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Author: Jeffrey B. Jacquet & David L. Kay

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The Unconventional Boomtown: Updating the Impact Model to Fit New Spatial and Temporal Scales

Jeffrey B. Jacquet
South Dakota State University
jeffrey.jacquet@sdstate.edu

David L. Kay
Cornell University
dlk2@cornell.edu

Abstract

The boomtown impact model, developed by researchers in the 1970s, implicitly assumes a spatially concentrated, finite resource will be extracted during a near-singular event (i.e., the "boom"), followed by a one-time "bust". This model has been criticized for its lack of realistic longitudinal or macro-level perspective beyond the boom-and-bust, and seems unlikely to transfer successfully to the context of modern hydrocarbon exploitation. Technological innovations have unlocked massive reservoirs of natural gas in many parts of the world that challenge the notion of a geographically concentrated supply that can be quickly exploited. While natural gas prices have plunged and this fuel source is poised to remain economically attractive for some time to come, energy prices are likely to retain their characteristic volatility. Hydrocarbon rich regions and their associated communities are likely to experience repeated waves of mini-booms and mini-busts over the course of decades: a scenario for which the classic one-time boom/bust model may not be well equipped. This development pattern holds profound implications for the types of impacts experienced by residents and the ways in which communities can prepare for them. In this article, we seek to both better define the sets of assumptions that predicate the boomtown impact model, and suggest updates to incorporate more macro-level economic concerns. We review the boomtown impact model for assumptions of rurality and isolation, land ownership and wealth retention, spatial and temporal concentration, and economic drivers and industry behavior. We compare these assumptions against the new reality of unconventional natural gas development, drawing from impacted communities in the Marcellus Shale of Pennsylvania that have experienced some of the new types of impacts. We further describe ways in which the boomtown model might be updated to include characteristics of a more complex energy industry. Finally, we suggest implications for research and rural community development.

Keywords: boomtowns; social disruption; shale energy; rural sociology; natural resources

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1.0 Introduction

"Only when the dusk starts to fall does the owl of Minerva spread its wings and fly."
G.W.F. Hegel (1820) "Preface", *Philosophy of Right*.

In the journal *Science*, John S. Gilmore (1976) wrote about the case of a fictional energy boomtown grappling with rapid changes resulting from nearby coal extraction. These changes included rapid population growth, new municipal service demands, and community strife over how to deal with growth management problems. Gilmore named his fictive town Pistol Shot, USA, and deemed it an example of a "typical business-as-usual energy boomtown" that was small, rural, and isolated, having "to depend on its own resources and cannot borrow consumer services from other places" (Gilmore, 1976, p. 535-540). In naming his town Pistol Shot, USA, Gilmore likely wished to pay homage to the dusty, old-west cowboy culture that permeates the western communities where the author had spent many years; towns with names such as Rock Springs, Wyoming or Rifle, Colorado. Yet, in addition to capturing the rural culture and isolated nature of these towns, the name also embodies the temporal implications of the energy boomtown: an explosive flash of growth and change, followed inevitably by a sudden, and likely permanent, decline[1].

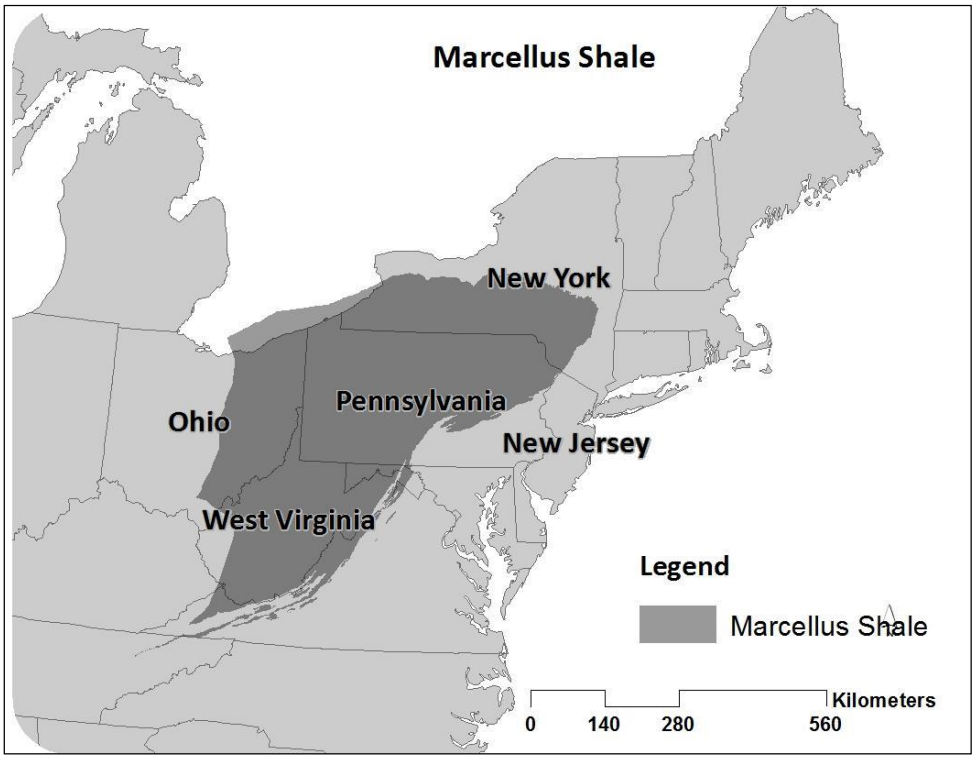
Gilmore's work was among the first of a flurry of sociological research studies on the community impacts of energy development that has come to represent the "boomtown model" of energy development. This body of research was largely set-aside for several decades, as interest in energy development waned while energy prices fell and remained low during the 1980s and 1990s. More recently, extensive new energy development in multiple areas of the US and the world has renewed interest in the sociological research conducted by Gilmore and others in the 1970s and 1980s (Brasier et al., 2011; Jacquet, 2009; Ryser & Halseth, 2011; Ruddell, 2011). However, as these new types of energy development emerge and unfold, the applicability of the basic assumptions in the original boomtown model – assumptions of very rural and isolated towns, a finite, spatially concentrated resource, a singular boom and bust event – are being questioned by some researchers (i.e., Jacquet, 2009; Stedman et al., 2012).

