



Original research article

# Conceptualizing the above ground factors in shale gas: Toward a research agenda on regulatory governance

Andreas Goldthau <sup>a,b,\*</sup><sup>a</sup> School of Public Policy, Central European University, Nador ut 9, H-1051 Budapest, Hungary<sup>b</sup> Belfer Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University, Nador ut 9, H-1051 Budapest, Hungary

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## ABSTRACT

Stalling progress in European, Chinese and Latin American shale has been attributed to difficult geological formations and lacking data. Yet, 'above ground' factors matter in the extractive industries as much as geology. It is policies, regulation and institutional settings that determines the success or failure of a contested, risk bound technology such as fracking. This article suggests that a regulatory governance agenda may offer novel insights into shale gas as a policy phenomenon. The article first provides a critical review of the existing literature on shale gas and identifies the key themes of security, social contestations and socio-economic impact. It then turns to assessing the literature on policy regimes, regulatory competition, regulatory path dependence and regulatory agencies which, it is argued, form essential elements of a research agenda for investigating unconventional gas as a regulatory governance problem. Building on these, the paper sketches focal points of investigations going forward.

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## 1. Introduction

Shale gas, a frequently used term for unconventional natural gas produced from deep-soil shale formations, has been described as a true 'revolution' in global energy [156].<sup>1</sup> By the early 2000s, a breakthrough in technology dubbed 'fracking' – a novel combination of horizontal drilling techniques and hydraulic fracturing – enabled companies to tap unconventional gas reserves at economic costs. A decade later, vast additional natural gas reserves have become available in North America. Recently, the United States has surpassed Russia as the largest gas producer in the world (EIA, 2012), and is expected to become 'import independent' in natural gas before 2020 [34,35]. The bulk of domestically consumed gas in the US is now 'unconventional', giving the term a new meaning.

The fracking technology is expected to spread to promising reserves beyond the U.S. [36,62], which would eventually make shale gas 'go global'. In fact, high hopes are placed on 'exporting' the fracking technology to other world regions with the hope of repeating the shale success story elsewhere. Notably Europe, a continent with an estimated unconventional gas base of 883 trillion

cubic feet (tcf) [36] – roughly 60 years of cumulative consumption – has come to discuss the chances and pitfalls of exploiting domestic shale reserves, not the least against the backdrop of its strong dependence on Russia as a contested main supplier of European gas [43,72].

Stalling progress in European, Chinese and Latin American shale has been attributed to difficult geological formations and lacking data. Yet, 'above ground' factors matter in the extractive industries as much as geology. More to the point, it is policies, regulation and institutional settings that determines the success or failure of a contested, risk bound technology such as fracking.<sup>2</sup> What is more, shale gas, a proven technology in the U.S. may fail in new regulatory environments even if thriving in its country of origin. In light of this, the present article asks: what does the literature have to say on shale gas as a regulatory problem? Exploring this question enhances our understanding of the role of above ground factors in shaping a new industry, and the opportunities and obstacles surrounding technology transfer from one regulatory context to another.

The main aim of this article is two-fold. One, it provides a review of existing works on shale gas, which so far has been lacking. Sec-

\* Correspondence address: School of Public Policy, Central European University, Nador ut 9, Budapest, H-1051, Hungary.

E-mail address: [andreas.goldthau@hks.harvard.edu](mailto:andreas.goldthau@hks.harvard.edu)

<sup>1</sup> Though technically incorrect, this article uses the term of shale gas as synonymous with unconventional gas, which reflects its use in broader public debates.

<sup>2</sup> Risks pertaining to fracking stem from, among other, chemicals entailed in fracking fluids that may harm groundwater safety, greenhouse gases related to methane emission, and the processing, and storage or transport of contaminated flowback water [50,59,108,148].

ond, it does so with a view to identify gaps in the literature and to justify a novel approach—one on regulatory governance. Indeed, as this paper suggests, a regulatory governance agenda may offer novel insights into shale gas as a policy phenomenon. More to the point, such an agenda may move the prevalent discussion away from optimization problems (“how to regulate best”) and toward investigations that explain the occurrence of regulation at first place. The latter, it will be argued, is important in determining whether shale gas scales up in a country or not, and whether it ‘succeeds’ or ‘fails’ elsewhere. In short, this article aims at sketching a research agenda that conceptualizes shale gas regulation as the dependent variable, not the independent one. So far, the literature has not evolved in this direction, and investigations into the regulatory governance of shale gas remain scarce.

In what follows, the paper first provides for a critical review of the existing literature on shale gas. Here, it identifies the key themes of security, social contestations and socio-economic impact. The article then turns to assessing the literature on policy regimes, regulatory competition, regulatory path dependence and regulatory agencies which, it is argued, form essential elements of a research agenda for investigating unconventional gas as a regulatory governance problem. Building on these, a final section sketches focal points of investigations going forward.

