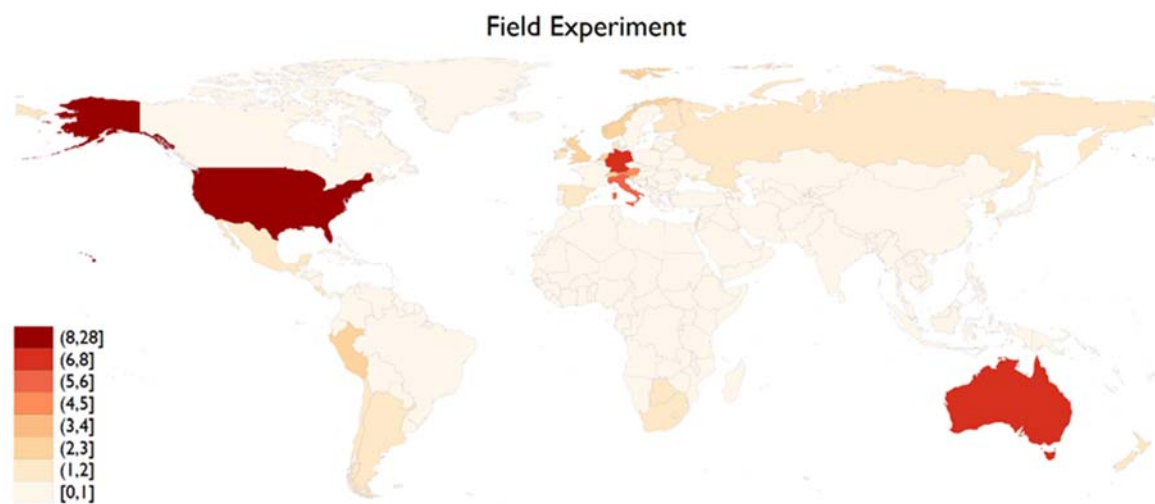
<sup>11</sup> <https://lternet.edu/about/>

<sup>12</sup> Interestingly, those values are comparable to Gini coefficients found in the highly competitive sports environment when looking at income inequality. Rodney D. Fort (2003, p. 203) reports Gini coefficients in men’s and women’s pro golf tournaments of 0.635 for men and 0.621 for women, respectively.

interacting with NGOs and private companies, while the area of behavioral taxation needs to rely more on government support to run field experiments. In countries where governance quality or democratic levels are low, it would be harder to implement field experiments, as governments agencies may have only limited interest in implementing strategies that benefit its citizens or that increase transparency.

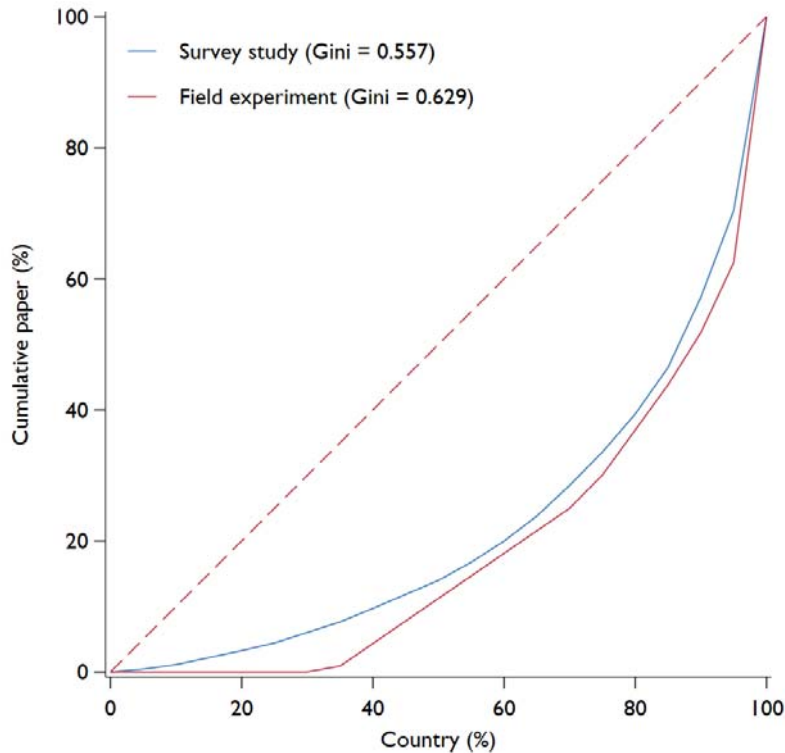
**Figure 4**

Field Experiments on Tax Compliance Around the World



**Figure 5**

Survey and Field Experimental Lorenz Curves Based on Number of Papers per Country



*Nudging*

In addition, the use of nudging strategies becomes highly problematic if government agencies may misuse them for their own purpose, despite the advantage of a nudge in not forbidding available options (freedom to choose provides citizens to select the less damaging option). Under those circumstances the freedom to choose is not a strong enough safeguard against bad or nasty choice architecture. Citizens require protection from potential vulnerabilities that a Leviathan-like state may exploit to its favor. It is questionable that such regimes would use the nudges where they are most likely to help and least likely to inflict harm. Influenced by Hirschman's (1991) *The Rhetoric of Reaction*, Sunstein (2017, 2019) points out that nudges can be futile, perverse, or can jeopardize important societal goals. For example, Hirschman (1991) refers to unintended effects or counterintuitive behaviors of human actions or social systems and policies therefore require attention. According to Hirschman, our social universe is not wholly predictable, and assuming predictability can lead to perverse effects (or claims of perversity!). For example, compulsory use of seatbelts may cause drivers to relax or drive more aggressively. If this leads to more accidents among pedestrians or cyclists, we need to

understand the net effects. If the effect is negative, it would jeopardize overall societal safety<sup>13</sup>. Or sometimes changes – though perhaps desirable in and of themselves – would involve unacceptance costs or consequences. Moreover, status quo biases and efforts may lead to the situation where any alleged changes are purely surface, façade, or cosmetic and therefore illusory (e.g., no change in the income distribution by benefiting the middle and upper-income groups via policy changes). As an example, Hirschman refers to the low-cost public or subsidized housing programs that started in the 1950s in Latin America. The problem was that the houses were too expensive for the poor families and therefore the middle and lower middle class families profited from it. The desire by the politicians to be seen as providing beautiful housing (“entregando una casa bonita”) and the ignorance among planners and architects about the kind of housing poor people could afford led to such perverse effects. Thus, actions can fail miserably. However, arguments around futility fails to acknowledge that social learning or incremental corrective policy-making may take place (e.g., via self-evaluation).

Nudges have also been criticized for being imposed by government and organizations with insufficient engagement and consultation from those being nudged (Mols et al. 2015). Such lack of engagement or consultation could affect citizens’ cooperation and compliance. The normative consequences of compliance may depend on the constitutional checks and the legitimacy of the government (Spicer 1990, Torgler 2001). Thus, applying behavioral nudging strategies requires that citizens’ preferences are well integrated in the political system. Nudges depend on governments’ willingness to understand what people want. Authoritarian governments may have limited incentives to provide transparency or to communicate their agendas and interests. They will not inform people explicitly of the nature of their strategies and will not naturally ask whether they would accept such a strategy. Thus, they depend on trust. As Thaler and Sunstein (2008) stress, the goal is not a bigger government but a better one (p. 14); recommending use of John Rawls “publicity principle”, which bans government from selecting a policy that it would not be able or willing to defend publicly to its own citizens (pp. 244).