New extraction technologies, including horizontal drilling and high-volume hydraulic fracturing, have revolutionized the oil and gas industry, opening vast natural gas and oil reserves across much of North America and the world for possible extraction (Energy Information Agency 2012; International Energy Agency, 2011, 2012). Unlike previous oil and gas extraction that targeted a geographically contained pool of resource, the new so-called "unconventional" methods require the systematic drilling of horizontal wells and hydraulically-induced fractures across

[1]Contrary to the metaphorical use of "boom" in our use of the word boomtown today, the term "boomtown" is said to have originated as a description of river communities that were situated near staging areas used by timber companies to organize timber booms to float timber downstream (Garland, 1917). The author Hamlin Garland described his boyhood home of 1860s timber-boom town of Onalaska, WI as "a rude, rough little camp filled with raftsmen, loggers, millhands and boomsmen. Saloons abounded and deeds of violence were common, but to me it was a poem" (Garland, 1917, p.23).

large landscapes to create a relatively contiguous underground zone of fractures and well bores: connecting millions of tiny bubbles of oil and/or gas so that they can flow to the well bores and up to the surface (USDOE, 2009). While conventional drilling methods typically brought large amounts of risk and reward, the predictability and replicability of the new technologically-advanced, unconventional procedures have been described as more akin to a manufacturing process (Farey, 2010).

Figure 1: Depiction of the Marcellus Shale Gas Formation.



Source: Author

Some industry analysts have argued that the success of this "manufacturing" model has been vastly oversold, or its significance misunderstood: the "carpet" and "manufacturing" metaphors implicitly suggest, contrary to evolving experience, an evenly distributed, accessible, and profitable extraction process (Berman, 2010; Blohm et al., 2012). In fact, the quality of the resource can vary tremendously within a "play" (Jacquet & Stedman, 2011). Nevertheless, unconventional exploration and production does open the possibility of economic resource recovery from previously unprofitable-to-drill geologic formations that are widely distributed throughout the world (EIA, 2011). These new methods require vast acreages of contiguous land and mineral rights, typically leased from private landowners for 5 or 10-year minimum periods.

Estimates of energy reserves, based largely on the acreages that companies hold, have driven wild speculation among investors, dramatically increasing the stock prices of energy companies. This has led to aggressive tactics to acquire additional leases from landowners in the midst of what one leading company called the "shale gas land grab" (Chesapeake Energy, 2013). These tactics have frequently involved drilling un-economical oil and gas wells in order to hold the acreages in "perpetuity", offering landowners inflated signing bonuses and sometimes deploying

unscrupulous legal tactics (Jacquet & Stedman, 2011; Ladlee & Jacquet, 2011; McAllister, 2012; Schneyer & Grow, 2011). Subsequent short-term over-production contributed to the collapse of the commodity price for natural gas. Still, widespread drilling continues unabated as companies maneuver to acquire and develop new oil and gas prospects in multiple regions of North America and the world (Kraus & Lipton, 2012).

In light of recent growth in unconventional energy development techniques, and the revisiting of the boomtown sociological model of energy impacted communities, we use this article to detail some of the explicit and implicit assumptions of the boomtown sociological model of energy development, and examine how these assumptions might compare to the context of unconventional oil and gas development. The need to adapt boomtown lessons to other energy technologies is likely to seem more urgent in the future as society turns towards renewable energy sources, which can also be associated with boom and bust cycles (Carlton, 2011; Ellis, 2012; Kaunda et al., 2012; Victor & Yanosek, 2011) and have the greatest potential to be located in rural places (Blair et al., 2011; Executive Office of the President, 2010).

We argue that while the boomtown model is still quite useful to predict and understand many of the impacts from energy development, in many cases the key assumptions of the model (especially a singular boom and bust, and impacted communities that are rural and isolated) may no longer be either "typical" or "business-as-usual" given the development of unconventional resources such as shale oil and gas. We suggest that some of these assumptions need to be examined more closely if the boomtown model is to guide community development planning or future research. We further describe ways in which the boomtown model may be updated to include a more complex energy industry, and new kinds of socioeconomic effects experienced by diverse communities over long periods of time. Finally, we describe impacted communities in the United States, specifically in Marcellus Shale of Pennsylvania, which have experienced some of the new types of impacts that may occur from the development of unconventional resources.

