Policy Bubbles:

Policy Overreaction and Positive Feedback*

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Abstract. Drawing on insights from economics, psychology, sociology, political science and policy sciences, this article proposes a definition and measurement strategies for policy bubbles. A policy bubble is a real and/or perceived policy overreaction which is reinforced by positive feedback over an extended period of time. Positive feedback is here integrated in a model of human herding as the key factor that propels this process, but also as a key generator of change. The process is conceptualized in terms of the formation, growth and burst of policy bubbles. This causal-explanatory understanding of the term allows for the possibility that different modes of policy overreaction lead to different types of human herding, thereby resulting in different types of policy bubbles.

Keywords. Policy bubbles, Policy overreaction; Positive feedback, Bounded rationality, Human herding

Introduction

What is a policy bubble, and what are its characteristic properties? What causes a policy bubble? Why do some policy bubbles deflate on their own while others continue to grow? What are the most effective means to identify the formation of a policy bubble? Can the growth of policy bubbles be predicted? Given that policy makers are boundedly rational, should the government respond to bubbles, and if so, should it respond when the bubble is growing or after it bursts? Might bursting bubbles be a desirable policy goal? Are policy bubbles desirable? With a few notable exceptions that address issues pertaining to human nature and public policy (Jones 2011, 2012) and the role of the media in policy bubbles (Jones, Thomas, and Wolfe 2013 a, b), these questions have so far been ignored by policy scientists. If policy scholars and practitioners have mentioned the term it has been because the bubble was perceptible after it burst. Yet these questions present interesting, sometimes even daunting, challenges for policy scientists. This is because bubbles are ubiquitous in human affairs (Gisler and Sornette 2010, 2). They appear in any policy sector, in any country and/or region, spill over from one policy sector to others,

and when they burst, they carry the potential for radical consequences. Although this paper cannot do full justice to the subject, its modest aim is to make a preliminary venture into the scientific analysis of policy bubbles by outlining a definition and measurement strategies for this concept.

A public policy bubble constitutes an essential element in policy processes. As its name indicates, it arises for a reason directly related to the conduct of public policy. A *policy bubble* is defined here as *a real and/or perceived policy overreaction which is reinforced by positive feedback over a long period of time*. "Policy overreaction" refers to a "policy that imposes objective and/or perceived social costs without producing offsetting objective and/or perceived benefits" (Maor 2012, 232).[1] Only the pursuit of policies against *existing* knowledge to the contrary (i.e., the best available evidence at the time the policy is enacted) should be considered a bubble. This implies that any policy that long after its enactment is found to be an overreaction should not be considered a policy bubble. It also implies that wrongly adopting a policy due to a lack of correct scientific knowledge is not a bubble.

In recent years, economists, psychologists, sociologists and political scientists have devoted a great deal of attention to the emergence of asset, stock market and housing bubbles (e.g., Akerlof and Shiller 2010; Evanoff, Kaufman, and Malliaris 2012a; Garber 2001; Kindleberger and Aliber 2011; Perez 2002; Shiller 2005), and to a lesser concern, also social bubbles (Gisler and Sornette 2010; Gisler, Sornette, and Woodward 2010) and political ones (McCarty, Poole, and Rosenthal 2013). The minimal diffusion of this research into the study of public policy, with the aforementioned exceptions, is surprising given that policy bubbles may have significant harmful as well as beneficial

consequences. An example of the harmful consequences is China's Great Leap Forward in 1958-1961 which "involved both agricultural collectivization and aggressive promotion of industry [by swiftly diverting] agricultural labor and resources to industry, resulting in a famine that killed tens of millions" (Shiller 2012). An example of the beneficial consequences is the railway mania in Britain during the 1840s that led to the vast expansion of the British railway system during the speculative investment period (Levin 1968).

The roots of my interpretation of this concept have grown out of my focus on the psychological and social psychological aspects of decision making by policy makers and the general public, and my studies of policy over- and underreaction (Maor 2012, 2013). Once my view of the triggering mechanisms of these phenomena was conceptually established, attention shifted to the understanding of the continuation of these types of non-proportional policy response over an extended period of time. This shift is not relevant solely to historical episodes. Policy scholars and practitioners claim that privatization has been, and still is, a policy bubble (Jones 2012), as is the Eurozone (Soros 2012), nuclear deterrence (Wilson and Lewis 2012), New Public Management (NPM) success in cost-cutting in the early NPM era (Hood and Dixon 2013), and state-private partnership in the delivery of long term infrastructure projects (Roberts 2011). Whereas the first three studies have specifically used the concept of "bubble", the latter has opted for "the logic of discipline". Some may even wonder whether the idea of "sustainability" and especially its policy applications (e.g., sustainable transport) are bubbles (Cox and Béland 2013). These suspected policy bubbles can be studied

preferably following conceptual thinking and the development of a model of human behavior.

