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On Numerical Arguments in Policymaking
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Article abstract

The use of numerical arguments has become part and parcel of evidence-based policymaking, serving increasingly as scientific evidence which is used to back up policy decisions and to convince citizens of the acceptability of those decisions. But numerical arguments and their quality and potential persuasive role in the specific institutional context of policymaking have received little treatment within argumentation theory. This paper endeavours to explain the forms, functions, and quality of numerical arguments in policymaking.

On Numerical Arguments in Policymaking

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Abstract: The use of numerical arguments has become part and parcel of evidence-based policymaking, serving increasingly as scientific evidence which is used to back up policy decisions and to convince citizens of the acceptability of those decisions. But numerical arguments and their quality and potential persuasive role in the specific institutional context of policymaking have received little treatment within argumentation theory. This paper endeavours to explain the forms, functions, and quality of numerical arguments in policymaking.

Résumé: L'utilisation d'arguments numériques est devenue une partie intégrante de l'élaboration de politiques fondées sur des preuves, servant de plus en plus comme preuves scientifiques sur la base desquelles sont prises des décisions politiques, tout en tentant également de convaincre les citoyens de l'acceptabilité de ces décisions. Mais les arguments numériques sont considérablement sous-étudiés dans la théorie de l'argumentation, et encore moins examinés pour leur rôle persuasif potentiel et leur qualité dans le contexte institutionnel spécifique de l'élaboration des politiques. L'objectif de cette étude est d'expliquer les formes, les fonctions et la qualité des arguments numériques dans l'élaboration des politiques.

Keywords: evidence-based policymaking, numerical arguments, numerical fallacies, political fallacies, scientific evidence

1. Introduction

The use of numerical arguments has always been part and parcel of evidence-based policymaking. Such arguments serve as scientific evidence which is used to back up policy decisions and to convince citizens of the acceptability of those decisions. This type of argument tends to be favored in crisis and controversial situa-

tions (Parkhurst 2017) and is used to impart a sense that there is an urgent need to adopt certain measures. The 2030 climate and energy framework of the European Commission (2022), for example, is full of numbers indicating the need to immediately reduce greenhouse gas emissions in all sectors. As another case in point, during the recent global health crisis, some countries imposed strict lockdowns on the basis of various figures suggesting the likely infection rates for the COVID-19 virus. Similarly, vaccination campaigns were launched, going as far, in some countries, as mandating vaccination for certain categories of people (such as those above 60 or medical workers), and these campaigns also relied on numbers indicating the probability that citizens would get sick or transmit the coronavirus.

The use of numerical arguments is crucial for supporting positions in policymaking. As will be shown in this study, these arguments can offer essential insights into the benefits or undesirable consequences of a policy proposal. When used correctly, numerical arguments can provide strong evidence for a proposed course of action. However, numerical arguments can also be abused when they are employed as a source of misinformation aimed at gaining support for positions that are not backed up by trustworthy figures and that are self-serving for those spreading the misinformation. Given the growing importance of numbers in forming opinions and making policy decisions, it is crucial to properly understand the forms and functions of numerical arguments in the different policy cycles and to critically assess their quality.

Argumentation theory can be used to explain the form and the potentially persuasive role of numerical arguments as well as to assess their quality in the specific institutional context of policymaking. Up until now, the all too rare research on numerical arguments has concerned experimental studies testing the persuasiveness of statistical arguments in comparison to other argument forms, such as narratives and anecdotal arguments (see Hoeken 2001; Limon and Kazoleas 2004; Zebregs et al. 2015). These studies do not explain how numerical arguments support positions on a course of action, they ignore the question of whether their persuasiveness is due to their sound or unsound use, and they do

not situate their discussions on this type of argument within the context of policymaking wherein they are so commonly employed.

This study endeavours to explain the forms, functions, and quality of numerical arguments in policymaking. In section 2, the pertinence and importance of numerical arguments in policymaking is discussed. Their role as justifications in various stages of the policy cycle, including agenda-setting, policy research, and analysis and policy formulation is explained therein. In section 3, the functions of numerical arguments in policymaking become clear. Apart from the common rhetorical function of giving the appearance of objectivity, impartiality, and scientific inquiry, it is shown that numerical arguments have various other functions that serve to "win points," which is a goal that is specific to political decision-making. Finally, section 4 provides an outline of five common numerical fallacies in policymaking.