## 2. Reviewing the literature on shale gas

The literature on shale gas has been advancing rapidly throughout the past 5 years. For this article, we conducted a systematic review of the scholarly work done in the realm of social sciences between 2010 and mid-2015. This review covers more than 200 articles that specifically address shale gas as a social and political phenomenon. The aim of this section is to provide an overview of key trends in research, with a view to developing research agenda in the sections that follow.

Before proceeding, three caveats are in order. First, the present review cannot claim to comprehensively cover all existing works on shale gas, as the literature is still evolving fast. Works as cited therefore remain selective but representative for key aspects covered in the literature. Second, the review does explicitly not cover purely ‘technical’ treatises, such as the economics of shale or the legalities of unconventional hydrocarbon extraction. Instead, the discussion focuses on works that investigate shale gas as a social phenomenon more generally. Third, there are numerous ways to group research into shale gas, including by country, level of analysis (global, national or local), method, or disciplinary focus (economics, political science etc.). For the purpose of this article we decided to delineate the literature according to the focus placed in the empirical investigation. Admittedly, this approach risks blurring units and levels of analysis and lumping together research conducted in separate scholarly fields. Yet, it allows identifying the gaps that exist particularly with a view to understanding shale gas as a regulatory governance phenomenon, and facilitates sketching a research agenda in that field. With this in mind, essentially three strands of research can be identified.

The first strand of existing literature is concerned with the international aspects of shale. Here, key issues covered range from shale gas as a means for projecting US power [9,31,56,72,95,112], the EU–Russia nexus and European energy security concerns [27,65,70,82,146] and broader geostrategic implications [28,48,77,78,127,146]. Broadly situated in the realm of International Relations, this strand of the literature tends to establish a firm link between foreign policy objectives and energy commodities as a geo-economic means thereof. The dominant lens through which shale gas is assessed is realism, which also makes states the primary unit of analysis in this body of works. Other

schools of thought in the IR literature feature at the margins at best. Another set of studies examines the effects of shale on international markets and economies. Here, the focal point of analysis is the relative advantage shale has given the US compared to other global economies [140,149], the economic potential for Europe were they to replicate the US story [119], and the way global market structures might be affected as a result [10,129].

A second, and rapidly growing literature particularly looks at public attitudes and social contestations. Key themes include public discourse surrounding fracking [12,14,24,47], resident perception and NIMBY effects [13,15,23,80,155], which extends into questions of partisanship and worldviews [16,85], social representation and the ‘license to extract’ [21,39,84,111,136], as well as framing, notably in the context of the co-evolution of technology and social structure [61,85]. This strand of the literature seeks to ground shale gas in social context and explores the contested nature of the fracking technology as part of broader phenomena such as technology innovation or participatory governance. A function of data availability, studies remain limited to OECD countries, and particularly the UK and the US.

A third, and related and sometimes even overlapping set of works centers on the socio-economic impact of shale gas on sub-state, that is county level or municipal, communities. Objects of analysis include effects on employment, income or the property market but also social dynamics [20,22,26,49,53,66,81,114,115,152], local risks, risk perception and risk governance [63,64,90,131,135] or questions of energy justice [41,105].<sup>3</sup> With regard to discipline, studies in these areas are biased toward sociological approaches and ethnography but also law. Again, the geographical focus is on Western democracies, for the obvious reason that community concerns resonate best in a political environment that is receptive to them, but also related to data availability and access.

In addition to these three broad sets of literature, some interesting works have started to use shale gas as an opportunity to theorize about pertinent issues in institutional theory [57], and to conduct socio-economic cost-benefit analyses [137].

As the above review demonstrates, the existing literature acknowledges important security related aspects of shale gas, the socio-economic nexus of shale gas as a novel technology and a source of significant economic activity, and the role of public attitudes and perceptions, also with regard to policy choices. Clearly, as the review shows, there exists an empirical bias toward OECD countries, and the bulk of studies has been carried out in the US. Within Europe, select Western European countries feature prominently, including the UK, whilst sub-state level dynamics are particularly underrepresented in works on Eastern Europe.

Moreover, and possibly more significantly, the existing literature by and large has a blank spot when it comes to investigating the regulatory dynamics surrounding fracking. More to the point, while a broad set of literature exists on the environmental or fiscal regulation of hydrocarbon extraction, including shale gas, that literature tends to be very technical and is primarily concerned with optimization problems such as minimizing methane leakage, setting the right incentives for energy investment, or taxing rents (e.g. [3,7,71,75,153,154]). Yet, the rapid scaling up of a novel technology and its spread across U.S. states does not happen in a vacuum, nor is it a mere function of the ‘right’ regulatory choices. Instead, it is contingent on the complex interplay between private actors,

<sup>3</sup> Though clearly relevant for local communities, we leave aside a large body of important work done on health impacts and environmental degradation. These studies typically lie in the realm of natural sciences and hence do not form part of the present investigation and review.

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