2.0 Introduction to the Boomtown Model

The rate and scale of energy development expanded rapidly in the western United States during the 1970s, driven primarily by rapid price increases and policy responses associated with the 1973 Arab Oil Embargo and 1979 Iranian revolution. Previously undeveloped areas of the western US saw rapid extraction of traditional fossil fuels (coal, oil, natural gas) during the 1970s and early 1980s; the construction of nuclear and coal-fired power plants; and the exploration of new and industrially intensive energy sources such as oil shale and coal gasification (Murdock & Leistritz, 1979; Myhra, 1980; Lovejoy & Little, 1977).

The result of this energy extraction was massive industrial development and worker in-migration in hundreds of locations across the western United States, oftentimes near small and isolated rural communities that were historically unaccustomed to such activity (Murdock & Leistritz, 1979). Communities underwent drastic rates of population growth, and many sociological studies were performed into the 1980s that became known as the boomtown model or the "social disruption hypothesis" (England & Albrecht, 1984): a model that describes the social and economic effects of rapid population growth and industrialization in small communities, focusing on overburdened municipal services (Markusen, 1978), increased mental health

caseloads (Bacigalupi & Freudenburg, 1983), and changes in the quality of life of long-time residents due to the breakdown of long-standing cultural patterns and informal social ties (Freudenburg, 1986). Krannich & Greider, 1984).

By as early as 1973, scholarly reports related to the municipal planning implications of rapid energy growth began to be published (Nellis, 1973), along with testimony to congressional committees (Gilmore & Duff, 1973), and lurid media reports on the deteriorating social conditions in these energy-impacted communities (Franklin, 1974; Kohrs, 1974; Thompson, 1974). In the midst of sensationalized news reports on the modern day "boomtown" experience, Gilmore's (1976) *Science* article provided a conceptual framework to explain the challenges to community development posed by energy development in rural communities, and also an explanation for the reactions of residents who live there. The key scenario addressed by Gilmore's model is that of a sleepy and isolated small town that is faced with a sudden influx of people and energy-related economic activity. This growth invokes what Gilmore calls "the problem triangle". The first corner of the triangle –"degraded quality of life"– occurs as the capacity of existing natural, social, and economic systems to respond is outpaced. The second corner of the triangle –"declining industrial productivity"– develops as the labor force that can be attracted to the community becomes inadequate to meet broad new community and local business needs. At this point, overall private investment and financing for public investment and services cannot keep up with growing needs. The third vertex –a growing gap in local service provision– feeds back into reluctance on the part of the private sector to invest, further degrading the local quality of life. Finally, Gilmore suggests that a four part –growth management" policy response– is needed, which involves (a) balancing investment; (b) planning for resource use and conservation; (c) labor force development; and (d) protecting/enhancing community quality of life to retain residents.

Energy boomtowns often present sub-optimum conditions for rigorous sociological study. The *ad-hoc* nature of the model and social disruption hypothesis received some criticism from sociologists at the time for a lack of empirical data, a paucity of longitudinal analyses tracking pre- through post-boom conditions, failure to differentiate among community subpopulations, and an inadequate consideration of cultural or historical differences in the communities studied (Freudenburg, 1984; Seyfrit, 1988; Thompson, 1974; Wilkinson et al., 1982). Many of the studies in this realm were qualitative in nature, and quantitative measures of indicators such as crime, mental health, and population growth were often difficult to obtain or lacked control groups with which to compare the results. Nonetheless, the boomtown model and social disruption hypothesis have been applied in numerous other contexts of rapid growth and/or industrialization in rural communities, such as tourism (Park & Stokowski, 2009) and meatpacking (Broadway & Stull, 2006).

By the mid-1980s the price of energy commodities had collapsed and energy development projects throughout the western US had been shuttered. Most sociological studies in these communities also ended, providing additional support to critics that derided the lack of longitudinal analysis. One exception was the study of the boomtown community of Delta, Utah, which experienced rapid growth in the 1970s and a severe bust by the mid-1980s. Survey data on resident community satisfaction was collected several times during the 1970s and 1980s, and Brown et al. (1989; 2005) went back to the community in the early 2000s. They re-surveyed residents, who reported their quality of life and community satisfaction had returned

to nearly pre-boom levels, causing Brown et al. (2005) to proclaim a boom-bust-*recovery* cycle of energy impacted communities. Besser et al. (2008) found similarly that quality of life and social capital in small towns could be as dependent over time on the sequence/balance of small positive and negative economic shocks as on large (initial) shocks. These studies were published during a period when the concept of "resiliency" was increasingly taking root in the social sciences (cf. a summary and critique in MacKinnon & Derickson, 2012).

3.0 Assumptions of the Boomtown Model (and Challenges to this Model)

The boomtown model received criticism for a lack of guiding theoretical construct or cohesion among the different researchers, and many central aspects of natural resource extraction went largely unexamined by many researchers, including the possible effects of overbuilding and rapid population decline. In this paper, we focus less on the logic and dynamics of the model as we do on the currency and relevance of the several assumptions it assembles.