2. What's in a numerical argument in policymaking?

The term 'numerical argument' is used in this study to refer to a justification that is based on a numerical quantity, including counts, measurements, averages, and ratios constituting a statistical/numerical result. The growing use of such numbers to argue for public decisions is a development that scholars and practitioners alike can hardly deny. On the one hand, this dominance is explained by policymaking becoming particularly complex (Snyder 2013), which makes policy choices and evaluation more challenging than ever before. This issue is partly addressed by policymakers demanding more data-based information. On the other hand, there are more sophisticated possibilities for data analysis which lend themselves quite naturally to policymaking.

As repeatedly demonstrated (see Porter 1995; Parkhurst 2017), numerical arguments are advanced and given considerable weight even when their validity is not further defended; in such cases, they are often used simply to give the impression of fairness, scientific objectivity, and impartiality. They lend authority to officials who rely on them for the purpose of persuading their opponents and the population at large that their proposals, particularly those most controversial and likely unpopular, are worth pursuing. Proposals for changes in daily consumer behavior, the

adoption of new technology, and health restrictions are only some of the instances in which data and numbers are used to support claims regarding the benefits or undesirable consequences of adopting a particular action.

The use of numbers is an integral element of evidence-based policymaking. Those in favor of evidence-based policymaking point out that numbers have sometimes saved lives; those opposing it cite the marginalization of social values due to too much reliance on objective evidence (see Parkhurst 2017, pp. 7-8). Because policymaking is essentially about social values, there is some fear that these are ignored, leading to what has become known as the "depoliticization of the political" (Fawcett et al. 2017; Barbi 2018). But whatever their views, scholars and practitioners alike recognize that current policymaking can only be properly understood if numbers are taken into account.

Numbers constitute *scientific* evidence, and the suggestion is that they can contribute to potentially highly effective policy that has been determined based on scientific experiments, data, trials, etc., which lends authority to the resulting policy. As Parkhurst (2017, pp. 18-25) convincingly shows, scientific evidence, including evidence based on numbers, points at "what works," although upon closer inspection, two problems become obvious. First, "what works" from a scientific perspective is not necessarily socially important and thus does not always lead to desirable policy (Parkhurst 2017, p. 19). Second, "what works" from a scientific perspective under certain conditions does not necessarily work under different conditions and is not always generalizable to regular, everyday life, which should be the case for policymaking (Parkhurst 2017, p. 20).

Nonetheless, with those reservations in mind, numbers are commonly used as evidence to support decisions in policymaking, alongside qualitative evidence, experimental evidence, and descriptive evidence (Porter 1995, p. 6). They play an increasingly significant role in the policy cycle (Nachmias and Felbinger 1982, p. 305), from identifying the policy problem through assessing policy options to ex-post evaluation (Howlett et al. 2009). Understanding these functions of quantitative evidence in the policy cycle enables the identification and explanation of different nu-

merical arguments.[1] From an argumentative perspective, we can understand numerical arguments in policymaking as premises supporting prescriptive positions in favour of a particular course of action. And since policy scholars have the appropriate tools to understand the evidence, we must lean on their results to put such arguments in their institutional context.

As part of the policy cycle, *arguments based on numbers serve in agenda-setting*, in essence, in identifying problems that require policies and making it possible to decide which issues to prioritize. For instance, in 2017, the US Energy Information Administration pointed out that approximately 8 billion people require almost 25 trillion kilowatt hours of electricity, thus demonstrating that global electricity consumption is increasing faster than the population. Using these numbers, the Administration argued that the need to dramatically shift energy sources should be a new agenda issue, with priority being given to the production of green energy.[2]

Arguing in this way amounts to a combination of a prescriptive standpoint—in which the need for policy is emphasized—and an argument in which numbers elucidate a problem and/or a priority along with another (usually implicit) argument for the adoption of a proposed policy, given that it is the only one capable of solving the problem, as shown below.[3] The two arguments (argument a and argument b constitute the premises of a pragmatic argument

[1] The idea advanced in this paper that numbers are components of various arguments is in line with the realisation that public policy is constructed through argumentation—a view that Majone (1989) thoroughly defends and that has been further explained by Fischer and Gottweiss (2012, p. 7).

[2] See https://www.eia.gov/todayinenergy/detail.php?id=44095

[3] This way of arguing corresponds, to some extent, to Garssen's complex problem-solving argumentation (2016, p. 30). Examining this type of arguing in the context of European parliamentary debates, Garssen points at the need for new legislation by supporting this view with the argument that there is a problem that can only be solved by legislation. According to Garssen, the existence of a problem is not automatically accepted by the addressees and therefore needs to be proven. In complex problem-solving argumentation, the fact that there is a problem constitutes a premise on its own. In the numerical argument type, *argument a* implies that there is a particular problem that constitutes an issue or that an issue needs to be made a priority and creating a policy P is the only solution to defend the prescriptive standpoint.

scheme, and together they offer support for the prescriptive standpoint.

