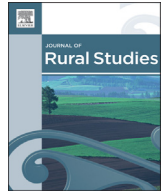


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# Impacts of unconventional gas development on rural community decline

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## ABSTRACT

### Keywords:

Unconventional natural gas  
CSG  
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Rural decline  
Regional development  
Rural youth

This paper looks at the impact of a new extractive industry, namely unconventional natural gas, on rural decline. Rural decline is defined as comprising loss of rural youth, reduced human capital and increasing rural poverty. Since the start of the current century, the unconventional natural gas industry has been expanding around the world, often in close proximity to pre-existing agricultural communities. The social impacts of this new industry represent a growing area of interest in rural studies. We contribute to this new research area through a case study of coal seam gas (CSG) development in Queensland, Australia, comparing regions where gas development occurred between 2001 and 2011 against a control group of similar regions without gas development. The study eliminated the influence of non-resident workforces by analysing census data based on place of usual residence as well as place of enumeration. A key finding of the study is that regions with CSG development have experienced a growing youth share of the population and, of particular note, a growing female youth share of the population. CSG regions had a higher proportion of youth with university degrees and advanced technical training compared to other rural regions. Poverty reduction was also observed in some specific CSG regions. The extensive spatial footprint of unconventional gas and increased female rural youth populations indicate a diversion from traditional boomtown social impacts observed in previous energy booms. Taken together, the results show signs of mitigating and reversing rural community decline.

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## 1. Introduction

As the world population has become more urban than rural, scholars of rural studies have increasingly grappled with the issue of rural decline. The expansion of urban populations has prompted researchers to look closely at the effects on rural areas, including demographic changes, economic changes and different settlement patterns in rural towns (Bloom et al., 2008; Montgomery, 2008). Much of the focus on rural decline has looked at changes in agriculture, such as increased mechanisation and diminishing terms of trade. Yet, alongside decreases in some traditional economic activities, some rural regions are experiencing expansion in other economic areas. One substantial economic change which has developed over the past decade, and which has significant impacts for rural areas with a history of agriculture, is a new industry in the

form of unconventional natural gas (herein unconventional gas). Understanding the implications of new extractive industries such as unconventional gas for rural localities is a crucial issue for the field of rural studies (Woods, 2012). The rationale for putting these new industries under the microscope is that they pose new challenges and opportunities for rural communities. In part, this is due to operational differences that affect the viability of existing rural communities in different ways from conventional mining and energy production. This paper looks at one such change – the development of unconventional gas – and considers how this is affecting rural decline in communities experiencing coal seam gas development in Queensland, Australia.

### 1.1. An overview of rural decline

The term ‘rural decline’ refers to a wide range of issues, from demographic changes through to rural political discourses (Lockie, 2000). Underpinning most of these discussions are three substantive changes, which flow through to issues of identity and aspiration in different rural contexts. The first is rural net migration loss,

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and in particular rural youth out-migration which leads to a skewed demographic profile in rural areas (Stockdale, 2004). The second is declining human capital due to the loss of skilled and educated young people (Winkler et al., 2012). The third area is the lower incomes of rural regions compared to urban areas (Argent and Walmsley, 2008). In practice this often boils down to questions of whether young people have a future in rural locations (Stockdale, 2004).

With some exceptions such as the UK, out-migration is the dominant trend for most rural regions around the world (Woods, 2011). Out-migration of youth in particular (including in the UK) is an issue because it is recognised as damaging to rural communities in terms of skewed demographic profiles, reductions in services and loss of local culture as expressed through festivals and related events (Stockdale, 2004). Young women are more likely to leave rural regions than their male counterparts (Argent and Walmsley, 2008). The 'exodus' of youth from rural areas has been a concern for decades in Australia, and shows empirical evidence of accelerating over the last two decades (Gabriel, 2002; Argent and Walmsley, 2008). Similarly, in the USA, a general trend of youth out-migration from rural areas to urban areas was observed during the second half of the twentieth century. In particular, the Great Plains region experienced consistent net migration loss, widening in recent years to include the corn belt and upper Great Lakes regions (Johnson et al., 2005; Johnson, 2011).

The causes of rural youth out-migration are multiple and complex, but partly explained by push factors including a lack of employment for school leavers (Golding, 2014). To some extent this is explained by the reduced demand for agricultural labour forces, which has been influenced by farm amalgamations, declining terms of trade and increased mechanisation. Other factors include escaping the perceived dullness of rural locations in favour of 'city lights', and increasing propensity to seek tertiary education which tends to be concentrated in metropolitan areas (Woods, 2011; Argent and Walmsley, 2008). The extent to which net migration loss is a problem, and what might be done about it, are areas of debate (Gibson and Argent, 2008). While it is not possible to engage with all aspects of net migration loss in this article, our focus in this paper is to consider how the development of a new extractive industry in the form of unconventional gas is reflected in opportunities to attract and retain rural youth.