One summary of the boomtown literature, as it pertains to community development, is a working paper by Markusen (1978) that details the major limitations to community development in the boomtown context: a lack of regulatory authority, insufficient control of land use, dramatic population growth, conflict between newcomers and "old-timers", volatile production patterns, and poor information. We suggest that given these limitations, implicit in the boomtown model are several assumptions regarding the nature of the communities that are impacted, the natural resource, and the manner in which it will be extracted: (*1) rurality and isolation; (2) spatial and temporal concentration; (3) lack of local control or wealth retention; and (4) economic development and corporate behavior*. These assumptions may have been useful to employ at the time the boomtown model was developed (i.e., in the American West of the 1970s and 1980s); however, we argue that unconventional hydrocarbon development may require each of these to be significantly recast for the boomtown model to be capable of offering useful insight to communities facing impacts from emerging types of energy extraction.

3.1 The Assumption of Rurality and Isolation

The most basic assumption in the boomtown model, as described in the aforementioned Gilmore quotations, is that most energy-impacted communities are (a) likely to be rural and geographically isolated; (b) likely to be without any significant prior development experience; and (c) that these virginal and isolated attributes are particularly vulnerable to rapid disruptions to social and economic structure caused by energy development. Rurality is a concept that is famously hard to define, although typically used to describe communities distanced from large population centers, and built upon close personal relationships, informal social and economic ties, and agricultural production (Wirth, 1938).

The boomtown assumption of rurality and isolation is at best limiting. Due to the dispersed nature of the resource, unconventional hydrocarbon development often deploys rapidly across expansive regions, rather than in isolated resource-endowed communities (EIA, 2011; Weber, 2013). Furthermore, rural sociologists have commented in detail on the degree to which technology, transportation, and economic structures have reduced the social and cultural isolation of rural areas since

the time of boomtown research of the 1970s (Lichter & Brown, 2011; Warren, 1987). Other disciplines have more fundamentally challenged the applicability of received categories and boundaries of place ("local") to communities that are increasingly implicated in linked global/transnational/cosmopolitan world systems (Heise, 2008).

In many parts of the U.S. and the world, rapid energy development has occurred in areas with relatively high degrees of population density, or even in suburban or urban areas. The Dallas-Fort Worth metroplex in central Texas may be the epitome of urban resource extraction, with thousands of gas wells drilled and hydraulically fractured within city limits, including hundreds planned to be drilled under the Dallas-Fort Worth International Airport (DFWIA, 2009). Drilling commonly occurs in residential neighborhoods, governed by city ordinance, and entire city blocks of homeowners band together to negotiate leases with energy companies (City of Fort Worth, 2009). One recent consultant's study found that this metro-boom had accounted for more than a third of the incremental economic growth in the region's gas producing counties from 2001-2011 (Perryman Group, 2011).

While Dallas-Fort Worth may be an extreme example, many areas of unconventional gas extraction are occurring in ex-urban or rural places with population densities that defy the traditional or stereotypical boomtown experience; for example, Northern Pennsylvania has been a hotbed of activity related to Marcellus Shale gas extraction. This area is among the most rural in Pennsylvania, but with a population density (nearly 46 persons per square mile) that is greater than 12 states in the US (for comparative purposes, there are 43 persons per square mile for the state of Maine, 10 per square mile for the State of South Dakota, 6.8 per square mile for the state of Montana, 5.1 per square mile for the State of Wyoming) (NTRPD, 2009). There are no large cities in this region; rather, it is characterized by many small towns, boroughs, and cities in relatively close proximity.

During development of the Marcellus Shale, many of the towns in this region of Northern Pennsylvania have experienced population spillover from adjacent communities that have engaged in extraction activity. Unlike the rural and isolated boomtowns of the American West, the closely adjacent communities in Pennsylvania share resources, workforces, and revenues. As housing shortages result in increased rental rates for motel rooms and apartments, construction workers simply drive to the next town a few dozen miles away where housing is available; for example, Williamson & Kolb (2011) note that a severe housing shortage in Bradford County, PA, one of the epicenters of Marcellus shale development, has forced both gas industry and other workers to commute to work from settlements in a number of nearby counties, including some in adjacent New York State. The result has been that while costs for housing and other services have increased substantially since the beginning of the boom and led to some hardships and displacement, the crippling price hikes and overwhelming service demands described in the traditional boomtown literature have been largely avoided via distribution over a larger area and population base (Kelsey et al., 2012; Partridge et al., 2013; Williamson & Kolb, 2011).

Finally, the notion that rural areas in today's society may be more susceptible to cultural changes from rapid energy development deserves further examination. Certainly, most rural areas will have more difficulty than urban locales in absorbing growth in population and related service demands. Less certain is the magnitude of cultural changes that rural communities may experience. The characterization of rural areas as largely homogeneous populations with strict historical narratives and informal economic and social patterns has strong sociological lineages in Tönnies

(1887) and Wirth (1938), but has recently come under increasing scrutiny from rural sociologists; for example, Lichter & Brown (2011) are not alone in arguing that rural areas have undergone dramatic cultural changes in the past several decades due to the forces of technology, transportation, modern agriculture, and urbanization (Nye, 1969; Warren, 1987). Building from Friedland (1982, 2002), Lichter & Brown note that, in many cases today, rural and urban populations share access to essentially the same cultural and consumer experiences, and that perhaps nowadays "rural and urban people are largely indistinguishable" (Lichter & Brown, 2011, p.567).