PRESCRIPTIVE STANDPOINT	Policy P needs to be adopted
ARGUMENT a	Numbers indicate a problem/that P is a priority
ARGUMENT b	Only the adoption of policy P can solve the problem/deal with the priority

In this type of arguing, a distinction is made between a problem constituted by the issue that is central to the policy debate, and a priority in the sense that while several issues may constitute problems, only one/some of them are central. While the two may and oftentimes do overlap, that need not be so. Numbers can be used to demonstrate that a situation is problematic, usually by showing that an issue in the private sphere is part of a larger societal problem. For instance, the World Health Organization (2007) reported that the proportion of women who had experienced physical or sexual violence or both from a partner ranged from 15% to 71%, with the largest number of respondents falling in the 29% to 62% range. In this case, the numbers were used to demonstrate that domestic violence is not just a problem at the individual level, but is a collective problem that requires social recognition given the many people that it arguably affects.

Numbers can also be employed to demonstrate that among a number of problems, some are more important than others and therefore require policymaking. Numbers are employed in this case to thematize a public problem that is a priority and needs to be solved by policymakers. One prominent case in point is that of child labor, which has been put on the political agenda as a problem that needs to be prioritized due to the large number of exploited children. The latest International Labor Organization estimates show that 152 million children around the world are engaged in harmful and exploitative work, and this figure has been used to signal the need for urgent action to eliminate child labor by 2025 (Unicef 2022).

Both of the premises in the agenda-setting argumentation can be further reinforced with numbers, and in this way, the problems, the choice of priorities, and the adoption of certain policies are further justified quantitatively, increasing the chances that the

prescriptive standpoint will be adopted by addressees. The following are ways in which numbers can lend support to these premises. First, the severity of the problem is underscored quantitatively by indicating the devastating consequences of non-intervention. Second, numbers are employed to show that policy makers need to pay particular attention to an issue because it affects a large number of people who are important both in terms of being numerous and in terms of their characteristics. Such was the discussion on cervical cancer in the Netherlands. The human papillomavirus (HPV) vaccine was first administered to girls of at least 13 years of age before they became sexually active and was later extended to girls of at least 10 years old, then finally to boys of at least 10 years old, in all cases pointing at an increase in the number of both boys and girls of at least 10 years old (see Dutch National Institute for Public Health and the Environment 2022). The combination of a large number of people and the extension to boys and girls of at least 10 years old made it possible to prioritize vaccination against cervical cancer at a young age for girls and boys as a policy issue. Third, numbers are advanced to show that a problem is new, which makes agenda-setting more readily acceptable. Such is the case for the new challenges involved in delivering on the twin green and digital transition while, at the same time, recovering from the coronavirus pandemic by building a more inclusive and resilient economy—more than 20 studies indicating new issues (European Commission 2021). Fourth, numbers are used to highlight the urgency of solving an issue that requires a policy intervention; such is the case for pandemics or economic crises. These ways of arguing are represented below. As in the case of agenda-setting, the two arguments (argument a and argument b) constitute the premises of a pragmatic argument scheme, and together they offer support for the prescriptive standpoint.

PRESCRIPTIVE STANDPOINT	Policy P needs to be adopted
ARGUMENT a	Numbers indicate a problem/that P is a priority 1. Numbers show that the problem is severe 2. Numbers show that the problem affects a great many people 3. Numbers show that the problem is new 4. Numbers show that the problem is urgent
ARGUMENT b	Only the adoption of policy P can solve the problem/deal with the priority 1. Numbers show that an issue is a matter of public policy

In addition to numbers being employed to problematize and prioritize issues, numerical arguments can also be advanced to establish causality, particularly to answer questions about whether certain actors have done something deliberately, through negligence, or purely by accident. In July 2021, there were large floods in the Southern part of the Netherlands, western Germany, and parts of Belgium. This was considered to be an accidental event as no policy can prevent natural disasters such as floods. However, numbers have been used to show that for decades the authorities in these countries have done too little to identify areas where there is a flood risk and to take measures to prevent flooding in inhabited areas. By demonstrating that there are people who shoulder some blame in the disasters, certain issues have been placed on the agenda—such as developing alternative construction methods or water sewage systems—and are considered priorities so that similar situations can be prevented from recurring.

