In the last decade, the academic literature on the causes of nuclear proliferation has undergone a quantitative renaissance. A decade ago, the study of proliferation belonged almost exclusively to qualitative scholars, who prioritized explaining individual cases of nuclear acquisition and restraint. Beginning with articles by Singh and Way (2004) and Jo and Gartzke (2007), however, the field began to turn to quantitative methods to explore why states build (or pursue, or explore) nuclear weapons. A new crop of scholars argued that quantitative methods offered insights that other techniques could not.

But the quantitative approach has recently come under attack. Sagan critiqued the quantitative approach in his 2011 review article, arguing that nuclear proliferation is simply too rare to justify the use of large-\(N\) statistical methods. Moreover, he argued, quantitative studies of proliferation usually employ causal variables that are under-theorized and crudely measured, yielding a hodgepodge of fragile and inconsistent findings (see also Montgomery and Sagan (2009).

Mark Bell’s (2015) outstanding research note mounts a different but equally serious challenge to this literature. More than a decade after Singh and Way’s pathbreaking article, Bell takes stock of the field’s progress in isolating the underlying causes of proliferation. His assessment is not encouraging.

Collectively, the literature on proliferation has identified dozens of independent variables that have turned up statistically significant in one study or another. But academia has a well-known publication bias: statistically significant findings are more likely to be published than null results. Published studies therefore may paint a skewed picture. Relationships that appear significant in one study may be fragile, or they may be substantively trivial when weighed against other factors.

Indeed, this is exactly what Bell finds in his assessment of the proliferation literature. Using a variety of computationally intensive statistical techniques, Bell evaluates the strength of more than 30 different causal variables and finds that few, if any, perform as advertised. Across literally millions of regression models, the average explanatory power of almost all of these causal variables – including external threats, outside technical assistance, leader

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1This commentary was part of an International Studies Quarterly online symposium, available at http://www.isanet.org/Publications/ISQ/Posts/ID/5012/A-Pivotal-Moment-in-Proliferation-Research.
background and regime type, and economic capacity – is zero. Worse, he finds that none of these variables consistently improves our ability to predict out-of-sample cases of proliferation.

One limitation of Bell’s analysis is that it cannot say anything about causal factors that scholars have not measured quantitatively. For example, studies have pointed to the importance of norms (Rublee 2009), psychology (Hymans 2006), and bureaucratic parochialism (Sagan 1996/1997) as drivers of proliferation, none of which quantitative scholars have been able to convincingly measure. By focusing only on the quantitative literature, Bell’s research note cannot – and does not claim to – assess the robustness of these factors. So we therefore should be careful not to interpret his piece as an indictment of the proliferation literature as a whole.

Nonetheless, Bell poses a serious challenge to the quantitative agenda in proliferation research. His findings seem to reinforce Sagan’s (2011, 233) contention that the quantitative approach to proliferation has yet to uncover any truly robust findings. It is unsettling that even the most basic and straightforward findings in the quantitative proliferation literature collapse in the face of Bell’s tests. (One wonders how studies of, say, militarized disputes would fare in similar tests.) How, then, does the field move forward from here?

I think there are at least three key lessons. First, as in any scientific enterprise, improving measurement must be a central goal of the proliferation literature. Sagan (2011, 228–31) and others have criticized measures of the dependent variable (nuclear capability) in quantitative studies, but Bell’s research note seems to suggest that independent variables are actually the key culprit here. For example, scholars have long emphasized national security as a primary driver of proliferation (e.g., Thayer 1995), yet Bell finds that security metrics perform poorly in quantitative models. Is this because security factors don’t matter in proliferation decisions, or because we are simply measuring them poorly? One suspects the latter. A key goal therefore must be to improve quantitative metrics so that our theories can be adequately tested. While there are strong professional temptations to locate new and increasingly novel explanations for proliferation, Bell’s results suggest that scholars first need to improve tests of the theoretical models we already have.

A second lesson carries more far-reaching implications for how we approach proliferation research. Quantitative studies of proliferation tend to be organized around individual independent variables. These studies often take the following form: (1) assert that nuclear proliferation is important; (2) hypothesize that a particular factor contributes to it; (3) demonstrate that this factor is statistically correlated with proliferation. (This formula, of course, is not unique to the study of proliferation.) But as Bell demonstrates, the aggregate result of this approach has been underwhelming. Bell’s findings imply that we should pay less attention to the bare statistical significance of individual variables and more attention to
whether those variables improve our ability to explain and predict proliferation. Proliferation scholars should regularly report metrics such as out-of-sample prediction rates and marginal reduction in error as alternative ways of assessing the importance of their findings.

Third, Bell’s analysis reaffirms – rather than undermines – the case for quantitative methods in the study of proliferation. One key advantage of quantitative methods is that they allow us to compare the relative importance of independent variables that all appear to “matter” (Fuhrmann et al. 2014). Deciding which variables can be safely ignored is a critical step in predicting complex political phenomena. Quantitative methods help scholars discriminate between essential and nonessential causal factors. While most of the independent variables scrutinized by Bell seem to fall into the “nonessential” category, it is worth noting that his tests would not have been possible without quantitative tools. His research note is not an indictment of quantitative methods; it is an endorsement of them.

In short, Bell has raised the bar for future quantitative studies of proliferation, which will now need to demonstrate much more than statistical significance in a few selected models. Bell is to be commended for making a timely and indispensable contribution to the nuclear proliferation literature, and scholars will be grappling with his findings for a long time.
References