3.1.1 Implications for Research and Community Development

All energy-impacted communities will not experience the outcomes related to extreme isolation and rurality in the boomtown literature. Certainly, many of the effects predicated on rurality and isolation in the boomtown model should not be automatically assumed to occur in more urban locales. Researchers need to better understand the dynamics between population density and boomtown problems. No framework or "rule-of-thumb" currently exists that can be used to evaluate the level of rurality or interdependence of a community and determine the susceptibility of problems related to rapid growth. The field would benefit greatly from a meta-analysis of boomtown problems that examines the relationship between isolation, population density, and the range of effects experienced. Each context and community must ultimately be evaluated on a case-by-case basis.

For communities that do not face extreme isolation, there is an implied opportunity and need for greater regional planning and coordination among other communities in the area (Jacquet & Stedman, 2011); for example, the city of Elmira, New York, has experienced economic and housing growth as "spillover" from drilling that has occurred as far as perhaps 160km away (Navvaro, 2011). Places such as northern Pennsylvania do not experience community effects so much as they experience regional ones as housing, service, and municipal demands related to population growth can easily migrate to adjacent communities.

3.2 The Assumption of Non-local Ownership and Control

Many of the previous boomtown sociological studies focused on areas in the western US that are characterized by either government-owned minerals or large mining operations that were owned by a single entity. A lack of local ownership or regulatory control mechanisms over the development was common, and widely viewed as resulting in inadequate mitigation practices, insufficient revenues to local communities to deal with boomtown problems, and local decision making hampered by limited information and uncertainty (Gilmore, 1976; Gilmore & Duff, 1975; Leistritz & Murdock, 1981; Jacquet, 2009; Markusen, 1978).

As described by Lovejoy & Little (1979), gains in employment and/or the creation of ancillary businesses to cater to new workers were the main ways in which local residents or communities in western contexts could economically benefit from the energy development. Lovejoy & Little found that local residents are often ill matched for these positions, and that unrealistic employment expectations are typical and by definition go unmet.

While some energy firms provided grants and loans for socio-economic mitigation (OIA, 1988; for a list, Myhra, 1980), in many cases the mining production was taxed at the state or federal level, without a direct way for local governments to control

development or for revenues to flow back to the impacted municipalities in a timely manner, if at all (Murdock & Leistritz, 1979). More recently, as shale gas and oil development occurs in more eastern locales, most municipalities do not have unclouded authority to regulate oil and gas development (Kay, 2012; Nolon & Gavin, 2013), nor is there universally settled policy about mechanisms for host municipalities to receive revenues from taxation of the development[2].

Unlike the traditional boomtown examples in the western US, the vast majority of mineral rights in the eastern US are held by private landowners. Privately held mineral rights provide an avenue for wealth to flow to local residents, with implications for local economic growth, community development, and local control. Landowners can receive payments from energy firms for the option to drill on the property, and an additional royalty on the value of oil or gas that is produced. In the US, lease payments in prime development areas have reached several thousand dollars per acre for a 3 to 5-year period, which can represent a large windfall for landowners who own 100s or 1000s of acres. Royalty payments typically range between 10-20% of the value of the energy produced, which can result in very large sums of wealth accruing to the landowner during the earliest years of production, before the amount of oil and gas produced from the well drops precipitously.

Landowner revenues can have several implications for rural communities that go beyond an improved economic position of local residents. Jacquet & Stedman (2011) explored the emergence of "landowner coalitions" that form to collectively bargain with energy firms and, in the process, create lasting community institutions that can affect socio-economic mitigation, community development, and environmental mitigation practices. They argue that –via the legally-binding operational practices that are dictated during the leasing process– landowners become the de facto managers of natural resource extraction across landscape scales. Who receives this "local" wealth, and how it is or is not invested in local communities can have large impacts on local communities (Macke et al., 2012).

The distribution of leasing and royalties is far from uniform, and community members who do not own property attractive to energy developers will not receive any leasing or royalty income. Such variation in revenue opportunities also portends a variation in attitudes toward the development that was largely not accounted for in the original boomtown literature, which tended to characterize differences in attitudes as function of "newcomers" versus "oldtimers" (Markusen, 1978). In Pennsylvania, Jacquet (2012) has demonstrated that attitudes toward energy development are positively correlated with experience with leasing and royalty income, suggesting that resident attitudes toward development in energy impacted communities may be much more complex than described by Gilmore (1976) and others (see also Schafft et al., 2013).

[2] Of the 39 states that levy natural resource severance taxes, only 15 share a portion with local government. Marcellus producers Ohio and West Virginia have a severance tax, but only West Virginia dedicates a share to local government (Zelio & Houlihan, n.d.). While Pennsylvania and New York have not adopted severance taxes to date, Pennsylvania has enacted a controversial impact fee schedule into law that assigns up to 60% of revenues to local government (Rabe & Borick, 2013). Marcellus well permitting remains largely on hold in New York, but an unusual framework already exists for municipalities to levy the standard local property tax rate against a state determined value of annual production for producing wells. While this provides a source of revenue to the jurisdiction hosting producing wells, it provides no revenue to nearby municipalities that might experience service cost increases (Kelsey et al., 2011).