Within the policy cycle, *arguments based on numbers occur during policy research and analysis*—the stage that forms the backbone of policy development (Nachmias and Felbinger 1982). While many stakeholders are involved in policymaking and shape public policy, essentially it is research that provides much of the information used to justify decisions. This stage is particularly important, as policymaking primarily involves selecting from various policy alternatives. And such choices are all too often made on the basis of quantitative information which is then used to argue for selecting one policy over another. Official statistics are one favored source of information that is employed in policy research. For example, in discussions about whether the tax on alcoholic beverages should be raised or not, statistical information

is drawn upon to determine the number of deaths per year and the traffic fatalities due to accidents caused by drunk drivers. Since numerical arguments are employed for the purpose of choosing among different alternatives, they are particularly useful in comparison argumentation in which policy options are set against each other to predict the effectiveness of a policy measure. For example, the number of deaths as a result of alcohol consumption is compared to the number of deaths resulting from tobacco use to demonstrate that an increase in tobacco tax in the past has led to a reduction in cigarette consumption, and hence fewer deaths.

Finally, in the policy cycle *arguments based on numbers are used for policy formulation*, that is, for setting objectives, identifying costs, and estimating the effect of selected solutions (Nachmias and Felbinger 1982). Numbers are used to formulate measurable objectives, explain what each alternative entails, determine the consequences of each alternative, and finally serve in the choice of which action maximizes net benefits. If we consider the case of unemployment, a policy objective might be to reduce the number of unskilled jobseekers by 5% within five years. Public policy can then be steered towards this objective.

3. Functions of numerical arguments

The importance of understanding the various arguments in which numbers are employed in policymaking should not be underestimated. Despite this importance, the functions of numerical arguments in this context remain under-explained, with some scholars focusing on their rhetorical function, primarily their ability to impart the *appearance* of objectivity, impartiality, and scientific inquiry (Porter 1995; McCloskey 1998; Desrosières 2008).

Using insights from Weiss' (1979) framework on research utilization, it becomes possible to understand some of the most prominent roles for numerical arguments. As a form of scientific evidence, numerical arguments can play at least six roles[4] in policymaking:

[4] Weiss (1979, pp. 427-428) refers to seven elements of research utilization. The seventh element, the social intellectual enterprise, is not immediately relevant in this context.

1. numerical arguments are employed to increase *knowledge* in a certain policy area by providing data for identifying, researching, and solving problems.
2. numerical arguments are used for *problem-solving* by offering a solution alongside other technical findings
3. numerical arguments serve as an *interactional* component in the back-and-forth process of learning between policy makers and multiple sources of information
4. numerical arguments have a *political* function, used as "ammunition" for pre-determined policy positions
5. numerical arguments have a *tactical* function, serving to deflect criticism
6. numerical problems have an *enlightening* role wherein they influence thinking indirectly, including the thought process to identify problems and/or convert them into "non-problems"

It is also important to note that policymaking is closely connected to the nature of politics, which is primarily about *social* outcomes. While this idea is often ignored, especially when it comes to evidence-based policymaking (Parkhurst 2017, p. 28), it has important implications in that when policies are accepted as *legitimate* by the population, they have social repercussions (Parkhurst 2017, p. 30). This implies that one fundamental function of numerical arguments in policymaking is to gain acceptance as proper evidence for the policy in question among citizens. Arguably, the use of numerical arguments as evidence does not in itself make policies legitimate, but it does make an important contribution. It is in this sense that Parkhurst (2017, p. 30) quotes Ben Goldacre from BBC Newsnight (2015): "[…] we can improve democracy by improving the way we use data." Equally relevant to understanding the role of numerical arguments in policymaking is the realization that politics is about cooperation as well as conflict (Heywood 2007, p. 2). If we take this view seriously, we can see that numbers are part of a competitive situation in which conflicts of opinion and contrasting values, wants, and needs explain why some numerical arguments are preferred over others. Hence, one other

function of numerical arguments is to resist, as it were, competing arguments in a situation in which many other sources of evidence have gained ground. As Parkhurst (2017, p. 66) rightly observes, "participation in policy debates is not driven by a desire to be technically accurate, but rather by a need for political success or even survival." So numbers that may be technically accurate are employed to achieve strategic political goals, but as we will see in the next section, that may not necessarily work