In general, nudging is powerful because small changes can have substantial effects (Thaler and Sunstein 2008). For example, default rules are an extremely effective nudge, but they need to be applied in a sensible way. Simplification as a nudge can also be extremely important in the context of behavioral taxation, as compliance costs are a constant challenge

---

<sup>13</sup> For a paper that discusses the empirical evidence, see Adams (1994).

when taking into account that tax systems tend to gravitate towards higher levels of complexity (James and Edwards 2008). Thus, complexity is a serious problem in behavioral taxation, causing not only a burden to taxpayers but also confusion and potentially law violations. In addition, complexity can affect various behavioral responses, such as citizens' voting behavior (level of reliance in trusting politicians, see Stadelmann and Torgler 2013). Nudges can also be useful to influence social norms – as indicated in the tax compliance literature, we are affected by our perceptions of how others comply (Frey and Torgler 2007).

A good understanding of reminders can also be applied in the area of behavioral taxation, taking into account that taxpaying is a constant feature in society and late payment or late tax filing can lead to substantial governmental costs. Behavioral economics has shown, for example, that timing matters considerably for reminders.

However, government agencies also need to respect when people show reactance to nudges, e.g., when they feel they are being steered into a specific direction. The advantage of nudges is that they can be used in a flexible manner that often does not depend on political process (e.g., blocked by political gridlock or financial circumstances, Loewenstein and Chater 2017). But in the end, the size and nature of the fiscal systems is largely a reflection of the balance of political forces and institutions (political equilibrium), as shown by Bird et al. (2006). Weak administrations and ad hoc measures, for example, undermine tax reforms (Bird et al. 2006). Thus, understanding how to change the fiscal system requires an understanding of the underlying forces that determine that equilibrium. Nudging strategies provide only limited insights, for example, of how one can move from a bad societal equilibrium to a good one. Here aspects of political economy and institutional economics become very important.

Moreover, if nudges are overused, one natural response is to rebel against them in order to maintain control (Sunstein 2019). As compliance is triggered by an overall perception of how the government acts and interacts with its citizens – an overuse of interventions and nudging strategies may crowd out the intrinsic motivation to comply and contribute due to fatigue or even potential resentment, even if the nudging strategy was unrelated to the act of compliance (negative spillover effects).

In addition, Loewenstein and Chater (2017) remind us that behavioral economics has a diverse set of tools and implications for public policy, of which, nudging is just one. The strong overemphasis on nudges in the last couple of years overshadows other ways that are integral to formulation of policy advice and responses narrowing the range of solutions. The traditional

use of taxes can have a behavioral economics rationale as demonstrated by Loewenstein and Chater. For example, if smokers misestimate the risks of smoking (e.g., due to a present bias) or struggle with the bad habit of smoking (e.g., willpower issues) a sin tax may not be a bad suggestion. Loewenstein and Chater rightly point out that “the question of whether behavioural factors can justify ‘hard’ government action, rather than the ‘libertarian’ paternalism of nudges, in which choices are merely made more or less easily available or appealing, is an active area of debate” (p. 30), stressing also that “hard paternalism may, in many instances, be more effective than soft paternalism” (p. 42). Thus, conventional legislative or economic actions can be justified to protect citizens against self-control problems or cognitive biases. In many cases they argue that the problems to be fixed require more fundamental and far-reaching interventions. They argue that we need to open to traditional economic and social scientific analysis when applying a behavioral economics approach. But this also requires fully understanding human incentives and potential externalities. For example, they refer to Denmark’s introduction of a “fat tax” on foods that contained more than 2.4% saturated fats. It was given up the following year as Danes drove into the neighboring Germany to stock up on products subject to the fat tax.

Torgler (2016b) also suggests derivation of insights from evolutionary biological models as they provide information on how information can be added into an existing system to answer questions: for example, what are the thresholds that must be surpassed to identify changes; which conditions and responses are too small and slow changes; how things can change or persist; or how systems are inherently contextual (e.g., the same stimulus can lead to different responses within a different context, see Kitto and Kortschak 2013). He refers to Gregory Bateson (2002, p. 27) who once pointed out, “[a]ll receipt of information is necessarily the receipt of news of difference, and all perception of differences is limited by threshold”.

Biological thinking encourages us to combine the elements of structure of state perspective with a process perspective that is deeply ingrained in biology (Matsuno 2013). Gregory Bateson (2002) also argues that the world of mental and biological systems is “a zigzag ladder of dialectic between form and process” (p. 182). The complexity faced by tax administrations requires application of a system thinking approach, but this necessitates close collaboration with an even larger number of scholars. Torgler (2016b) stresses that taxpayers (individual and firms), the tax administration, the government, and tax practitioners can be seen as biologically active components that are learning and adapting to an uncertain environment. He recommends looking at developments in biomathics and novel insights from quantum



models which are flexible enough to not only define variables and spaces with respect to a specific context (Gabora, Scott, and Kauffmann 2013), or to derive counterfactuals (Torgler 2020). As Bickley et al. (2021a) point out, such tools and models can establish knowledge representation and adaptation in situations with considerable uncertainty (Yukalov, Yukalova, and Sornette 2018) or when order and context influence perception and decision making in non-insignificant ways (Pothos and Busemeyer 2013). Experience with AI tools such as those used in the area of predictive policing allows to gain insights into the possibilities and limitations of how to explore dynamics of compliance, and how that can help in achieving a sustainable environment that may encourage compliance (Bickley et al. 2021b). However, it is not yet clear how those tools and insights that heavily rely on near-real-time information are applicable to specific aspects in the area of behavioral taxation.

### *Opportunities via Digitalization*

The increased digitalization of government actions and services also requires an understanding of how that affects tax compliance or tax morale (Gangl and Torgler 2017). Digitalization offers an excellent opportunity to explore and learn from design choices or design science (e.g., Norman 2013) that are important in understanding choice architectures (Thaler and Sunstein 2008). Thus, the digitalization process can be guided by the use of field and lab experiments and a collaboration between scholars and the tax administration or the government in general. Such research efforts can also benefit from the literature on attention (e.g., Van der Stigchel 2019) or the use of sensing tools such as eye tracking devices. Lab experiments may also be beneficial in this setting, especially with the application of eye tracking tools. However, the real advantage would be the use of field experiments with real taxpayers. An interesting avenue is exploration of how education and support of taxpayers promotes cooperation (Gangl and Torgler 2017). Taxpayers could be provided with explanatory videos for preparing tax documents and filing returns, fitted to socio-demographic characteristics by using common speech. For example, with school and university students, new taxpayers (e.g., immigrants), and young entrepreneurs it might help to inform them on the history and importance of taxes, provide practical information (e.g., when the taxes are due, what is needed to prepare for a tax return, where to go to get the information), or simulate how to create a company in which tax audits etc. take place. Young entrepreneurs may benefit from planning aspects (e.g., how to organize tax issues based on own business plans (goal setting, partitioning, deadlines, etc.)).

Digitalization may help in allocating taxpayers to tax officers who are responsible for that client across their whole business-life (client-based structure similar to a bank officer). In addition, field experiments could test the usefulness of apps in organizing all required tax documents from the beginning to the end, including the interaction with the personal tax officer.