The approach advanced here for the definition and measurement of policy bubbles offers a foundation upon which further efforts at understanding this concept can be made. Rather than relying on unidimensional constructs (e.g., overinvestment), an attempt has been made to develop a more nuanced definition which allows for the possibility that different modes of policy overreaction lead to different types of human herding, thereby resulting in different types of policy bubbles. The hope is that realistic, behavioral public policy models will be built upon the concept of policy bubbles, using the definition provided here. This contribution is important because this concept, in combination with the concepts of policy over- and underreaction, create an emerging research agenda for both policy scientists and political psychologists and lay the groundwork for the study of the dynamics of non-proportional policy response.

The article proceeds as follows. The second section introduces various approaches to the term "policy bubble" and elaborates on the definition advanced here. The third discusses the importance of real and/or perceived policy overreaction to the evolution of policy bubbles. The fourth elaborates on the positive feedback process which is at the heart of any policy bubble. The fifth expands on the variations that exist among various dimensions of policy bubbles. The sixth elaborates on the measurement of policy bubbles, and the final section presents an agenda for future research.

What Constitutes a Policy Bubble?

In the *popular press*, the term "bubble" often shares the same meaning as a fad, fashion, hype, boom, mass hysteria and so on. It often describes a situation in which the support of the general public for a certain public policy increases significantly over a short period of time and is therefore suspected of being vulnerable to an equally rapid collapse of support. Implicit in the use of this common narrative by the popular press is that the policy does not reflect its intrinsic worth. This definition is problematic because of its ambiguity regarding the precise level of the surge or decline in enthusiasm for the policy at hand, and the fact that changes in the support of the general public for policy programs may originate from demand and supply cycles as well as from other factors, rather than solely from a random fad or fashion. Policies may also be overvalued and undervalued following changes in economic, demographic and political conditions. However ambiguous the popular meaning of the term is, the main insights derived from it are that a policy bubble may be a transient phenomenon and that it should be distinguished from situations in which support for the policy at hand fluctuates because of changes in the objective worth of the policy.

In the *economic approach*, the term bubble is defined as any asset or commodity whose price differs from the "fundamental" value of the asset/commodity (Evanoff, Kaufman and Malliaris 2012b). The fundamental value of an asset refers to the present value of all of the asset's future dividends and payments (Lucas 1978). Although the fundamental value of an asset may be a straightforward concept for economists, it is certainly not forthcoming for an analysis of public policy. It is impossible to assign a value to a policy, not to mention the absence of "prices" attached to public policies. Even if one takes on board the concept of policy value, it may be very difficult to model the

aggregate value of a policy because of the lack of a market for policies. Furthermore, this definition does not reflect the transient nature of some bubbles because it treats the bubble as a phenomenon that may occur forever. In other words, the divergence of the actual price of an asset (or commodity) from its "fundamental" value does not contain the seeds of its eventual collapse. For economists, therefore, a bubble is defined "not by what actually happens to the price of the asset but by what *could* happen to it" (Barlevy 2012, 44, italics in original).

In the *behavioral finance approach*, the term is defined as an episode that involves "irrational thinking or friction" which causes an asset's price to be overvalued (Barberis 2011, 2). Psychology-based mechanisms that manifest such thinking and friction are reflected in theories that can be classified on the basis of whether they focus on investor beliefs or on investor preferences (Barberis 2011). Among the former, we can find bubble formation based on *investors' disagreement* about an asset's future prospects combined with short-sale constraints; investors motivated by a *representativeness heuristic*, therefore extrapolating a small sample of past asset's prices too far into the future (Kahneman, Slovic, and Tversky 1982), and investors characterized by *overconfidence* who overestimate the precision of their forecasts (Barberis 2011). Some of the aforementioned insights can easily "travel" to policy sciences (see below), and thus be helpful in understanding policy bubbles.