As pointed out at the beginning of this section, one function of numbers that has been commonly cited is to provide rhetorical advantage. Numbers contribute credibility and authority to decision-making and can therefore be convincing for addressees. Koblitz (1981, p. 113), for one, illustrates the authoritative force of statistical arguments by referring to past research on slavery that created a stir in academia and beyond using ". . . a 'scientific' view on computer analysis of hard quantitative facts." As Koblitz (1981) explains, an "argument which would be quickly disputed if stated in plain English will often acquire some momentum if accompanied by numbers and formulas, regardless of whether or not they are relevant or accurate" (p. 115). Certain policies and the actions they require are thus more readily embraced by citizens, even when they place limitations on them, when data is provided to back up the suitability of a course of action (see also Davis and Hersh 1987). Such was the case during the COVID-19 pandemic when data was used to convince citizens to stay inside at all times, to take many precautionary constraining measures such as wearing masks everywhere, and even to get vaccinated despite scientific uncertainty about the efficacy and effects of the vaccines, particularly at the very beginning.

4. What can go wrong with numerical arguments?

"The rhetoric of quantification" can go "crazily wrong," as McCloskey (1998, p. 100) convincingly demonstrates. Numerical arguments can be not only used but also abused when advanced to support policies. As Battersby (2013) points out, numerical arguments can be employed "to mislead, intimidate, and illegitimately

persuade" given their "undue rhetorical force"[5] (pp. 1-2). Rational and sound numerical arguments can be easily turned into fraudulent and deceptive ones used to manipulate opponents of a proposed policy and ultimately the citizens. They can be what Davis and Hersh (1987) call "rhetorical mathematics" referring to "empty verbiage or pretentious obfuscation" (p. 55). The idea that policymaking is "defined by competition over interests and beliefs" (Parkhurst 2017, p. 66) is particularly pertinent in a discussion concerning the quality of numerical arguments. As they constitute evidence in policymaking, numerical arguments are not employed only for their technical accuracy, but also for "political success and even survival" (Parkhurst 2017, p. 66).

The strategic use of numerical arguments in this context is fundamentally oriented towards increasing the chances of having certain policies accepted and opposing policies rejected. The attempt to reach this goal can easily give rise to what can be called "numerical" fallacies in policymaking: unsound contentions that may easily pass unnoticed as such by the imprudent. These are arguments that negatively affect a reasonable process of persuasion and arise when the aim to obtain acceptance for policies is prioritized above all else.

Although fallacies occurring in a political context are commonly discussed, their usage specifically in policymaking is much neglected in the scholarly literature. Remarkably, numerical fallacies in this context, despite their commonality and important consequences, have never been systematically identified on their own, let alone explained. Given that the goal of having policies accepted and opposing policies rejected is specific and fundamental to policymaking, a proper recognition and examination of fallacies is required in this context.

[5] A similar point is made by Koblitz (1981) who explains how a historical slavery project that was based on statistical arguments lost all validity due to "fallacious inferences, dubious assumptions, and disingenuous use of statistics […]" (p. 113). He refers to the book *Time on the cross* (1974) in which statistical arguments have been used "to show that the slave system in the South was both more humane and economically more efficient than the free labor system that existed at that time in the North" (p. 113).

To properly identify such fallacies, I will use Bentham's (1952) definition of political fallacies, which refers to "any argument employed or topic suggested for the purpose, or with the probability of producing the effect of deception, or of causing some erroneous opinion to be entertained by any person to whose mind such an argument may have been presented" (p. 3). Bentham (1952) adds that the term 'fallacy' concerns "[…] discourse in any shape considered as having a tendency, with or without design, to cause any erroneous opinion to be embraced, or, through the medium of some erroneous opinion already entertained, a pernicious course of action to be engaged in or persevered in" (pp. 5-6). This definition captures perfectly the interactional nature of political fallacies by bringing to the foreground the very essence of policymaking: obtaining *acceptance* from addressees. This view coincides with Bentham's (1952) position that politics is about policymaking: it is about "[…] the adoption or rejection of some measure of government, whether of legislation or of administration" (p. 6). Moreover, the definition points at the treacherous nature of political fallacies by including those that may be judged as being potentially deceptive even if not obviously so, irrespective of whether they are deliberately or mistakenly employed to deceive. In this way, the almost completely neglected and under-appreciated account of political fallacies provided by Bentham as early as 1824 (reprinted in 1952)[6] enables an account of fallacies that is specific enough in the context of policymaking but also broad enough to include a wide range of fallacious potential. Nonetheless, while Bentham endeavoured to provide an outline of the tactics employed in defenses against proposals for change, I will discuss fallacies as committed by the political actors proposing new policies.