3.2.1 Implications for Research and Community Development

The economic implications of widespread lease bonuses and royalties accruing to landowners in communities are significant, with the potential to influence community development, the fiscal health of municipalities, and how residents perceive and react to development in their communities. Due to a historical lack of interest and the continuing high cost of access to lease data (due to inadequate public records), too little is currently known about important land and mineral rights ownership patterns in the eastern landscapes now being affected by unconventional oil and gas development (e.g., Who owns subsurface rights? Who receives the royalties and bonuses? What do they do with their new wealth?) (Kelsey et al., 2011). This poses a persistent barrier to full understanding of the economic, sociological, and other community and regional implications of mineral exploitation throughout these landscapes.

With many communities still not receiving significant tax revenue from energy operations (Jacobson & Kelsey, 2011), the larger question remains whether this personal wealth can compensate for the lack of municipal revenue. Wealth retention in rural communities has emerged as an important topic for community development in the US in recent years, especially as the median age of many rural populations nears retirement amid widespread out-migration to urban areas by younger populations set to inherit this wealth (Macke et al., 2012; McGranahan et al., 2010; Pender et al., 2012). Multiple strategies are surely required. Creating rural "wealth that sticks" is a theme highlighted by Molinaro & Topolsky (2010, p.16), which they amplify through practical lessons learned in wealth creation involving rural energy, food, and ecosystem services. One of many such lessons is the "critical" element of "local ownership and control over a region's place-based assets and businesses, and the structures that generate wealth from these assets". In another product of a recent Ford Foundation funded initiative on wealth creation in rural America, Kelly & Ratner (2009, p. 4) cite Goldschmidt (1947) in emphasizing even more strongly that "[o]wnership and control of assets can spell the difference between those who enjoy economic stability and those who do not". Research is needed to further contextualize and sort out the potential and performance of the examples mentioned by Kelly & Ratner, including institutions of shared ownership (cooperatives, land trusts, easements, covenants, etc.) and related tools that promote community control or influence (fees/taxes, local currencies, community benefits agreements, land banking, community endowments, etc.).

3.3 The Assumption of Spatial and Temporal Concentration

Many of the previous contexts in which the boomtown framework has been applied involved singular resources or related construction projects that were located at a specific location that was not likely to migrate. While the length of time of the project may have been uncertain, the physical location was not. In considering the component of time, much of the boomtown literature simply did not address the resource bust. If the bust was addressed, it was assumed that the eventual decline in activity would effectively end all development in the area (Gilmore, 1976; Markusen, 1978). Many researchers called for a longitudinal perspective that included a post-impact analysis; however, most boomtown studies effectively reported on "a snapshot in time", often at the height of growth and change (Seyfrit, 1988). Brown et al. (2005) eventually expanded this narrative to include a recovery cycle that can occur in communities after the boom and bust, where communities eventually

experience increased qualities of life that begin to approach pre-development levels; however, even that study supposes new waves of development are unlikely.

Today's shale developments have very wide geographic footprints. The amount of oil and/or gas in unconventional hydrocarbon layers is massive, and many resource rich areas (or "plays") contain multiple geological strata that may be conducive to exploration and development under different economic and technology regimes. Different companies with different corporate strategies, economic structures, and production incentives invest differentially across location. Drilling and development by even a single company may shift from location to location, and then return as relative energy prices adjust or the stages of exploration and development of a gas field unfold. Moreover, in many shale plays, leases contain "hold by production" or related clauses generally intended to require the energy company to begin production within a specified time frame, otherwise enabling the landowner to release the drilling rights (King, 2011). Though intended in no small part to protect landowners' economic interests, this incentivizes a "land grab" strategy that involves energy companies securing land holdings via the bare minimum amount of drilling necessary, and then later returning to the property for "in fill" drilling in that location (Ladlee & Jacquet, 2011). In the Marcellus Shale, each drilling site has the geologic capacity to support up to 12 horizontal wells, yet the average number of wells drilled initially per location was slightly above two. For leasing reasons as well as several others, many companies have left locations with as much as 80% or more of the resource yet to be extracted (Ladlee & Jacquet, 2012). It is likely the companies will return for the in-fill development, as the infrastructure is already in place, but when exactly this will occur remains the question. Whether development will occur all at once or perhaps over several different cycles, is also questionable.

In many of these regions, some portion of the shale gas resource is likely to outlast current and even foreseeable technology and economic conditions involved in its extraction. This focuses attention on the larger question of when, exactly, there is sufficient economic or market incentive to develop the resource? We view the evidence to date as suggesting that shale development at regional, community, and even individual drilling unit scales is likely to semi-bust and re-boom over the course of many years, rather than playing out in a singular event. Indeed, even in some areas of Wyoming, Utah, and Colorado, communities that were impacted in the 1970s and 1980s have seen a reemergence of activity in the mid to late 2000s. Unfortunately, there have been few attempts to examine the longer-term place-based implications of this extended cycle of booms and busts. In contrast to 30-year cycles of development, modern exploration and production practices have demonstrated the ability to quickly ramp up and ramp down activity at given locations, moving rigs and crews across various plays. This ability reinforces the prospect that a given geographical area will see notable ebbs and flows in activity, prompted by smaller changes in markets and general economic conditions.