In the *ideational approach*, the term is defined as a situation where "[a] policymaking system is seized by a single set of ideas that justify a more-or-less consistent and reinforcing course of public policy" (Jones 2011, 2012). Although policy bubbles may be beneficial or harmful, they "always involve an oversupply of policy,

since the bubble is self-reinforcing" (Jones 2012). This process by which ideas and theories are adopted in policy making systems is well documented in both policy and political science (Baumgartner 2013; Béland 2005, 2009; Béland and Cox 2010; Berman 2006, 2012; Campbell 1998; Cox and Béland 2013; Hall 1989, 1993; Weir and Skocpol 1985). The same holds true for innovations which are motivated by beliefs or "the logic of discipline", such as the beneficial effects of private-public partnership or independent central banks which subsequently proved to be illusory (Roberts 2011). Relatedly, the social constructivist approach goes beyond the institutional pressure of positive feedback to emphasize that "the choice of ideas adopted may be affected […] by the nature of national political discourse, the receptive of state structures and the goal of ruling political parties" (Abolafia 2010a, 93). In the case of market fundamentalism, for example, "these institutional pressures, when taken together, help to explain why a bubble economy may still occur despite the existence of knowledge and organizational capacity needed to inhibit it" (Abolafia 2010a, 93; see also: Abolafia 2010b).

In the *agenda-setting and attentional approach*, the definition of the concept revolves around the gap between the actual "value" of a policy tool (i.e., government investment in the policy tool), and its instrumental value. Specifically, a policy bubble "occurs when government overinvests in a policy instrument beyond its instrumental value" (Jones, Thomas and Wolfe 2013a, 6). "Policy instrument" is defined as "a means controlled by government — such as a budget commitment or regulatory change"; "instrumental value" is defined as "the instrument's ability to affect policy goals, less the cost of the instrument and its negative "spillovers""; and "overinvestment" is defined as "the expected benefits (direct and indirect; positive and negative) from a policy" (Jones,

Thomas and Wolfe 2013a, 6). This definition employs the generic term of "overinvestment", ignoring the nuances which were conceptually captured in my research on policy overreaction (Maor 2012). In that research, I identified and illustrated four distinct modes of policy overreaction which reflect differences in the nature of implemented policy. I argued that the menu of policy instruments utilized in each mode of policy overreaction "is dominated by unique mechanisms for changing or coordinating people's behavior that, once established, produce excessive social costs" (Maor 2012, 241). Ignoring this insight may be problematic if different modes of policy overreaction are found to be leading to different types of policy bubbles.

The discussion so far implies that care is needed in defining the concept of a public policy bubble. Given that the aim is to define the concept in terms of what actually happens to the policy rather than by what could happen to it, the definition of a policy bubble advanced here rests upon a few premises, some of which are drawn from the approaches elaborated above. First, public policy is interpreted here in a broader sense, that is, it also includes the legal system and the regulatory structure that help to limit the risk exposure of policy actors, as well as those strategies that help instill public confidence in the basic elements of the policy at hand (Bernanke and Gertler 1999). Second, individuals are boundedly rational (Simon 1972, 1997) and may make biased decisions (i.e., mistakes) in assessing the quantity/quality of public policy, policy performance, the level of policy output and its rate of change, and other dimensions of public policy. One of the most common mistakes revolves around using the popularity of policy as an indirect measure of its worth.

Third, only the pursuit of policies against *existing* knowledge to the contrary (i.e., the best available evidence at the time the policy is enacted) should be considered a bubble. Fourth, there is a process which sustains the evolution of a bubble and leads to its demise once it is interrupted or blocked. In policy terms, there is a dynamic social process of positive feedback which reproduces itself even with the absence of the recurrence of the original event, and even if the individuals involved lack any clear conception of policy at all. This is precisely where emotional and social contagion enters into the fray. People may accept or rule out information based upon rational, irrational, social and emotional reactions. Fifth, the process that consistently reinforces the policy path may include unlimited forms of "social interactions and information transmission, wherein the beliefs and behavior" (Hirshleifer and Teoh 2009, 1) of members of the general public affect others. Attention now turns to an elaboration of the causal-explanatory understanding (Gerring 2011, 74) of the term, especially the psychological aspects underlying the behavioral dynamics of policy bubbles.

How Do Policy Bubbles Start?

A policy bubble cannot arise when individuals lack new information regarding a policy, be it information that revolves around the substance of policy (e.g., policy development, agenda, forecasts) or information that is in any way related to the policy (e.g., the behavior of policy actors and policy clients, the popularity of the policy, and so on). With the absence of new information, individuals are unlikely to re-evaluate their views, perceptions and expectations, and their activity in relation to the policy at hand is unlikely to change. Individuals who are not exposed to new information regarding the

policy at hand may still be conscious of the fact that the actions of other individuals remain unchanged as they are not faced with new information which contradicts their view or perception of the policy as "appropriate". Another explanation is that it is unlikely that, in the absence of new information, an asymmetric information setting will evolve which could then be exploited by individuals and policy entrepreneurs for their advantage (e.g., Cox and Béland 2013, 3). The uncertainty regarding the emergence of a bubble is likely to persist until information is available that the policy is oversupplied or is perceived to be so. Before that stage, it is not a policy bubble, rather it can be an "appropriate" or "proportionate" policy given the available (possibly wrong) information.