Unsound numerical arguments can take at least five different forms in policymaking. First, numerical evidence can be used in

[6] To my knowledge, prominent exceptions include Perelman and Olbrechts-Tyteca (1969) who touch upon the persuasive nature of fallacies, Secor's (1989) appreciation of the rhetorical nature of Bentham's fallacies, Grootendorst's (1997) dialectical account of Bentham's handbook and Finlayson's (2017) discussion of parliamentary debates in which he looks back into Bentham's account of deliberation. Hamblin (1970) also briefly discusses Bentham's work of which he is very critical.

biased ways, positive or negative, to serve a particular purpose. Such a *fallacy of exaggerating numerical values*, which results from overstating the importance of quantitative arguments, is particularly favored in agenda-setting activities or to prioritize an issue. This fallacious tactic can be combined with appeals to fear to exaggerate the potentially negative consequence of not putting an issue on the agenda or not prioritizing it. This strategy is particularly favored in controversial situations where non-acceptance of drastic measures is expected. For example, in 2021, the media (NOS 2021; Die Welt 2021) reported that German ministers had asked scientists to exaggerate the number of infections and deaths that would likely result if restrictive measures were not taken by the German population during the COVID-19 health crisis. In order to prioritize drastic measures, particularly those including a complete lockdown, scientists exaggerated the number of infections that were likely to occur without those measures, estimating that 70% of the whole population would become infected and millions of people would likely die within one year. By presenting the worst-case scenario rather than the best-case scenario, which was much less dramatic, the policymakers amplified the potential for negative consequences in order to obtain support for unpopular measures.[7]

Second, a closely related but slightly different tactic is to hide numerical evidence because it is politically sensitive. This *fallacy of data underreporting or data minimization does* not necessarily consist of hiding numerical evidence altogether, but occurs in much subtler forms when incomplete and/or lower numbers are presented to favor a particular conclusion. Such manipulative "reduction of data" as Good (1962, p. 129) terms it, is used to give the impression that appropriate evidence-based policymaking is in effect when in fact only preferred evidence is being selected with the intention of influencing policy decisions (Parkhurst 2017, p.

[7] See also Koblitz (1981) who refers to "frightening statistics" which are employed to support certain policies, such as those regarding smoking and drinking (p. 117). The same point is made by McCloskey (1998) in chapter 8 of her book on the rhetoric of economics to show that statistical significance is confused with scientific significance, and therefore adopting policies on the basis of statistical significance is wrong.

71). It is the pursuit of competing interests within the political arena that leads to the selection and use of minimized numerical evidence to direct policy attention to a specific selection of key concerns and obscure other relevant policy considerations (Parkhurst 2017, p. 71). Minimized numbers serve to frame particular interests and ideas in policy debates, as well as to exclude opposing values and preferences from such debates (de Bruijn 2017). As the selected minimized data is employed for a particular policy issue, it can be declared to be unsound from a policymaking perspective. A much-discussed case in point is the policy adopted by some local Chinese governments to underreport air quality measurements between 2015-2017 to avoid increasingly difficult targets in terms of pollution reduction and address a persistent lack of resources (Turiel and Kaufmann 2021).

Third, numerical arguments are invoked as a guarantee of the appropriateness of a proposed measure. While such arguments are essentially arguments from authority and are often reasonably employed, they become fallacious when they are aimed at undermining the credibility of opposing parties who are making use of other numerical arguments. This *fallacy of casting doubt with numbers* represses all opposing views based on the weight of the authority imposed by the numbers. It uses doubt as a political strategy to undermine the opponent's credibility and is likely most effective in the case of a complex policy issue with a number of scientific unknowns. Particularly in cases of polarization, in which the "winner takes it all" (Parkhurst 2017, p. 77), there is a greater incentive to use numerical arguments such that there is little room for alternative positions and the opposition is excluded. For example, as policymakers debated which policy was best suited for disease control during the COVID-19 crisis, some drew on studies demonstrating that masks are effective if 80% of the population wears a good mask (Gandhi et al. 2020) and some drew on studies showing that masks alone are never sufficient (Akhtar et al. 2020). Those supporting the first policy mentioned that the opponents could not be trusted as they used insights from studies with reduced validity.