In addition, when communicating with citizens, many of the impressions around friendliness, trust, and identity may matter. For example, when a taxpayer visits a website, it may matter whether citizens are faced with picture of friendly people (tax officers, other taxpayers etc.), or whether tax administrations provide reasons to trust individuals (e.g., videos, stories, news on political and administrative achievements or how the tax money is used). The narrative is important and the field of behavioral economics is just starting to understand the power of narration (Shiller 2019), images (Boulding 1961) or the battles of stories (Sedlacek 2011). Stories are particularly relevant when creating an identity. Providing videos, stories, news on honest taxpayers (e.g., role models), symbols that make people proud can affect their compliance behavior (Gangl et al. 2016, Macintyre et al. 2021). The use of such stories and narration can also be subject to manipulation and misuse. The use of digital technologies also reduces transaction costs when providing feedback; positive feedback via rewards or awards can become an additional tool in achieving compliance (Feld et al. 2006, Koessler et al. 2019). In order to capture the benefits of civic duty, it is possible to implement policies that try to provide citizens a sense of acknowledgement in response to their good behavior. For example, introducing ways of allowing citizens to agree on specific policy implementations or criteria can reinforce their willingness to cooperate. It is comparable to a promise having a binding function, because of an individual's need to behave consistently to avoid internal discomfort (Kiesler 1971, Festinger 1957). An agreement (e.g., no penalty for shortfall amounts arising from false or misleading tax statements or suspended penalty for up to two years provided if specific agreed criteria are met) could strengthen the psychological contract between the citizens and authority, while emphasizing the moral obligation to comply. This would provide an opportunity for a more flexible penalty regime. Previous field experimental evidence suggests that such a commitment effect enhances tax compliance, although selection effects are very strong, meaning taxpayers who have been more compliant in the past are more likely to provide a promise (Koessler et al. 2019). Once agreed upon, citizens will encounter internal pressure to behave *consistently* with the agreed commitment to short-term and long-term compliance. Consistency is a very powerful motivation in compliance as it has an adaptive and

evolutionary element: “The person whose beliefs, words, and deeds don’t match may be seen as indecisive, confused, two-faced, or even mentally ill. On the other side, a high degree of consistency is normally associated with personal and intellectual strength. It is at the heart of logic, rationality, stability, and honesty” (Cialdini 2007, p. 60). In addition, expectation-based guilt aversion (Charness and Dufwenberg 2006) may also trigger compliance. Individuals feel guilty when letting others down. Because a promise (agreed commitment) raises others’ expectations, promise-makers want to live up to their word in order to avoid inner conflict. Thus, in general, once a promise is made, the probability of it being fulfilled increases. A commitment may be an incentive or “nudge” that citizens sometimes need to kick start their action against non-compliance, therefore avoiding procrastination with respect to making behavioral changes.

Digitalization also allows to foster transparency on how tax money is used and would allow flexible visualization of a taxpayer’s contribution<sup>14</sup>. For example, at the beginning of the financial year and shortly before the tax reporting phase starts, taxpayers could be informed on how the tax money is used/or has been used. They would be presented with a pie chart indicating how much tax money is spent on infrastructure, health, or education. One could provide taxpayers with a higher level of cost transparency by depicting how much the education of one child costs, how much one kilometer of a highway costs. It would also indicate what exactly can be done with your individual tax money (e.g., for instance, with your tax payments of X Euro this year, Y months of schooling in primary class of Z students can be paid). Such a strategy may enhance taxpayers’ active participation; when taxpayers fill in their tax returns, they could decide how a part of their tax money (e.g., 10%) will be spent. They would therefore be able to allocate part of the taxes paid based on their preferences, which would allow them to feel they are part of the decision process, thereby increasing procedural fairness. Pre-defined options could be given to reduce uncertainty in maintaining public goods. Moreover, when taxpayers fill in their tax return, they could make suggestions on how the tax procedures can be facilitated and enhanced. Digitalization would also facilitate informing taxpayers about positive changes and improvements. Again, all these strategies can be tested with field experiments, which would also allow to understand repeated exposure effects, monitor long-term effects, and potentially even identify spillover effects from different policy adjustments.

---

<sup>14</sup> These ideas were developed in collaboration with Katharina Gangl and were presented to the European Commission at the Best Practices in the Field of Tax Collection Workshop in Ispra (Italy) in 2013.

## **Narrowness of Behaviorism**

Behavioral taxation has been inspired by behavioral economics and its tools. Lab experiments provide important insights into testing theoretical concepts or discriminating between theories in a controlled environment that allows a causal interpretation. It also provides guidance into the causes of theory failures. Such advantages are important in areas such as tax evasion where data are hard to get. In addition, it allows application of innovative tools such as neuroscience (e.g., Harbaugh et al. 2007, Coricelli et al. 2010, Dulleck et al. 2016, Gangl et al. 2017) to better understand the “inner life” of individual decision making. Non-intrusive neuroscientific tools such as wearable biosensors that track heart rate variability, blood pressure, skin conductivity, are particularly suitable for behavioral taxation experiments that are usually more complex or dynamic than the traditional behavioral economics experiments of ultimatum, dictator, or trust games. Current and future technological advances provide interesting avenues for behavioral taxation to explore human action and interaction in the real world (for an overview see Torgler 2019). Those advances are especially powerful if open source platforms are developed to allow for inexpensive ways of measuring human actions with portable biological, social, and behavioral sensing systems. For example, Stopczynski et al. (2014) have developed a “smartphone brain scanner” that uses open source software and provides low density but real time imaging of brain activities using neuroheadsets based on 16 electrodes placed on the scalp, producing a portable 3D EEG imaging system. As technology improves such technologies will become less intrusive and more suitable for use during daily life activities. The combination of multiple approaches with overlapping data sources that are integrated on a large scale will help to produce a richer, more realistic portrait of human nature and social interactions (Torgler 2019) and it is worth understanding how the field of behavioral taxation can explore such technologies. Terms used such as “social fMRI” (Aharony et al. 2011), the creation of a “social supercollider” (Watts 2013), or a “knowledge accelerator” (Helbing 2015) due to the increase in tools available are indications that social science will be able to explore better the complexities constantly faced in daily life.

Biomarkers are useful because they allow to dig deeper into challenging topics such as the relevance of emotions, which are not only cognitive but also physical. The brain and the body interact during an emotional response, as William James noted more than 70 years ago (James 1950). Social dilemma situations where there is a conflict between individual and

collective interests (such as, e.g., paying taxes) are a natural setting in which to test emotions (Torgler 2019). However, a key roadblock is the ability to understand the large amount of different emotional responses (e.g., fear, pride, hatred, guilt, shame, anger, regret, elation, disgust, joy, love etc.) that humans experience – both the positive and negative. It is therefore hard to isolate each different emotional response. In addition, reason and emotions are closely connected. Simon (1983), for example, argues that to exercise a sensible kind of bounded rationality we need some way of focusing attention (which is one of the principal functions of the process we identify as emotions): “One thing an emotion can do for and to you is to distract you from your current focus of thought, and to call your attention to something else that presumably needs attention right now” (p. 21). Thus, as Simon stresses “[a] behavioral theory of rationality, with its concern for the focus of attention as a major determinant of choice, does not dissociate emotion from human thought, nor does it in any respect underestimate the powerful effects of emotion in setting the agenda for human problem solving” (p. 30). But when we try to open the black box of how the human mind works, we need to be careful in imitating physicists who have been so successful in finding compact sets of laws – see Newton, Maxwell, Einstein or Schrödinger – as the brain has a large number of parts with different functionalities by turning certain resources on while turning others off (Minsky 2006)<sup>15</sup>. Minsky (2006) sees emotions as a certain way to think that we use to increase our resourcefulness. In general, we struggle to find complex ways to depict mental events that we experience naturally. Minsky reminds us that many emotional words are suitcase-like words that hide what they actually describe and therefore conceal the actual complexity of the different things, whose relationship we do not fully comprehend: “In everyday life, we expect our friends to know what we mean by Pleasure and or Fear – but I suspect that attempting to make our old words more precise has hindered more than helped to make theories about how human minds work” (p. 18). Similarly, previously I referred to the importance of information when applying biological thinking but the word information itself is also a suitcase-like word.

---

<sup>15</sup> Hirschman (1991) points out that since natural sciences come forward with laws ruling the physical universe, thinkers on human societies driven by ‘physics envy’ have tried to find general laws: “The aspiration found early expression in the assertion that the concept of “interest” provides a unified key to the understanding and prediction of human and social behavior. This conviction was already widespread in the seventeenth century and carried over into the eighteenth, as Helvétius wrote triumphantly, ‘As the physical universe is ruled by the laws of motion so is the moral universe ruled by laws of interest’... A century later his call was heeded. It was Karl Marx’s proudest claim – and he made it at his proudest moment, in the preface to *Capital* - that he had indeed ‘come upon traces’ of what he would call precisely ‘the economic law of motion [*Bewegungsgesetz*] of modern society,’ thereby all but designating himself the Newton of the social sciences (pp. 155-156).