3.3.1 Implications for Research and Community Development

As previously noted, most of the initial boomtown literature was sociologically grounded. The economic (or other) drivers of the boom and how they, as well as the community, evolved over time were taken as givens. Several researchers have attempted to advance a more economically-oriented branching of the boomtown literature, each of which identifies timing-related issues (Freudenburg & Gramling, 1998). Gramling & Brabant (1986) represents an early contribution that identified

the need to modify the basic boomtown model to account for the significance of a fluctuating pace of development and policy as a mediator of this pace, along with the interactions between local and nonlocal pools of labor and the gradual regional evolution of new industry sectors over time. In a more narrowly-scoped paper concerning optimal, municipal infrastructure investment, Cummings et al. (1978) draw similar attention to pace/timing, geography, economic uncertainty, and the relationship of each of these to the differential incidence of municipal costs incurred versus revenues earned.

Given the day-to-day demands on municipalities in the boomtown context, it is difficult for communities to plan at all, much less plan for these kinds of complexities or the indeterminate future when development may rapidly decline and the dynamics of municipal service supply and demand will shift dramatically. While most areas are likely not to experience the aggressive levels of population growth and service demands seen in the typical boomtown model, the changes are still likely to be significant and point to ongoing challenges to community-based planning in the context of energy development (STCRPDB, 2012). Indeed, even researchers have often not considered "the bust" when describing problems and solutions for local municipalities (Seyfrit, 1988).

The changes in the spatial and temporal footprint of the oil and gas industry may dictate that communities will need to plan even further ahead to encompass the repeated mini-booms and mini-busts that may occur as companies variously develop and scale back resource extraction. In addition, for reasons of capacity as well as the geography of new energy landscapes, some form of regionalism seems indicated in both research and practical agendas. Planning institutions with capacity or potential to reach beyond single communities can profitably support and inculcate greater intentionality in energy country regionalism, especially in relation to a trend that has been termed "ad hoc rural regionalism" (Hamin & Marcucci, 2008).

3.4 The Assumptions about Economic Development and Corporate Behavior

Perhaps the sharpest economic divergence from the world of Gilmore's Pistol Shot, USA, to the world in which hydraulically-fractured, horizontally-drilled unconventional oil and gas are exploited has to do with the financialization[3] and globalization of the economy. Financialization and globalization broadly pervade the modern economy, moving well beyond changes associated with energy sectors or even directly with Wall Street and the financial sector itself. Milesi-Ferretti & Tille (2011) show that global capital flows more than doubled their share of world GDP to 20% between 1998 and 2007. After the financial crash of 2008 and with the long-term rise of emerging economies, capital flows associated with financialization have become vastly more global and multi-polar. As noted below, these interrelated trends have important implications for the pace and scale of resource development at the community level.

Not surprisingly, given the immense importance of energy to economic activity writ large, the energy sectors are deeply implicated in both trends. Although some

[3] In its most salient formulation for this article, financialization can be defined as the tendency to increasingly seek and take profit through financial means (interest, dividends, capital gains), rather than through the production and sale of traditional goods and services (Krippner, 2005; Arrighi, 1994).

analysts challenge the effect and consequence of financial speculation *per se* in fossil fuel markets, a significant literature points to an evolving role of hedge funds, pension funds, insurance companies, and others in energy markets. They have increasingly "traded in futures as oil derivatives – futures, options, swaps – became attractive financial assets through which to diversify investment portfolios" (Sawyer, 2012, p. 713; Dwyer et al., 2011; Fattough et al., 2012; Orhangazi, 2008). A small number of large institutional investors dominate crude oil futures contracts (Masters & White, 2008). According to various estimates, trade in "paper barrels" of oil absolutely dwarfs that of physical commodity transactions[4]; thus, the relationship between current commodity price, corporate behavior, and the commitment to commodity production in particular communities and locales has become much more complex than it was in the 1970s.

The role of globalization and financialization with respect to the shale boom in the United States remains to be thoroughly analyzed by academics; however, there are many indicators of the importance of each. Investment in U.S. oil and gas plays by foreign companies is significant. The US Energy Information Administration catalogues more than $26 billion in foreign joint venture investment from European, Indian, Asian, and other companies in shale plays since 2008, with at least one other estimate of totals being significantly larger (Dittrick, 2012). Over half of this investment was in just two plays (the Eagle Ford and Marcellus; see Gruenspecht, 2012). Many of these deals involve "drilling carries" or arrangements where the entity buying into a joint venture covers all or part of the costs to drill and develop the selling company's holdings, thereby financing drilling regardless of commodity price. Chesapeake has explicitly associated its acquisition strategy with the concept of the global "land-grab", whereby nations and companies have pre-emptively attempted to ensure profitable access to food, fuel, and water through an extraordinary wave of worldwide speculative "land" investment (Chesapeake Energy, 2013; De Schutter, 2011; Hall, 2011).