Fourth, a numerical fallacy is committed when non-significant statistical findings are unduly emphasized. This *fallacy of false*

numerical interpretation or technical bias also has an alternative presentation in which results that show statistical significance are assumed to represent "facts" when the result could still be due to chance (Parkhurst 2017, p. 54; McCloskey 1998, chapter 8). In both variants, numerical arguments serve to promote the interests of powerful groups who are controlling information and can result in policy choices that are less effective than those based on technically valid evidence and are even potentially harmful. Scriven (1987) emphasizes that "statistical significance is not even a necessary condition for […] political […] significance, and when it is relevant at all, it is no more than one of the […] conditions that must be met in order to ensure practical significance" (p. 338). He adds that "statistical tests of significance, where they are relevant, at best give an indication of the likelihood that a result is due to chance" (p. 338). The misinterpretation of risk statistics is a common example, especially when absolute risk (the chance of something actually happening) is confounded with relative risk (the difference in the chances of something occurring between two situations being compared) (Parkhurst 2017, p. 53). This is the case when the media reports on a risk increase (for instance because some category of people consumes a certain product) without the details necessary to judge its importance. If the outcome has a low absolute risk of occurring, even a large increase in relative risk does not warrant a higher-priority policy response.

Fifth, numerical arguments are employed in the *fallacy of cherry-picking* in which policymakers select only those pieces of quantitative evidence that fit their desired outcomes. In this way, the selected evidence aligns with their political goals. Politicians may even have pre-established plans and then look for evidence that supports those plans. For example, pollution resulting from intensive use of cars on national routes can be demonstrated to not be a big issue anymore using data from the two pandemic years. However, in those years, many people worked from home due to pandemic restrictions, and thus this selected data is not representative of the real situation.

5. Summary

This study explained the form, functions, and quality of numerical arguments employed in policymaking. Despite their common use in evidence-based policymaking, and their special importance in supporting decision-making, numerical arguments have not been adequately studied within argumentation theory. The examination of their form revealed that numerical arguments serve in agenda-setting, policy research and analysis, and policy formulation. In these stages of the policymaking process, numerical arguments are employed to problematize and prioritize an issue and argue for policy alternatives as well as for setting objectives, identifying costs, and estimating the effect of selected solutions. The examination of the function of numerical arguments revealed that these reasoning forms are not employed solely for rhetorical purposes in order to give the appearance of policy acceptability. Building on insights from research utilization, this study showed that numerical arguments increase knowledge, are used for problem-solving, serve in the interactional process between policy makers and multiple sources of information, and have a political function, a tactical function, and a knowledge-generating role. Most importantly, it has become obvious that numerical arguments are a strategy for political success and survival since policymaking is a social enterprise that needs to be legitimized in the eyes of citizens. In examining the quality of numerical arguments, five fallacies have been identified in the context of policymaking*:* the fallacy of exaggerating numerical values, the fallacy of data underreporting or data minimization, the fallacy of casting doubt with numbers, the fallacy of false numerical interpretation or technical bias and the fallacy of cherry-picking.

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References

Akhtar, J., A. L. Garcia, L. Saenz, S. Kuravi, F. Shu and K. Kota2020. Can face masks offer protection from airborne sneeze and cough droplets in close-up, face-to-face human interactions?—A quantitative study. *Physics of Fluids* 32: 127112.

Barbi, G. N. 2018. The depoliticization of the political. An Arendtian account of expertise in politics. *Raisons Politiques* 70(2): 75-96.

Battersby, M. 2013. The rhetoric of numbers. Statistical inference as argumentation. In *OSSA conference archive* 5. <https://scholar.uwindsor.ca/ossaarchive/OSSA5/papersandcommentaries/5>.

Bentham, J. 1952. *The handbook of political fallacies*. New York: The Academy Library.

De Bruijn, H. 2017. *The art of political framing. How politicians convince us that they are right.* Amsterdam: Amsterdam University Press.

Desrosières. A. 2008. Pour une sociologie historique de la quantification. Paris: Presses de l'Ecole des mines.

Davis, P. J. and R. Hersh. 1987. Rhetoric and mathematics. In *The rhetoric of the human sciences. Language and argument in scholarship and public affairs,* eds. J. S. Nelson, A. Megill and D. N. McCloskey, 53-68. University of Wisconsin Press: Madison.

Die Welt. 2021. URL accessed 25 August 2022: <https://www.welt.de/politik/deutschland/plus225868061/Corona-Politik-Wie-das-Innenministerium-Wissenschaftler-einspannte.html>

Dutch National Institute for Public Health and the Environment. 2022. URL accessed 25 August 2022: <https://www.rivm.nl/hpv-humaan-papillomavirus>

European Commission 2021. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. A competition policy fit for new challenges. COM(2021)713.