As Sloman and Chrisley (2004, pp. 11-12) suggest, to progress scientifically in analyzing information we therefore need to focus on:

- the variety of *types* of information there are
- the kinds of *forms* they can take
- the kinds of *relations* that can hold between information items
- the means of *acquiring* information,
- the means of *manipulating* information
- the means of *storing* information
- the means of *communicating* information
- the *purposes* for which information can be used
- the *variety* of ways of using information

Thus, AI scholars such as Marvin Minsky or Aaron Sloman shift the question of what sort of things are emotions and thoughts to a more useful query that focuses on the variety of different *processes* emotions are involved with, and by thinking how a machine could perform such processes. Thus, AI scholars have been able to progress in that area of research by looking more closely at the *mechanism* and *machinery* of decision-making via trying to *program* those mechanisms (Torgler 2021). This allows then to develop more refined mental procedures beyond what currently we observe or embrace in behavioral economics with concepts such as Kahneman's (2011) system 1 and system 2 – which is beautifully simple, but in the end too simplistic to progress on how the mind works. Scholars have a natural urge to apply a “dumbbell” mentality and the classification into system 1 and system 2 is no exception; as Minsky (1985) demonstrated, this can lead to false analogies and constrained thinking. The complexity of our daily life can be shown nicely with the following example adapted from Minsky (2006, pp. 97-99) and also applied in Torgler (2019, pp. 198-199). Let's assume Martin Fochmann is starting to cross the street on his way to the Workshop on Behavioral Taxation. While thinking about the workshop, he hears a sound and turns his head – and sees a quickly oncoming car. Uncertain as to whether to cross or retreat, but uneasy about arriving late, Martin decides to sprint across the road. He later remembers his injured back and reflects upon his impulsive decision. “If my back had failed, I could have been killed. Then what would my partner, family and friends have thought of me?”. Any attempt to catalogue Martin's cognitive activities as the scenario unfolds quickly illustrates how far current neuroscience is from understanding how our cognitive processes work in the real world: identification, specification, planning, attention, (in)decision, reaction, imagining, selection, reconsideration, reflection,

self-reflection, empathy, reformulation, moral reflection, self-awareness, and self-imaging. This led Minsky to develop a six-level model of the mind:

*Inborn, instinctive reaction:* Martin hears a sound and turns his head because we are born with survival instincts.

*Learned reaction:* Martin has learned since his childhood that certain conditions, such as seeing an oncoming car, demand specific ways to react.

*Deliberative thinking:* Martin thinks about what to say at the workshop, considering, for example, several alternative ways to interact with the participants and tries to decide which would be the best approach to take.

*Reflective thinking:* Martin reflects on his decision, reacting to what is happening inside his brain.

*Self-reflective thinking:* Martin is uneasy about arriving late so he thinks (fleetingly) about how he would deal with it.

*Self-conscious emotions:* Martin thinks about higher values and ideals. In considering what his partner, family, friends, and scholars in the area of behavioral taxation would think of him in case of an accident or death he asks himself how well his actions agree with his ideals: ‘What would they have thought of me?’.

Thus, as Minsky shows you need higher-level processes, descriptions, or resources to form and keep track of your plans (higher-level representation of what the future of your actions should or ought to look like). Sloman (2001) presents H-Cogaff, a three-level architecture which supports simultaneous, interdependent, adaptive reactive, deliberative, and reflective processes and thinking. This allows two levels of ‘system 2’ thinking; one which thinks about issues and problems at hand, and one that performs meta-cognition (i.e., thinking about thinking) (for a discussion see Bickley and Torgler 2022). Surprisingly, behavioral economics scholars interested or trained in AI are focusing on more recent hypes such as machine learning (see, e.g., Mullainathan and Spiess 2017) rather than going back to revisit what we can learn from many of the pioneers in AI such as Herbert Simon, Allen Newell, Marvin Minsky, or John McCarthy. Psychology and neuroscience are no exceptions. These fields have also failed at trying to make better sense of our current knowledge on cognitive architectures despite the fact that the cognitive revolution was strongly influenced by the question of whether the mind is a computer and despite the fact that there have been fascinating discussions in cognitive

psychology between the classical cognitive ideas and connectionism. Such discourse is heavily influenced by the neuroscience perspective, stressing that our mental processes do not take place in computer-like serial fashion, leading to theories around parallel distributing processes (e.g., Rumelhart et al. 1986) (for a discussion see also Hunt 2007). As Bach (2009) points out, the lack of cross-fertilization may be due to a field needing credibility, which is

due to their focus on an area that allows a homogenous methodology and thus, the growth and establishment of scientific routines, communities, and rules of advancement. But this strictness comes at a price: the individual fields tend to diverge, not just in the content that they capture, but also in the ways they produce and compare results. Thus, it not only becomes difficult to bridge the terminological gaps and methodological differences in order to gain an integrative understanding of an individual phenomenon – the results from different disciplines might completely resist attempts at translation beyond a shallow and superficial level (pp. 7-8).

In general, behavioral economics would be well-advised to pay more attention to those developments. Naturally, economists who move into behavioral economics are not well-trained in psychology or AI. We also observe the trend that modern behavioral economics – contrary to the classical behavioral economics thinking in the spirit of Simon (1983, 1996) – tries to remain more heavily within the neoclassical framework of optimization under constraints (Sent 2004, Kao and Velupillai 2015)<sup>16</sup>. Baumol (2004), for example, suggests the idea of “optimally imperfect” decision making (see also Baumol and Quandt 1964) or “rational satisficing”. He concludes by pointing out that

[p]erhaps [optimization] can be shown to hold approximately in some discoverable and relatively broad varieties of cases. Perhaps in other cases it may prove to be the wrong description that dependably is approximately correct in its answers—in its description of the consequences of actual decision making procedures. At the very least, optimization can provide a standard of comparison—an indication of what is forgone in reality as a result of the uses of alternative decision procedures. Whatever the outcome of a discussion in such terms, however, it remains clear, first that theoretical analysis based on an optimization premise is not useless, second, that there is a real difference between optimization and satisficing and, third, that at least casual observation suggests that the latter is at least sometimes, and probably quite often, the more accurate description of the actual state of affairs. I suspect Herb Simon would have been willing to accept these conclusions, or at least to consider them seriously (pp. 65-66).

---

<sup>16</sup> For detailed discussion see also Bickley and Torgler (2022).



Moreover, scholars primarily applying a lab or field experimental approach may also need to watch out for I call the “behavioralism trap”. In his famous article, “Psychology as the Behaviorist Views It”, John Watson (1913) termed it the *behaviorist manifesto*, pointing out that “[p]sychology as the behaviorist views it, is a purely objective, experimental branch of natural science which needs introspection as little as do the sciences of chemistry and physics” (p. 176). Although objective forms of observation, predictability, and control are important, such a “social engineering mentality” reduced progress in the area of mentalism which was forbidden or banished to a faraway island – removed from the behaviorist action field (Benjamin 2007). Only with cognitive psychology has mentalist psychology found its way back to psychology, despite the fact that the origins of experimental psychology around William Wundt (and his large number of students who built their own labs in various places such as Columbia, Cornell, Harvard, Yale, Minnesota, Stanford or California) focused on mental states, looking at aspects such as sensation, images, feelings, and applying introspection (Benjamin 2007). Experimental economics tends to naturally gravitate towards behaviorism, which is therefore not free of problems. The terms “behavioral economics” or “behavioral taxation” are not helping either. As behavior is the core observation in lab experiments, post-experimental surveys are still often used in a relatively “primitive” way, and often as a way of controlling for factors, applying an “experimetrics” approach driven by econometric techniques (for many years post-experimental survey data were not even used). But the use of econometric techniques may have a negative side-effect in that we are becoming less thorough in the way we design our experiments. Although we observe people’s behavior in the lab, we fail to understand *why* they decide in a particular way, or what they thought while making their decision. Yes, treatment variations can provide important information regarding human actions, but we still need more advances in how humans *think when deciding*. Newell and Simon (1972), for example, have applied thinking-aloud protocols that might be useful in experimental economics. As scholars in behavioral taxation, we should be interested in understanding, for example, what people think when filling out their tax forms.