Several contrarian industry analysts, Arthur Berman most prominent among them, have persistently and with increasing authority argued there has been a financial "bubble/crash" element to recent unconventional gas development (Berman, 2012; Powers, 2013; Stafford, 2012); in other words, a financialization of traditional boom/bust dynamics. Following the initial frenzy of land leasing, whereby companies staked out their claims in unconventional gas, the trade and popular press is now replete with stories about a natural gas supply glut (e.g., Buttonwood, 2012; Kelly-Detwiler, 2012). Within a few short years, the price of natural gas has fallen dramatically, for some companies below the marginal price of production: an obvious deterrent to profit taking from commodity production and sales.

Perhaps the most significant economic question about the recent history of unconventional gas development is related: Why has production remained so high despite prices that have dropped so low? The major reasons advanced have all had more to do with the logic of finance than with the short-term production and commodity sales motivations implicitly embodied by Gilmore (1976) and others in the boomtown model (Berman, 2012; Kelly-Detwiler, 2012; Rathan, 2009). Many companies acquired leases in order to attract capital by showing greater reserves on

[4] According to Maugeri (2009, p. 158), "more than 1.4 billion 'paper barrels' were traded daily on the NYMEX alone during the bullish days of 2007, even though worldwide physical consumption of oil was less than 85 million barrels per day" (see also Downey, 2009, p. 325; Kennedy, 2012).

their balance sheets. As noted above, joint venture "drilling carries" can require production regardless of market conditions. Furthermore, strategic positioning is important. Industry leader Chesapeake (Grow et al., 2008) asserts boldly that it intended to "enjoy competitive advantages for decades to come as other companies would be locked out of the best new unconventional resource plays in the U.S.". In any event, after leases are acquired from landowners, hold-by-production lease clauses often require a company to begin well development within a specified time frame or terminate its lease rights.

3.4.1 Implications for Research and Community Development

Although the explanations by industry analysts as to why drilling activity can continue despite very poor profit margins seem compelling, in-depth research is needed on the extent and implications of each identified phenomenon. Of critical importance for policy and for affected communities is a deeper understanding of how these dynamics may extend over time; for example, are the financialization of the energy sector and the "land grab" of drilling acreages associated exclusively with the earliest phases of exploration and development of a new play, or is this a more permanent fixture of a globalized energy sector?

All of the aforementioned issues remain highly relevant to current efforts to understand unconventional oil and gas extraction. As noted in the discussion above regarding the decreasing prevalence of rurality and isolation in modern boomtowns, it is the broad, cumulative, and regional impacts that are a new and significant facet of these new kinds of development. These impacts simultaneously involve multiple communities and are associated with a distinctive, fickle pace and scale of development driven by global financial and economic interests: phenomena that require further adaptation and expansion of boomtown theory (Christopherson & Rightor, 2012; Haefele & Morton, 2009; Kay, 2011).

4.0 Conclusions

Since its inception in the early 1970s, the body of sociological research on energy-impacted communities has received criticism for its poor data collection, a lack of theoretical orientation, a lack of longitudinal analysis, and its one-size-fits-all application to differing communities (Wilkinson et al., 1982). Just as some efforts to respond to various critiques began to be implemented, research attention to the phenomenon faded. Despite the recognized shortcomings, the "boomtown model" of community impact, the "social disruption hypothesis", and the associated body of research from that era has proved valuable to the fields of Rural Sociology, Social Impact Assessment, and community development in the context of rural areas undergoing rapid change.

Despite its flaws, nearly 40 years later the legacy of this research remains important to understanding communities undergoing rapid change from energy development. The case study descriptions and sociological findings in this research from several decades ago often represent the best – and sometimes only – in-depth examples of energy impacted communities from which social scientists and community development practitioners can draw. The new, "second wave" of boomtown sociological research that started to emerge in the late 2000s utilizes the concepts, methods, and findings of the original boomtown research to examine contemporary impacted communities, clearly attesting to the continuing relevance of the boomtown model.

It remains increasingly important to critically examine the assumptions and contexts of the original works to identify areas where this research is applicable to today's energy-impacted communities, versus areas where the core assumptions supporting this research no longer apply. This paper is an attempt to identify some key areas where assumptions no longer fit, where model evolution is required, and where much more rigorous research and analysis is necessary. We have focused on four main areas: rurality and isolation, spatial and temporal concentration, local control, and economics and corporate behavior. There are likely other key assumptions of the previous research that also deserve such close scrutiny. Much of the recently published research that explores the boomtown phenomenon (i.e., Brasier et al., 2011; Jacquet, 2009; Parkins & Angell, 2011; Ruddel, 2011) is focused on the similarities between what has happened in the 1970s and what is occurring today. We suggest that focusing on the differences may be even more fruitful when it comes to generating data, analysis, and contemporary insights that can aid energy impacted communities. Practitioners must in any event use caution to remember that applicability of the model will vary on a case-by-case basis. We are still early in the "second wave" of boomtown research; however, there is little thus far to suggest that the original assumptions and tenets of this model have been fundamentally examined, much less adapted, to the new era of energy development.

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