European Commission 2022. 2030 climate and energy framework. URL accessed 25 August 2022: <https://climate.ec.europa.eu/eu-action/climate-strategies-targets/2030-climate-energy-framework_en>

Fawcett, P, M., C. Hay Flinders and M. Wood, eds. 2017. *Anti-politics, depoliticization, and governance.* Oxford: Oxford University Press.

Finlayson. A. 2017. What is the point of parliamentary debate?: Deliberation, oratory, opposition and spectacle in the British House of Commons. *Redescriptions* 20(1): 11-31.

Fischer, F. and H. Gottweiss, eds. (2012). *The argumentative turn revisited. Public policy as communicative practice.* Durham and London: Duke University Press.

Fogel, R. W. and Engerman, S. L. 1974. *Time on the cross: the economics of American negro slavery*. New York: W. W. Norton and Company.

Gandhi, M., Beyrer, C. and E. Goosby. 2020. Masks do more than protect others during COVID-19: Reducing the inoculum of SARS-CoV-2 to protect the wearer. *Journal of General Internal Medicine* 35: 3063-3066.

Garssen, B. 2016. Problem-solving argumentative patterns in plenary debates of the European Parliament. *Argumentation* 30: 25-43.

Good, I. J. 1962. A classification of fallacious arguments and interpretations. *Technometrics* 4(1): 125-132.

Grootendorst, Rob. 1997. Jeremy Bentham's *Handbook of political fallacies*. In *Historical foundations of Informal Logic,* eds. D. Walton and A. Brinton, 114-124. Aldershot: Ashgate.

Hamblin, C. 1970. *Fallacies*. Methuen: London.

Heywood, A. 2007. *Politics*. Basingstoke: Palgrave Macmillan.

Hoeken, H. 2001. Anecdotal, statistical, and causal evidence: Their perceived and actual persuasiveness. *Argumentation* 15: 421-437.

Howlett, M., M. Ramesh and A. Perl. 2009. *Studying public policy, policy cycles and policy subsystems* (3rd edition). Oxford: Oxford University Press.

Koblitz, N. 1981. Mathematics as propaganda. In *Mathematics tomorrow,* ed. L.A. Steen, 111-120. Springer: New York.

Limon, S. M. and D. C. Kazoleas. 2004. A comparison of exemplar and statistical evidence in reducing counter-arguments and responses to a message, *Communication Research Reports* 21(3): 291-298.

Majone, G. 1989. *Evidence, argument, and persuasion in the policy process*. New Haven, London: Yale University Press.

McCloskey, D. N. 1998. *The rhetoric of economics*. The University of Wisconsin Press: Madison, WI.

Nachmias, D. and C. Felbinger. 1982. Utilization in the policy cycle: Directions for research. *Review of Policy Research* 2(2): 300-308.

NOS. 2021. URL accessed on August 25 2022: <https://nos.nl/artikel/2367971-duits-ministerie-schakelde-wetenschappers-in-om-corona-angst-op-te-wekken>

Parkhurst, J. 2017. *The politics of evidence: From evidence-based policy to the good governance of evidence*. Abingdon, New York: Routledge.

Perelman, C. and L. Olbrechts-Tyteca. 1969. *The new rhetoric: A treatise on argumentation*, Notre Dame: University of Notre Dame Press.

Porter, T. M. 1995. *Trust in numbers. The pursuit of objectivity in science and public life*. Princeton: Princeton University Press.

Scriven, M. 1987. Fallacies of statistical substitution. *Argumentation* 1(3): 333-349.

Secor, M. 1989. Bentham's book of fallacies: Rhetorician in spite of himself. *Philosophy and Rhetoric* 22: 83-93.

Snyder, S. 2013. The simple, the complicated, and the complex: Educational reform through the lens of complexity theory. In *OECD education working papers*. Paris: OECD Publishing.

Turiel J. S, R. K. Kaufmann. 2021. Evidence of air quality data misreporting in China: An impulse indicator saturation model comparison of local government-reported and U.S. embassy-reported $PM_{2.5}$ concentrations (2015–2017). *PLOS ONE* 16(4): e0249063.

Unicef. 2022. Child labour. URL accessed 14 February 2022: <https://www.unicef-irc.org/research/child-labour/>

Weiss, C. H. 1979. The many meanings of research utilization. *Public Administration Review* 39(5): 426-431.

World Health Organisation. 2007. *Multi-country study on women's health and domestic violence against women*. Geneva: World Health Organization.

Zebregs, S., B. van den Putte, P. Neijens and A. de Graaf. 2015. The differential impact of statistical and narrative evidence on beliefs, attitude, and intention: A meta-analysis. *Health Communication* 30(3): 282-289.