For a policy bubble to emerge then, a sustained period of real and/or perceived policy overreaction should occur, but it must be combined with some mechanism of policy feedback. Regarding the former condition, some individuals may perceive opportunities to gain from public policy (be it "proportionate" or not) or to (speculatively) exploit it by rallying support for the policy, promoting word-of-mouth enthusiasm and widespread endorsement of the policy, heightening expectations for further policy, and increasing demand for this policy and subscribing to it. In particular, they stand to gain more if they find other individuals who act similarly. If that is the case, an *oversupply* of this policy is likely to follow. If this process is sustained over an extended period of time, a policy bubble may emerge. Policy bubbles arise therefore by way of "mobilization of enthusiasm" (Baumgartner and Jones 1993) when the real and/or perceived policy enacted exceeds its "appropriate" value.[2]

Heightening expectations for further policy and a euphoric atmosphere around a policy can also be derived from psychological factors such as *animal spirits*. According to Keynes (1936, 161),

> Even apart from the instability due to speculation, there is the instability due to the characteristic of human nature that a large proportion of our positive activities depend on spontaneous optimism rather than on a mathematical expectation, whether moral or hedonistic or economic. Most, probably, of our decisions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as a result of animal spirits — of a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities.

Assuming that *animal spirits* are the force that drives economic activity, and drawing on the emerging field of behavioral economics, Akerlof and Shiller (2010) have identified five psychological factors that are of particular importance in describing how the economy really works. These mechanisms include confidence and the feedback mechanisms between it and the economy that amplify policy fluctuations; concerns about fairness; the temptation towards corruption and anti-social behavior; money illusions and the difficulty of the general public in understanding the effects of inflation and deflation; and stories which individuals tell themselves about who they are, what they are doing, and how what they are doing is related to what others are doing (Akerlof and Shiller 2010, 5-6).

People may also be emotionally attracted by certain aspects of the policy. In a recent advance in policy studies, it has been shown that increasingly influential policy

ideas are conceptualized in terms of their valence, that is, "the emotional quality of an idea that makes it more or less attractive" (Cox and Béland 2013, 2). According to Cox and Béland (2013, 1) "a policy idea is attractive when its valence matches the mood of a target population". Furthermore, people may "fall in love" with "fantastic objects" — defined as subjectively very attractive ideas or people that individuals imagine can satisfy their deepest desires which they may only be slightly aware of or not at all (Tuckett 2011). An example in the financial arena is a celebrity stock, and in the area of public policy, the rise of a government "tsar" (i.e., an advisory position that has acquired a form of celebrity status of an expert from outside government who is appointed to advise on policy development).[3] Although the aforementioned scholars use different language, their ideas revolve substantially around the "image" of issues and government's official jobs, and therefore resonate strongly with what Baumgartner and Jones (1993) called the "image" of the policy. A change in policy image may trigger positive feedback which, in turn, encourages an oversupply of this policy.

The insight that positive feedback mechanism or "feedback loops" (Shiller 2005) is an essential part of bubbly processes was recorded long ago by scholars dealing with speculative bubbles in financial and asset markets (e.g., De Long, Shleifer, Summers and Waldman 1989; Shleifer and Summers 1990), and more recently, by students of social bubbles (Gisler, Sornette and Woodward 2010). Policy feedback — that is, the "mechanism [that] includes a self-reinforcing process that accentuates rather than counterbalances a trend" (Baumgartner and Jones 2002, 13) — is an important influence on public policy (Pierson 2000, 2004). Bursts of public optimism regarding a policy often lead to increased support for that policy, thereby encouraging trend-chasers to subscribe

to the policy, further arousing individuals' enthusiasm which then leads to oversupply of the policy at hand. Alternatively, as a given policy becomes known for increasing efficiency (e.g., privatization and contracting out), its reputation can be self-perpetuating. By the same token, as a given government agency becomes known for its ability to effectively provide a unique service or product, its reputation can be self-perpetuating. Such reputation may have solid grounds, but may also lack solid footing and be based on past performance which is not valid anymore (Maor 2010, 2011; Maor and Sulitzeanu-Kenan 2013), rumor or misconception. This implies that the trigger for the policy trend may be purely random, negligible, unstable or weak.