In general, the problem is that once an entire generation relies on specific tool of thought and exploration – and behavioral economics is no exception – the second generation often lacks the thinking tools necessary for the interpretation of what the theoretical and methodological choices of the first generation actually mean for science. They are too busy applying what the first generation saw as sounder analytical and methodological bases for science. It is then no accident that such short-sightedness can lead to future scientific grievances.

## Conclusions

This contribution has tried to shed some light on opportunities and challenges faced by the field of behavioral taxation. The main focus was to discuss the data structure and collaboration possibilities between scholars, as well as between scholars and government agencies, adding insights into some possible interesting research avenues. Although the field of behavioral taxations is in a very healthy and active state, it is not immune to the same potential pitfalls and missing elements that behavioral economics is faced with. Discussing and illuminating them might be a worthwhile exercise of self-reflection to avoid getting stuck in areas and methods that may reduce the capacity for future innovation. Without question, I might be wrong on some of the aspects discussed. “Mental scientific bugs” are often hard to identify and control for, particularly if the field itself and its scholars gravitate in that direction (e.g., scientists showing publication and career success going in that direction). The best thing one can do to prevent getting caught in the moment by mental bugs is to constantly and critically re-evaluate where we are scientifically, what we are able to solve or not solve or explore today with the available tools, and where we could be heading – all while considering a large number of different tools of thought of exploration.

## References

- Adams, J. G. (1994). Seat belt legislation: the evidence revisited. *Safety Science*, 18(2), 135-152.
- Aharony, N., Pan, W., Ip, C., Khayal, I., & Pentland, A. (2011). Social fMRI: Investigating and shaping social mechanisms in the real world. *Pervasive and Mobile Computing*, 7(6), 643–659.
- Ahn, T. (2010). Attitudes toward risk and self-employment of young workers. *Labour Economics*, 17(2), 434-442.
- Ali, M., Fjeldstad, O. H., & Sjørnsen, I. H. (2014). To pay or not to pay? Citizens’ attitudes toward taxation in Kenya, Tanzania, Uganda, and South Africa. *World Development*, 64, 828-842.
- Alm, J. (1999). Tax compliance and tax administration, in W. B. Hildreth & J. A. Richardson (Eds.), *Handbook on Taxation*, Marcel Dekker, pp. 741–768.
- Alm, J. (2012). Measuring, explaining, and controlling tax evasion: lessons from theory, experiments, and field studies. *International Tax and Public Finance*, 19(1), 54-77.
- Alm, J. (2019). What motivates tax compliance?. *Journal of Economic Surveys*, 33(2), 353-388.
- Alm, J., & Malézieux, A. (2021). 40 years of tax evasion games: a meta-analysis. *Experimental Economics*, forthcoming
- Alm, J., & Torgler, B. (2006). Culture differences and tax morale in the United States and in Europe. *Journal of Economic Psychology*, 27(2), 224-246.
- Alm, J., & Torgler, B. (2011). Do ethics matter? Tax compliance and morality. *Journal of Business Ethics*, 101(4), 635-651.

- Alm, J., Martinez-Vazquez, J., & Torgler, B. (2006). Russian attitudes toward paying taxes—before, during, and after the transition. *International Journal of Social Economics*, 33, 832-857.
- Alm, J., Martinez-Vazquez, J., & Torgler, B. (2010). *Developing alternative frameworks for explaining tax compliance*. Routledge.
- Alm, J., Blaufus, K., Fochmann, M., Kirchler, E., Mohr, P., Olson, N. E., & Torgler, B. (2020). Tax Policy Measures to Combat the SARS-CoV-2 Pandemic and Considerations to Improve Tax Compliance: A Behavioral Perspective, *FinanzArchiv/Public Finance Analysis*, 76, 396-428.
- Andreoni, J., Erard, B., & Feinstein, J. (1998). Tax compliance. *Journal of Economic Literature*, 36(2), 818-860.
- Alvarez, R. M., & Brehm, J. (1998). Speaking in two voices: American equivocation about the Internal Revenue Service. *American Journal of Political Science*, 418-452.
- Andreoni, J., Erard, B., & Feinstein, J. (1998). Tax compliance. *Journal of Economic Literature*, 36(2), 818-860.
- Åstebro, T., Herz, H., Nanda, R., & Weber, R. (2014). Seeking the Roots of Entrepreneurship: Insights from Behavioral Economics. *Journal of Economic Perspectives*, 28(3), 49-70.
- Attard, J., Orlandi, F., Scerri, S., & Auer, S. (2015). A systematic review of open government data initiatives. *Government Information Quarterly*, 32(4), 399-418.
- Audretsch, D. B. (1991). New-firm survival and the technological regime. *Review of Economics and Statistics*, 73(3), 441-450.
- Bach, J. (2009). *Principles of synthetic intelligence Psi: An architecture of motivated cognition*. Oxford University Press.
- Batrancea, L., Nichita, A., Olsen, J., Kogler, C., Kirchler, E., Hoelzl, E., ... & Zukauskas, S. (2019). Trust and power as determinants of tax compliance across 44 nations. *Journal of Economic Psychology*, 74, 102191.
- Bateson, G. (2002). *Mind and Nature: A Necessary Unity*. Hampton Press.
- Baumol, W. J. (2004). On rational satisficing, in: Augier, M. & March, J. G. (Eds.), *Models of a Man: Essays in Memory of Herbert A. Simon*. MIT Press.
- Baumol, W. J., & Quandt, R. E. (1964). Rules of thumb and optimally imperfect decisions. *The American Economic Review*, 54(2), 23-46.
- Beaton, T., & Torgler, B. (2018). Volunteering and life or financial shocks: does income and wealth matter?. *Applied Economics*, 50(19), 2190-2209.
- Begley, T. M., & Boyd, D. P. (1987). Psychological characteristics associated with performance in entrepreneurial firms and smaller businesses. *Journal of Business Venturing*, 2(1), 79-93.
- Benjamin, L. T., J. (2007). *A Brief History of Modern Psychology*. Blackwell Publishing.
- Berens, S. (2020). Opting for Exit: Informalization, Social Policy Discontent, and Lack of Good Governance. *Latin American Politics and Society*, 62(2), 1-28.
- Bickley, S. J., & Torgler, B. (2022). Behavioural economics, what have we missed? Exploring "classical" behavioural economics roots in AI, cognitive psychology, and complexity theory in. Altman, M. (Ed.) (2022). *Handbook of Research Methods and Applications on Behavioural Economics*. Edward Elgar, forthcoming.
- Bickley, S. J., Chan, H. F., Schmidt, S. L., & Torgler, B. (2021a). Quantum-sapiens: the quantum bases for human expertise, knowledge, and problem-solving. *Technology Analysis & Strategic Management*, forthcoming.
- Bickley, S. J., Macintyre, A., & Torgler, B. (2021b). Safety in smart, livable cities: Acknowledging the human factor. CREMA Working Paper No. 2021-17.
- Bird, R. M., J. Martinez-Vasquez, and B. Torgler (2005). Societal Institutions and Tax Effort in Developing Countries, in: J. Alm & J. Martinez-Vazquez (Eds), *The Challenge of Tax Reform in the Global Economy*. Springer-Verlag.
- Bird, R. M., Martinez-Vazquez, J., & Torgler, B. (2008). Tax effort in developing countries and high income countries: The impact of corruption, voice and accountability. *Economic Analysis and Policy*, 38(1), 55-71.