Compounding the loss of rural youth, a related component of rural decline is reduced human capital (Johnson, 2011; Winkler et al., 2012). In particular, a concern about losing 'the best and brightest' has long been recognised in rural studies (Gabriel, 2002; Winkler et al., 2012). According to Stockdale (2004) those with ability or ambition have little choice but to leave rural communities. Others suggest that the development of human capital in rural contexts may accelerate the departure of the most capable (Corbett, 2007). Some scholars note the potential advantage for rural regions of youth out-migration, provided that some of the out-migrants return with the knowledge and skills they have developed through programs which are only available in urban centres (Gibson and Argent, 2008). Thinking along these lines, Stockdale (2004) considers that the number of youth returning to rural communities is perhaps more important than the numbers who leave. In concrete terms this is an important phenomenon to consider as human capital is fundamental for the development of entrepreneurship, innovation and long term growth.

Increasing income disparities between rural and urban areas – which are common in many countries – are another component of rural decline (Pritchard and McManus, 2000; Hu, 2002; Stockdale, 2004). Low incomes for residents in agricultural regions compared to cities are particularly significant due to the interrelated impacts of market access, trade liberalisation, structural adjustment,

declining commodity prices and property amalgamations (Goetz, 1992; Argent and Walmsley, 2008; Connell and McManus, 2011). It is also important to recognise that there are varying levels of poverty between rural regions, in part depending upon the size and productivity of the agricultural sector (Fleming et al., 2010), therefore the rise of the resources sector may affect different types of rural regions in different ways.

While rural decline is a crucial area for study, some call for caution when applying the label to particular locations, as the stigma attached to this phenomenon may hasten its development (Gibson and Argent, 2008). Young people may be inherently mobile – seeking exploration and new challenges – so some of the intrinsic factors such as low incomes in rural areas may not always be strong drivers of out-migration (Delisle and Shearmur, 2010). Others reject the inevitability of rural decline, viewing it more as the outcome of particular policy choices (Markey et al., 2008). Some have tentatively observed 'rural revival', as jaded urban dwellers seek better lifestyles in rural areas (Connell and McManus, 2011).

## 2. The rise of unconventional natural gas extraction in rural landscapes

Internationally, the growing demand for energy and, at the same time, for lower carbon emissions has fuelled demand for new types of energy resources. Interest in 'unconventional' energy has grown increasingly since the end of the 20th century, requiring new mechanisms to harness this energy (Rogner, 1997). Much of this development has occurred in the USA, where unconventional natural gas has been a major component of strategic programs aimed at increasing self sufficiency in energy with a lower carbon emission burden compared with other fossil fuels (Stedman et al., 2012; Gunter et al., 1997). The 'unconventional natural gases' comprise sources of methane which include shale gas (the most widely exploited), coal seam gas (also known as coal-bed methane) and the lesser known 'tight gas' trapped in rock formations (Law and Spencer, 1993; Wright, 2012). Shale gas is extracted in substantial volumes in the USA, notably in the Marcellus and Barnett shales. Potential for shale gas production has been recognised in several parts of Europe, including Austria, China, Germany, Norway, Poland, Romania, Sweden, Turkey and the UK (Schulz et al., 2010; Selley, 2005; Weijermars, 2013; Wiśniewski, 2011). Reserves of shale gas are also located in Argentina, Australia, Brazil, Canada and Mexico (Ross and Bustin, 2007; Wright, 2012).

Coal seam gas (CSG), geologically distinct from shale gas, is also expanding throughout the world. Coal seam gas is currently extracted in a dozen countries including the United States, Canada, Australia, India and China (GA and ABARE, 2010). Previously thought of as a fugitive gas waste product from conventional coal mining, it is now an industry in its own right due to developments in technology to harvest methane trapped in coal seams (Cheng et al., 2011). This has enabled extraction of methane from deep coal seams which are not economical for conventional coal mining.

Australia has all three types of unconventional gas resources, with varying levels of known accessibility (GA, 2012). The largest estimated reserves are for shale gas, notably in Western Australia, although exploration is still in early stages. Exploration for tight gas is even less developed, with no viable reserves identified. Of the different forms of unconventional gas, the most developed in Australia is CSG, which has rapidly expanded in the state of Queensland in the past decade (Morrison et al., 2012; GA, 2012; Fleming and Measham, 2014a). Queensland possesses over ninety per cent of the country's economically demonstrated resources (EDR) of CSG known to 2011 (GA, 2012), distributed mainly across the Surat and Bowen basins (see Fig. 1). Moreover, exploration activity has revealed increasing quantities of commercially viable

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