The aforementioned view of the ways bubbles start is different from the one that has recently been proposed by Jones, Thomas, and Wolfe (2013 a, 7), who have argued that policy bubbles are initiated by "a sustained increase in indicators of the problem […][,] [a]n increase in attention [,] [and] [p]olicy action beyond what is desirable (where marginal benefits = marginal costs)". However, the first stage in the initiation of a bubble — a *sustained increase* in indicators of the problem — is neither a necessary nor a sufficient condition for the emergence of a policy bubble. Consider, for example, the case of manipulative preemptive overreaction, which occurs "when policy-makers attempt to gain a strategic advantage in an allegedly unavoidable swing of public mood" (Maor 2012, 243). Policy makers may deliberately opt for creating a policy bubble in order to shield themselves from a potential swing in public opinion, even if there is a *sustained decrease* in the indicators of the policy problem itself. This is because the blame game (Hood 2011) often intensifies after the problem or crisis has been dealt with.

How Do Policy Bubbles Grow?

Optimism and Overconfidence

For a policy bubble to grow, optimism (e.g., Scheier and Carver 1985; Chang, Chang and Sanna 2009; Chang et al. 2011), overoptimism (e.g., Buehler, Griffin, and Ross 1994, 2002) and overconfidence (e.g., Kahneman 2011) should propel the process of positive feedback. Overconfidence and optimism of policy makers may trickle down to the general public (or vice versa), whose appetite for risk and high expectations may lead to a gradual inflation of the bubble. The longer the policy appears calibrated (Lichtenstein, Fishhoff, and Phillips 1981, 307) — that is, there is a relatively high correspondence between policy predictions and their actual occurrence — the more confident the policymakers become. Furthermore, the longer policymakers are confident and/or the judgment task is difficult, the more overconfident they become (Lichtenstein, Fishhoff, and Phillips 1981, 315). The same process may occur with the general public. Individuals who are overconfident in their views of the policy may put less effort into looking outside their social group when searching for new sources of information. They may also fail to draw on valuable outside information, even when that information could easily be obtained (Janis 1972). Situations which are vulnerable to the development of such overly optimistic expectations by the general public may be recorded during episodes of innovative projects, national and international successes, and so on. Once overconfidence and over-optimism break, even following modest perturbations (Pierson 2004), the bubble may burst. A burst of a policy bubble can wreak havoc on the policy system. The

more severe the consequences of bubble burst are, the more relevant it is. Modeling the aforementioned dynamics is a major challenge facing policy scientists.

Human Herding and Imitation

In bubbly situations, positive feedback may also gain explanatory force when there are strong sources of behavioral convergence or herding (e.g., Asch 1952; Banerjee 1992; Scharfstein and Stein 1990). Herding occurs when "the influence of private information on individual choices is overwhelmed by the influence of public information about the decision of a herd or group" (Baddeley et. al 2007, 2). The focus on the interaction between individuals is derived from scholarship of social influence, which is defined as a "change in an individual's thoughts, feelings, attitudes, or behaviors that results from interaction with another individual or group" (Rashotte 2007, 4426). This is precisely the case where individuals observe others' choices and draw inferences from their actions or the consequences of those actions. In other words, people observe others' choices and, as a result, make similar choices so that public goods/services will be available in their locality and/or shared most easily, thereby creating self-reinforcing processes. Some of those who observe others' choices may ignore private information they have and solely rely on others' information and choices as *information cascades* (Hirshleifer and Teoh 2003, 2009). These trend-followers act completely independent of any analysis regarding the "appropriate" value of the policy or any information they are privy to regarding the policy at hand.

The reliance on others' information is an essential feature of imitation. For example, information cascade, which is an imitating mechanism, produces conformity

with others' behavior. Conformity is a concept which is distinct from social influence and "occurs when an individual expresses a particular opinion or behavior in order to fit in to a given situation or to meet the expectations of a given other, though he does not necessarily hold that opinion or believe that the behavior is appropriate (Rashotte 2007, 4426). Conformity with others' behavior may occur by *emotional contagion* which "involves an involuntary spread of feeling without any conscious awareness of where the feeling initially originated" (Raafat, Chater and Frith 2009, 424), as well as by *social contagion*, that is, "the tendency to automatically mimic and synchronize expressions, vocalizations, postures and movements with those of another person leading to behavioral convergence" (Raafat, Chater, and Frith 2009, 425).