- Braithwaite, V. (2001). Tensions Between the Citizen Taxpaying Role and Compliance Practices, Regulatory Institutions Network (RegNet) Working Paper 12, July, ANU, Canberra.
- Braithwaite, V. (Ed.). (2002). Taxing democracy. Ashgate Publishing Ltd.
- Braithwaite, V., & Ahmed, E. (2005). A threat to tax morale: The case of Australian higher education policy. *Journal of Economic Psychology*, 26(4), 523-540.
- Braithwaite, V., & Reinhart, M. (2013). Deterrence, coping styles and defiance. *FinanzArchiv/Public Finance Analysis*, 439-468.
- Braithwaite, V. A. & Reinhart, M. (2005). Preliminary findings and codebook for the How Fair, How Effective Survey – the collection and use of taxation in Australia, Centre for Tax System Integrity Working Paper No. 84, Australian National University, Canberra.
- Braithwaite, V., Reinhart, M. & McCrae, J. (2004). Game playing with tax law, Research Note 8, Canberra: Centre for Tax System Integrity, Research Note 8, Australian National University.
- Boulding, K. E. (1961). *The Image: Knowledge in Life and Society*. The University of Michigan Press.
- Boulding, K. E. (1981). *A Preface to Grant Economics: The Economy of Love and Fear*. Praeger.
- Chadwick, I. C., & Raver, J. L. (2020). Psychological resilience and its downstream effects for business survival in nascent entrepreneurship. *Entrepreneurship Theory and Practice*, 44(2), 233-255.
- Chan, H. F., Skali, A., Savage, D. A., Stadelmann, D., & Torgler, B. (2020a). Risk attitudes and human mobility during the COVID-19 pandemic. *Scientific reports*, 10(1), 1-13.
- Chan, H. F., Brumpton, M., Macintyre, A., Arapoc, J., Savage, D. A., Skali, A., Stadelmann, D. & Torgler, B. (2020b). How confidence in health care systems affects mobility and compliance during the COVID-19 pandemic. *PloS One*, 15(10), e0240644.
- Churchill, N. C., & Lewis, V. L. (1983). The five stages of small business growth. *Harvard Business Review*, 61(3), 30-50.
- Charness, G., & Dufwenberg, M. (2006). Promises and partnership. *Econometrica*, 74(6), 1579-1601.
- Cialdini, R. B. (2007). *Influence: The Psychology of Persuasion*. HarperCollins.
- Cooper, C. (2016). *Citizen science: How ordinary people are changing the face of discovery*. The Overlook Press.
- Coricelli, G., Joffily, M., Montmarquette, C., & Villeval, M. C. (2010). Cheating, emotions, and rationality: an experiment on tax evasion. *Experimental Economics*, 13(2), 226-247.
- Cressy, R. (2008). Determinants of small firm survival and growth. In: A. Basu, M. Casson, N. Wadson, and B. Yeung (Eds.), *The Oxford Handbook of Entrepreneurship*. Oxford.
- Cressy, R., & Olofsson, C. (1997). European SME financing: an overview. *Small Business Economics*, 9, 87-96.
- Cuccia, A. D. (1994). The economics of tax compliance: What do we know and where do we go?. *Journal of accounting literature*, 13, 81-116.
- Cummings, R. G., Martinez-Vazquez, J., McKee, M., & Torgler, B. (2009). Tax morale affects tax compliance: Evidence from surveys and an artefactual field experiment. *Journal of Economic Behavior & Organization*, 70(3), 447-457.
- de Soto, H. (1989). *The other path: The invisible revolution in the third world*. Harper & Row.
- de Soto, H. (2000). *The Mystery of Capital: Why Capitalism Triumphs in the West and Fails Everywhere Else*. Basic Books.
- Duflo, E. (2006). Field Experiments in Development Economics. In R. Blundell, W. Newey, T. Persson, (Eds.), *Advances in Economics and Econometrics: Theory and Applications*, Ninth World Congress, Cambridge University Press, Vol. 2(42): 322-348.
- Dulleck, U., Fookan, J., Newton, C., Ristl, A., Schaffner, M., & Torgler, B. (2016). Tax compliance and psychic costs: Behavioral experimental evidence using a physiological marker. *Journal of Public Economics*, 134, 9-18.
- Elgin, C. and O. Öztunali (2013). *Shadow Economies Around the World: Model Based Estimates*, Bogazici University, Department of Economics, WP 2012/05.
- Ensley, M. & Munger, M. C. (2001). Institutions, Ideology, and the Transmission of Information Across Generations, *Constitutional Political Economy*. 12, 107-122.

- Etilé, F., Frijters, P., Johnston, D. W., & Shields, M. (2020). Psychological resilience to major socioeconomic life events, IZA Discussion Papers, No. 13063, Bonn.
- Feld, L. P., Torgler, B., & Dong, B. (2008). Coming closer? Tax morale, deterrence and social learning after German unification. CREMA Working paper No. 2009-09.
- Feld, L. P., Frey, B. S., & Torgler, B. (2006). Rewarding honest taxpayers, in: Elffers, H., Verboon, P. & Huisman, W. (Eds.), *Managing and Maintaining Compliance*. The Hague: Boom Legal Publishers, pp. 45-61.
- Festinger, L. (1957). *A Theory of Cognitive Dissonance*. Stanford University Press.
- Fetzer, T. R., Witte, M., Hensel, L., Jachimowicz, J., Haushofer, J., Ivchenko, A., ... & Yoeli, E. (2020). Global Behaviors and Perceptions at the Onset of the COVID-19 Pandemic (No. w27082). National Bureau of Economic Research.
- Finer, S. E. (1999). *The history of government*, Vol. I-III. Oxford University Press.
- Fochmann, M., Hechtner, F., Kirchler, E., & Mohr P. N. C. (2021). When Happy People Make Society Unhappy: Emotions Affect Tax Compliance Behavior. Available at SSRN: <https://ssrn.com/abstract=3259071> or <http://dx.doi.org/10.2139/ssrn.3259071>
- Forest, A., & Sheffrin, S. M. (2002). Complexity and compliance: An empirical investigation. *National Tax Journal*, 55(1), 75-88.
- Fort, R. D. (2003). *Sports Economics*. Prentice Hall.
- Frey, B. S., & Torgler, B. (2007). Tax morale and conditional cooperation. *Journal of Comparative Economics*, 35(1), 136-159.
- Frijters, P., Gangl, K. & Torgler, B. (2021) How to Tax the Powerful and the Sophisticated?, in: Erdogdu, M., Batrancea, L. & Cevik, S., (Eds.). *Behavioural Public Finance: Individuals, Society, and the State*. Routledge International Studies in Money and Banking. Routledge.
- Frijters, P., Haisken-DeNew, J. P., & Shields, M. A. (2004). Money does matter! Evidence from increasing real income and life satisfaction in East Germany following reunification. *American Economic Review*, 94(3), 730-740.
- Frijters, P., Johnston, D. W., & Shields, M. A. (2011). Life satisfaction dynamics with quarterly life event data. *Scandinavian Journal of Economics*, 113(1), 190-211.
- Gabora, L., Scott, E. O., & Kauffman, S. (2013). A quantum model of exaptation: Incorporating potentiality into evolutionary theory. *Progress in Biophysics and Molecular Biology*, 113(1), 108-116.
- Gangl, K. & Torgler, B. (2017). *Fostering Tax Morale in the Digital Age: Evidence-Based Tax Administration*. Material presented at the SmartEST Taxation Conference Organized by the Estonian Tax and Customs Board During the Estonian Presidency of the Council of the European Union (October 4-5), Tallinn, Estonia.
- Gangl, K., & Torgler, B. (2020). How to achieve tax compliance by the wealthy: A review of the literature and agenda for policy. *Social Issues and Policy Review*, 14(1), 108-151.
- Gangl, K., Torgler, B., & Kirchler, E. (2016). Patriotism's impact on cooperation with the state: an experimental study on tax compliance. *Political Psychology*, 37(6), 867-881.
- Gangl, K., Pfabigan, D. M., Lamm, C., Kirchler, E., & Hofmann, E. (2017). Coercive and legitimate authority impact tax honesty: evidence from behavioral and ERP experiments. *Social Cognitive and Affective Neuroscience*, 12(7), 1108-1117.
- Gorodnichenko, Y., & Roland, G. (2011). Which dimensions of culture matter for long-run growth? *The American Economic Review*, 101(3), 492-498.
- Greiner, L. E. (1998). Evolution and revolution as organizations grow. *Harvard Business Review*, 76(3), 55-64.
- Gutierrez, C., Åstebro, T., & Obloj, T. (2020). The Impact of Overconfidence and Ambiguity Attitude on Market Entry. *Organization Science*, 31(2), 308-329.
- Harbaugh, W. T., Mayr, U., & Burghart, D. R. (2007). Neural responses to taxation and voluntary giving reveal motives for charitable donations. *Science*, 316(5831), 1622-1625.