Serial Information Processing

Another process which is generally responsible for positive feedback is serial information processing (Simon 1980). Attentional limitation implies that people cannot possibly be attuned to all the information available and to all dimensions of choice at any time. People therefore pay attention to limited information and just a few dimensions of choice in making their decisions. As new information and dimensions of choice emerge, attention is shifted toward these new elements — a process termed "serial shift" (Jones 1994) — and behavior rapidly and unpredictably changes. Positive feedback at the individual level is heavily affected by attention shifting (Baumgartner and Jones 2002). Paying attention solely to a very limited number of elements, and then, as other dimensions become more salient, shifting attention to these new considerations, may lead to abrupt changes in decisions, including decision reversals. When attention shifting and

imitating occur simultaneously, bubble growth and bursts (i.e., decision stability and reversals) are likely to be extreme.

Lock-in Effect and the Role of the Media

The aforementioned processes of positive feedback may result in a "lock-in effect [which] occurs when the policy becomes institutionalized and grows due to self-reinforcement" (Jones, Thomas, and Wolfe 2013a, 44). The role of the media in overemphasizing the value of policy and creating a lock-in effect is of paramount importance (Jones, Thomas, and Wolfe 2013a). The media may promote a policy by intensively reporting positive news regarding the policy and creating an investment culture around this policy. The publicly available information generated by the media (and supplemented by other sources) may include past performance of the policy, streams of benefits derived from the policy, forecasts, and so on. This may contribute to the creation of *familiarity bias* (Kahneman and Tversky 1979), letting people think that they know and understand the merit and the intricate details of a policy. It may also create an emotional attachment to the policy, a decrease in the dispersion of opinions in society, and the formation of more optimistic assessments regarding the policy. The creation of excitement, euphoria and mania around the policy (e.g., by reporting a policy as one representing a new era/age) may furthermore let people believe that the policy offers huge potential, and that it will create streams of benefits to those who subscribe to it. The derived enthusiasm may persuade people that the policy may be moving in one direction only, and, this in turn, may subsequently lead to positive feedback with the effect of oversupply of the policy. These extrapolative expectations can be explained by the

representativeness bias which occurs when individuals "focus exclusively on the similarity of the description to the stereotypes […] ignoring both the base rate and the doubts about the veracity of the description" (Kahneman 2011, 149). Individuals may therefore believe that the past is indicative of the future and follow the crowd. Media attention and policy activities may also become entangled in feedback processes as an increase in "media and public attention to the issue, […][leads] to more policymaking activities, [leading] to more media and public attention, in a cycle that continue[s] even after the issue at hand has ceased to increase" (Wolfe, Jones, and Baumgartner, Forthcoming, 11).

Different policy bubbles are likely to have different feedback mechanisms, and the processes which are by and large responsible for positive feedback may operate independently of one another. In addition, in contrast to Jones, Thomas, and Wolfe's (2013a) overemphasis on the role of the media in policy bubbles, a lock-in effect may occur for an extended period of time under the radar of the media. This may occur by way of slow-moving processes of social imitation in esoteric policy sectors when people's overconfidence is amplified by *self-attribution bias* (e.g., Gervais and Odean 2001) and the *illusions of control* (Langer 1975), rather than by the media coverage of the policy at hand.

Still, the process remains the same: "an action leads to consequences which themselves reinforce the action and so on" (Sornette and Woodward 2010, 22), until positive feedback processes are interrupted or terminated. The interruption or termination of positive feedback may occur for various reasons such as endogenous (e.g., a shift in public attention, declining optimism) as well as exogenous ones (e.g., external events). A

policy bubble therefore embodies a positive feedback loop as a result of which, the deviation between the "appropriate" and the suboptimal policy is amplified, and, when the momentum of positive feedback is interrupted, the bubble bursts. Thus, positive feedback may be a drive of policy change.

As noted earlier, a group of individuals acting in the same way over a period of time (i.e., "herding") constitutes an essential element in policy bubbles. Positive feedback involves a correlation between human herding and policy payoffs. As long as there is anticipation for higher policy payoffs, positive feedback of high hopes overcomes negative feedback (e.g., Jacobs and Weaver 2013) of crash expectations. However, since persistent policy payoffs cannot occur forever, elements of diminishing returns, at some point in time, are bound to replace positive feedback. Policy payoffs are likely to decline, and the bubble may gradually or abruptly burst. Losses incurred to individuals and to government alike once the bubble bursts can be severe, sometimes even threatening the stability of the policy system.

Herd Behavior and Policy Bubbles

Identifying the type of human herding involved in bubbly processes is tricky due to the difficulty in gauging the motivation underlying human behavior. A few variations may be useful in analyzing the relations between herding models and types of policy bubbles. First, Maor (2012) has conceptually identified four distinct modes of policy overreaction which reflect differences in the nature of implemented policy. Second, mechanisms of transmission of thoughts and behavior may be divided into two groups, namely, mentalizing and non-mentalizing mechanisms (Raafat, Chater, and Frith 2009). The

former includes social influence and conformity as well as peer pressures (i.e., reputational concerns); the latter includes social contagion (e.g., priming, mass hysteria) and emotional contagion. Consequently, herding may be divided into two types on the basis of the source of herding: intentional herding caused by non-rational behavior and unintentional herding caused by the common reaction to public information and informative signals (Bikhchandani and Sharma 2000).

Third, social networks may be comprised of homogenous group/s or heterogeneous groups. Homogenous groups are comprised of individuals who share a similar educational and professional background, professional experience and operational style (i.e., a capacity to model a response to a need). Hence, they tend to interpret information similarly and arrive at the same conclusions. This unintentional herding occurs because the similarity in educational background and/or professional experience solidifies prior beliefs, information and values. Drawing upon these commonalities, similar interpretation may lead these individuals to end up on the same side of the policy dimension. A manifestation of a simultaneous response to a common signal is positive feedback behavior. "If herding is driven by past [policy payoffs], this [may] be considered as evidence of unintentional herding" (Kremer and Nautz 2012, 6). Positive feedback following policy overreaction is likely to contribute to herding. Individuals may herd out of public policies that have performed well in the past or are performing badly in the present (Kremer and Nautz 2012, 6), and (unintentionally) herd towards policy overreaction that produces positive feedback.

By contrast, heterogeneous groups are comprised of individuals who do not share the aforementioned characteristics, and are therefore more susceptible to emotional cues.

Under such cues intentional herding is likely to evolve. Individuals operating in these groups are likely to imitate other participants, leading to a behavior regardless of prior beliefs or information. They may do so because they assume that those observed have relevant information, or because they do not want to act differently from the crowd in order to maintain their reputation.

Identifying Policy Bubbles

Given the definition of a policy bubble advanced here, what reliable measurement of bubbles can be devised? An *attentional perspective*, which extends the idea of disproportionate information processing (Jones and Baumgartner 2005), involves measuring congressional/parliamentary concerns, media concerns, and public opinion regarding the policy at hand, preferably over 50 years or more. Congressional concerns may be operationalized in terms of hearings in congress/parliament regarding the policy, as well as the monthly length of coverage per law by publications covering congressional news and analysis (e.g., bill tracking, committee coverage). Media concerns may be operationalized in terms of monthly length of coverage in major newspapers of the issue at hand, and public concerns in terms of public opinions (Jones 2001, 2012; Jones, Thomas, and Wolfe 2013a). A bubble will be identified if congress/parliament, the media or public opinion builds up concerns regarding a public policy and the others then follow (Jones 2001, 2012; Jones, Thomas, and Wolfe 2013a). To gauge the bubble effects, these trends may be compared with the budget allocation to the policy at hand over the same period (Jones 2001, 2012; Jones, Thomas, and Wolfe 2013a).

A *transmission perspective* for the identification of a policy bubble involves measuring the operation of different transmission mechanisms in human herding. I refer here particularly to mechanisms by which people infer other people's beliefs. As noted earlier, these mechanisms may be divided into two groups, namely, mentalizing and non-mentalizing mechanisms (Raafat, Chater, and Frith 2009). The problem is, of course, how to measure the involuntary spread of social influence and feeling, when the person affected is not aware of where the influence or the feeling originated from. Here, computer-aided content analysis of verbal and non-verbal communication in social networks, especially instant messaging and emails, may capture emotional and social contagion (e.g., Feldman 2013). Based on insights derived from dynamic social impact theory, which revolves around the evolution of spatial patterns of attitudes, these sources in the "on-line world" may also be used to measure the spread of rumors — defined as "unverified and instrumentally relevant information statements in circulation that arise in contexts of ambiguity and that function primarily to help people make sense and manage threat" (DiFonzo and Bordia 2007, 273). The spread of rumors is an important tool for shared sensemaking, especially in contexts of uncertainty and ambiguity, and when government information is not available or not trusted (Shibutani 1966). The same also applies to fads and opinions which may "infect" individuals. Measuring the spread of rumors, especially the network factors in rumor spread, may enable gauging the dynamics of social contagion — which includes all social phenomena that spread through social networks — in the formation and growth of a policy bubble (Barash 2011). The process whereby social contagion spreads throughout social networks can also be investigated by using formal analysis, simulation, and data mining (Barash 2011).