- Helbing, D. (2015). *Thinking ahead-essays on big data, digital revolution, and participatory market society*. Springer.
- Hirschman, A. O. (1991). *The rhetoric of reaction*. Harvard University Press.
- Hunt, M. (2007). *The story of psychology*. Anchor Books.
- James, W. (1950). *The principles of psychology*. Dover Publication.
- James, S., & Edwards, A. (2008). Developing tax policy in a complex and changing world. *Economic Analysis and Policy*, 38(1), 35-53.
- Kahneman, D. (2011). *Thinking, fast and slow*. Farrar, Straus and Giroux.
- Kao, Y.-F., & Velupillai, K. V. (2015). Behavioural economics: Classical and modern. *European Journal of the History of Economic Thought*, 22(2), 236-271.
- Kasper, W. & Streit, M. E. (1999). *Institutional Economics. Social Order and Public Policy*. Edward Elgar.
- Katona, G. (1947). Contribution of psychological data to economic analysis. *Journal of the American Statistical Association*, 42(239), 449-459.
- Katona, G. (1975). *Psychological Economics*. Elsevier.
- Kiesler, C. A. (1971). *The Psychology of Commitment: Experiments Linking Behavior to Belief*. Academic Press.
- Kirchler, E. (1997). The burden of new taxes: acceptance of taxes as a function of affectedness and egoistic versus altruistic orientation. *Journal of Socio-Economics*, 26(4), 421-437.
- Kirchler, E. (1998). Differential representations of taxes: Analysis of free associations and judgments of five employment groups. *Journal of Socio-Economics*, 27(1), 117-131.
- Kirchler, E. (1999). Reactance to taxation: Employers' attitudes towards taxes. *Journal of Socio-Economics*, 28(2), 131-138.
- Kirchler, E. (2007). *The economic psychology of tax behaviour*. Cambridge University Press.
- Kirchler, E., Hoelzl, E., & Wahl, I. (2008). Enforced versus voluntary tax compliance: The "slippery slope" framework. *Journal of Economic Psychology*, 29(2), 210-225.
- Kitto, K., & Kortschak, R. D. (2013). Contextual models and the non-Newtonian paradigm. *Progress in Biophysics and Molecular Biology*, 113(1), 97-107.
- Koessler, A. K., Torgler, B., Feld, L. P., & Frey, B. S. (2019). Commitment to pay taxes: Results from field and laboratory experiments. *European Economic Review*, 115, 78-98.
- Krause, K. (2000). Tax complexity: Problem or opportunity?. *Public Finance Review*, 28(5), 395-414.
- Lewis, A. (1982). *The Psychology of Taxation*. Martin Robertson.
- Loewenstein, G., & Chater, N. (2017). Putting nudges in perspective. *Behavioural Public Policy*, 1(1), 26-53.
- Macintyre, A., Chan, H. F., Schaffner, M., & Torgler, B. (2021). National pride and tax compliance: A laboratory experiment using a physiological marker, CREMA Working Paper No. 2021-07.
- Malézieux, A., & Torgler, B. (2021). Culture, Immigration and Tax Compliance. CREMA Working Paper No. 2021-23.
- Martinez-Vazquez, J., & Torgler, B. (2009). The evolution of tax morale in modern Spain. *Journal of Economic Issues*, 43(1), 1-28.
- Matsuno, K. (2013). Making biological theory more down to Earth. *Progress in Biophysics and Molecular Biology*, 113(1), 46-56.
- Mearns, M., & Braithwaite, V. (2001). *The Community Hopes, Fears and Actions Survey: Survey method, sample representativeness and data quality*, Centre for Tax System Integrity Working Paper No. 4, Australian National University, Canberra.
- Minsky, M. (1986). *The Society of Mind*. Simon & Schuster.
- Minsky, M. (2006). *The Emotion Machine: Commonsense Thinking, Artificial Intelligence, and the Future of the Human Mind*. Simon & Schuster.
- Mols, F., Haslam, S. A., Jetten, J., & Steffens, N. K. (2015). Why a nudge is not enough: A social identity critique of governance by stealth. *European Journal of Political Research*, 54(1), 81-98.

- Möhlmann, A. (2014). Persistence or Convergence? The East—West Tax-Morale Gap in Germany. *FinanzArchiv/Public Finance Analysis*, 70, 3-30.
- Muehlbacher, S., & Kirchler, E. (2013). Mental accounting of self-employed taxpayers: On the mental segregation of the net income and the tax due. *FinanzArchiv/Public Finance Analysis*, 412-438.
- Mullainathan, S., & Spiess, J. (2017). Machine learning: an applied econometric approach. *Journal of Economic Perspectives*, 31(2), 87-106.
- Mueller, E. (2004). *The Performance of Private Companies: An Empirical Investigation Into the Role of Control, Risk and Incentives*. PhD thesis. London School of Economics and Political Science, London.
- Nature Communications Editorial (2018). Data sharing and the future of science, *Nature Communications*, 9:2817.
- Newell, A. & Simon, H. A. (1972). *Human Problem Solving*. Prentice-Hall, Inc.
- Norman, D. (2013). *The design of everyday things: Revised and expanded edition*. Basic books.
- Olsen, J., Kasper, M., Kogler, C., Muehlbacher, S., & Kirchler, E. (2019). Mental accounting of income tax and value added tax among self-employed business owners. *Journal of Economic Psychology*, 70, 125-139.
- Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge University Press.
- Ostrom, E. (2005). Policies that Crowd out Reciprocity and Collective Action, in: H. Gintis, S. Bowles, R. Boyd, & E. Fehr (eds.), *Moral Sentiments and Material Interests*. MIT Press, pp. 253-275.
- Pagan, A., & Torgler, B. (2015). Use '4Rs' criteria to assess papers. *Nature*, 522(7554), 34.
- Pothos, E. M., & Busemeyer, J. R. (2013). Can quantum probability provide a new direction for cognitive modeling? *The Behavioral and brain sciences*, 36(3), 255-274.
- Potts, J. (2010). Can behavioural biases in choice under novelty explain innovation failures?. *Prometheus*, 28(2), 133-148.
- Rumelhart, D. E., McClelland, J. L. & PDP Research Group (1986). *Parallel Distributed Processing, Volume 1, Explorations in the Microstructure of Cognition: Foundations*. MIT Press.
- Sagie, A., & Elizur, D. (1999). Achievement motive and entrepreneurial orientation: a structural analysis. *Journal of Organizational Behavior*, 20(3), 375-387.
- Schaffner M. (2016). *Statdoc: document and explore*, mimeo, School of Economics and Finance, Queensland University of Technology.
- Schmolders, G. (1951/1952). *Finanzpsychologie*, *FinanzArchiv/ Public Finance Analysis*. 13: 1-36.
- Schmolders, G. (1960). *Das Irrationale in der öffentlichen Finanzwissenschaft*. Rowolt.
- Schmolders, G. (1962). *Volkswirtschaftslehre und Psychologie*. Reinbek.
- Schmolders, G. (1970). Survey Research in Public Finance: A Behavioral Approach to Fiscal Theory, *Public Finance*. 25: 300-306.
- Schmolders, G. (1959). Fiscal psychology: A new branch of public finance. *National Tax Journal*, 12(4), 340-345.
- Sheffrin, S. M. & Triest R. K. (1992). Can brute deterrence backfire? Perceptions and attitudes in taxpayer compliance', in: Slemrod, J. (Ed.), *Why People Pay Taxes: Tax Compliance and Enforcement*, University of Michigan Press.
- Shiller, R. J. (2019). *Narrative Economics: How Stories Go Viral & Drive Major Economic Events*. Princeton University Press.
- Simon, H. A. (1983). *Reason in Human Affairs*. Stanford University Press.
- Simon, H. A. (1996). *Models of My Life*. MIT Press.
- Sloman, A. (2001). Beyond shallow models of emotion. *Cognitive Processing*, 2(1), 177-198.
- Sloman, A., & Chrisley, R. (2004). Updated version of: Virtual machines and consciousness. *Journal of Consciousness Studies*, 10(4-5), 133-172, <https://www.cs.bham.ac.uk/research/projects/cogaff/sloman-chrisley-jcs03.pdf>
- Strümpel, B. (1969). The Contribution of Survey Research to Public Finance, in: A. T. Peacock (ed.), *Quantitative Analysis in Public Finance*. Praeger Press: 14-32.