Finally, an *attitudinal perspective* for the identification of a bubble revolves around studying bubble expectations and individuals' confidence through time (Shiller 2000). "Bubble expectations" are the perceptions by an individual of policy trends, which lead him/her to follow/chase the trend before it is interrupted (Shiller 2000, 49). An individual's confidence is "the feeling that nothing go wrong with a [policy], that the [individual] can sleep well because there is nothing to worry about" (Shiller 2000, 49). Although the idea is to distribute a questionnaire to a random sample of the population, it is also reasonable to survey experts in the relevant policy sub-field, as well as decision makers, and to compare the results across time and nations.

Conclusions

In this paper I have sought to build on my earlier work which conceptualizes policy overreaction in an attempt to explain the continuation of this type of non-proportional policy response over an extended period of time. My interpretation of the concept is different from the one proposed by Jones (2011, 2012) and Jones, Thomas, and (Wolfe 2013 a, b) mainly because it allows for the possibility that different modes of policy overreaction lead to different types of human herding, thereby resulting in different types of policy bubbles. However, both interpretations share the emphasis on positive feedback which is brought into the fray in a model of human behavior as the key factor that propels this process, but also as a key generator of change, including the most radical form of change, namely, policy transformation. As a force of stability, self-reinforcing dynamics may bring about an oversupply of policy over an extended period of time, and as a force of change, abrupt policy reversibility. This process is conceptualized here in terms of the

formation, growth and burst of policy bubbles. This conceptualization is consistent with a view of procedural behavioral rationality, that is, a focus on the process by which people make decisions while reflecting information processing which includes intuitions, heuristics, and others.

This attempt to abstract out the most relevant features of a distinct category of policy processes which may lead to dramatic harmful as well as beneficial consequences, may have broad applications in the increasingly interconnected world within which public policy is implemented. The challenge ahead is to design a behavioral "toolbox" which could be applied to research of these psychological, social and policy processes in a range of policy settings. To do so, the research program may involve the study of policy ideas and their spread via social networks and other transmission mechanisms, the features that advance their persistence and replication, the characteristics of the environment which favor specific kinds of such policy ideas and (reform) ideologies, the adaptation of these ideas in different environments and their ability to spill over from one policy sub-system to another, and the competition between ideas as well as the situations wherein they complement each other (e.g., Hirshleifer and Teoh 2009). Another avenue is to focus on the social process that leads public policy to attract public attention, facilitate the spread of rumors, and heighten public expectations for further policy. Psychologists, social psychologists and policy scholars have produced worthwhile insights thus far (e.g., Shafir 2013). However, an emerging research agenda will need to incorporate these insights on human cognition, emotion and social tendencies, on the one hand, and transmission mechanisms of social and emotional contagion, on the other, into analytical frameworks that distinguish between majority and minority on the level of the general

public and/or of societal groups (i.e., the group that starts the trend and the group that may or may not follow it). This will enable a gauge of the nuances of human herding in policy bubble processes.

Relatedly, scholars may assess the link between emotional liquidity and the life-cycle of policy bubbles. An individual's emotional liquidity refers to the minimum amount of comfort one needs to maintain his/her policy choices throughout the bubble life-cycle. One may hypothesize that, as emotional liquidity is eroded (e.g., following volatile conditions in the policy bubble lifecycle), he/she will find it more difficult to maintain bubbly choices, thus withdrawing these choices and, as a result, undermining positive feedback processes. In addition, students of policy may examine the link between human herding and information quality, as well as the impact the level and the nature of human herding has on the lifecycle and nature of policy bubbles. Overall, human herding is of first-order significance to understanding the life-cycle of policy bubbles.

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[1] As a baseline for comparison, a "proportional policy response" refers to a policy whose objective and/or perceived social costs produces the same level of objective and/or perceived benefits. This construct can be measured by cost-benefit analysis, interviews/surveys, and experiments.

[2] A related insight which will not be explored in this paper is that sustained periods of policy underreaction (Maor 2013) lead to policy anti-bubbles. Anti-bubbles arise by way of "mobilization of pessimism" when the real and/or perceived policy enacted is below its "appropriate" value.

[3] A recent report has revealed that over 260 tsars were appointed in Britain between May 1997 and July 2012 (Levitt and Solesbury 2012).