- Smith, K. W. (1990). Integrating three perspectives on noncompliance: A sequential decision model. *Criminal Justice and Behavior*, 17(3), 350-369.
- Smith, K. W. (1992). Reciprocity and fairness: Positive incentives for tax compliance, in: in: Slemrod, J. (Ed.), *Why People Pay Taxes: Tax Compliance and Enforcement*, University of Michigan Press.
- Spicer, M. W. (1990). On the desirability of tax evasion: conventional versus constitutional economic perspectives. *Public Finance*, 45(1), 119-127.
- Stadelmann, D., & Torgler, B. (2013). Bounded rationality and voting decisions over 160 years: Voter behavior and increasing complexity in decision-making. *PloS One*, 8(12), e84078.
- Stopczynski, A., Stahlhut, C., Larsen, J. E., Petersen, M. K., & Hansen, L. K. (2014). The smartphone brain scanner: a portable real-time neuroimaging system. *PloS One*, 9(2), e86733.
- Sunstein, C. R. (2017). *Nudges that fail*. *Behavioural Public Policy*, 1(1), 4-25.
- Sunstein, C. R. (2019). *How Change Happens*. MIT Press.
- Thaler, R. H. & Sunstein C. R. (2008). *Nudge: Improving Decisions About Health, Wealth, and Happiness*. Penguin Books.
- Torgler, B. (2001). Is tax evasion never justifiable?. *Journal of Public Finance and Public Choice*, 19(2-3), 143-167.
- Torgler, B. (2002). Speaking to theorists and searching for facts: Tax morale and tax compliance in experiments. *Journal of Economic Surveys*, 16(5), 657-683.
- Torgler, B. (2003a). Does culture matter? Tax morale in an East-West-German comparison. *FinanzArchiv/Public Finance Analysis*, 59, 504-528.
- Torgler, B. (2003b). Tax Morale, Rule Governed Behaviour and Trust, *Constitutional Political Economy*. 14: 119-140.
- Torgler, B. (2005a). Tax morale and direct democracy. *European Journal of Political Economy*, 21(2), 525-531.
- Torgler, B. (2005b). Tax morale in latin america. *Public Choice*, 122(1-2), 133-157.
- Torgler, B. (2005c). A knight without a sword? The effects of audit courts on tax morale. *Journal of Institutional and Theoretical Economics (JITE)/Zeitschrift Für Die Gesamte Staatswissenschaft*, 735-760.
- Torgler, B. (2007). *Tax compliance and tax morale: A theoretical and empirical analysis*. Edward Elgar Publishing.
- Torgler, B. (2012). Tax morale, eastern Europe and European enlargement. *Communist and Post-Communist Studies*, 45(1-2), 11-25.
- Torgler, B. (2016a). Tax compliance and data: What is available and what is needed. *Australian Economic Review*, 49(3), 352-364.
- Torgler, B. (2016b). Can Tax Compliance Research Profit from Biology?. *Review of Behavioral Economics*, 3, 113-144.
- Torgler, B. (2019). Opportunities and Challenges of Portable Biological, Social, and Behavioral Sensing Systems for the Social Sciences, in: G. Foster (Ed.), *Biophysical Measurement in Experimental Social Science Research*. Elsevier, pp. 197-224.
- Torgler, B. (2020). Big Data, Artificial Intelligence, and Quantum Computing in Sports, in: S. Schmidt (Ed.), *21st Century Sports*. Springer, pp., 153-173.
- Torgler, B. (2021). *Symbiotics> Economics?* CREMA Working Paper No. 2021-15.
- Torgler, B., & Schneider, F. (2007). What shapes attitudes toward paying taxes? Evidence from multicultural European countries. *Social Science Quarterly*, 88(2), 443-470.
- Torgler, B., & Schneider, F. (2007). Shadow economy, tax morale, governance and institutional quality: a panel analysis. *IZA Discussion Paper No. 2563*.
- Torgler, B., & Schneider, F. (2009). The impact of tax morale and institutional quality on the shadow economy. *Journal of Economic Psychology*, 30(2), 228-245.



- Torgler, B., Schaffner, M., & Macintyre, A. (2010). Tax compliance, tax morale, and governance quality, in: Alm, J., Martinez-Vazquez, J., & Torgler, B. (Eds.). *Developing alternative frameworks for explaining tax compliance*. Routledge.
- Torgler, B., Demir, I. C., Macintyre, A., & Schaffner, M. (2008). Causes and consequences of tax morale: An empirical investigation. *Economic Analysis and Policy*, 38(2), 313-339.
- Van Bavel, J. J., Cichocka, A., Capraro, V., Sjästad, H., Nezelek, J. B., Alfano, M., ... & Zwaan, R. (2020). National identity predicts public health support during a global pandemic: Results from 67 Countries. Available at psyarxiv.com: <https://doi.org/10.31234/osf.io/ydt95>
- Van Der Stigchel, S. (2019). *How attention works: Finding your way in a world full of distraction*. MIT Press.
- van Praag, C. M. (2003). Business survival and success of young small business owners. *Small Business Economics*, 21(1), 1-17.
- van Raaij, W. F. (1991). The life and work of Burkhard Strümpel. *Journal of Economic Psychology*, 12(1), 13-26.
- Wärneryd, K. E. (1982). The life and work of George Katona. *Journal of Economic Psychology*.
- Wilson, D. S. (2019). *This view of life: Completing the Darwinian revolution*. Pantheon Books.
- Watson, J. B. (1913). Psychology as the behaviorist views it. *Psychological Review*, 20(2), 158-177.
- Watts, D. (2013). Computational social science: Exciting progress and future directions. *The Bridge on Frontiers of Engineering*, 43, 5–10.
- Weber, T. O., Fookien, J., & Herrmann, B. (2014). Behavioural economics and taxation. *European Commission Taxation Papers*.
- Yukalov, V. I., Yukalova, E. P., & Sornette, D. (2018). Information processing by networks of quantum decision makers. *Physica A: Statistical Mechanics and its Applications*, 492, 747-766.