

Rural revitalization effects of hydraulic fracturing: An initial perspective from Texas

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Abstract. As hydraulic fracturing opens new possibilities for recovering shale gases, rural communities are looking to the oil and gas industry to stimulate economic growth and reverse decades of decline. Stories of boom towns saved from imminent doom fuel the hopes of rural residents on the fringes of drilling activity. This paper analyzes economic data from six Texas shales, corroborating findings of increased earnings and population in rural counties within shale boundaries and suggesting a more nuanced pattern of pockets of activity within each shale. Focusing on six Texas shales (Barnett, Cline, Eagle Ford, Grant Wash, Haynesville/Bossier, and Permian Basin), hydraulic fracturing has disproportionately benefited rural and micropolitan counties in terms of income and, to a lesser extent, population growth. The oil and gas share of some rural economies has increased more than tenfold in five years, resulting in dramatic increases in personal income. Population gains have been modest in most rural counties because many workers are not permanent residents. However, rural counties have experienced significant growth in establishments, employment, and gross sales—the focus of this paper. Not only have rural growth rates general outpaced metropolitan and micropolitan rates, some rural economies are beginning to converge with micropolitan sales levels. Core counties tend to experience greater growth than non-core shale counties, but all counties vary dramatically in their growth patterns.

1. Introduction

A number of studies consider the economic impact of the oil and gas industry on regions and even individual towns. These studies tend to either note the magnitude of growth or look at the positive multiplier effects of increased spending in the region. Some studies and popular press articles note the tax placed on infrastructure, increased traffic congestion, and higher wages faced by local industries. Fewer studies consider economic trade-offs from energy activity, using, for example computable general equilibrium models. To date, the literature largely ignores the impact of the energy boom on the rural-urban hierarchy.

The paper has two principal aims. First it explores the benefits to rural counties and communities during the labor-intensive exploration and drilling. Energy industry employment will generate demand for services and lodging. Royalty holders will induce demand for goods and services among local businesses. In the exploration and drilling phase, it is expected that:

1. Rural counties more proximate to a shale's epicenter receive a greater boost in both income and employment.
2. Oil and gas exploration increases the number of businesses and the sales volume in small rural communities during the drilling phase, particularly food and beverage establishments and lodging establishments.

Second, the paper considers the possible effects of oil and gas drilling and extraction on the long-term consolidation of the rural-urban hierarchy. Decades of rural decline, especially in the remote rural areas

experiencing much of the recent energy production activity, are unlikely to be reversed by increased incomes. Demand by local households and non-local energy sector employees is best served in regional trade centers with existing clusters, economies of scope, and established infrastructure. As energy sector employment declines, the non-resident workforce will leave the area, putting additional pressure on businesses with small service areas and their communities. At this point, the long-standing trend of converging economic activity in micropolitan and rural retail trade centers seems likely to continue, despite increased income in rural communities. Specifically, it is expected that

3. Overall economic growth, during drilling and subsequent phases, favors regional trade centers that provide higher-ordered goods and services.
4. An energy boom does not reverse the consolidation of rural economic activity into rural regional trade centers and micropolitan cities because trade centers continue to serve larger trade areas.

2. Data

An overview of economic change

More than 40 percent of Texas' 254 counties are part of major oil and gas plays in the state. Figure 1 shows the locations of oil and gas wells in the state, and the shales are easily seen within that context (adapted from TCEQ 2014). The 30-county Eagle Ford in South Texas receives the lion's share of media attention and is often compared to the Bakken formation in the northern plains (Table 1). The Eagle Ford opened in 2008, around the

same time as the Bakken was found to have greater reserves than formerly estimated. The Barnett shale in the Dallas-Forth Worth area encompasses 25 counties. Hydraulic fracturing has revived the 38-county Permian Basin in West Texas. The Cline shale includes 13 counties, 11 of which are part of the Permian Basic; however, the Cline shale has contributed five additional core counties to that region. The Railroad Commission of Texas makes note of two additional oil producing regions, the Haynesville/Bossier shale in northeast Texas

and the Granite Wash which contains a tight cluster of wells in the Panhandle (Texas Railroad Commission 2014).

More than half of the counties in the Texas shales are rural (Table 2). Indeed, the energy boom is often portrayed as a rural phenomenon with boom towns arising in the formerly bucolic countryside. Still, a significant share of activity occurs within metropolitan and micropolitan areas (OMB 2012, Texas Railroad Commission 2014).

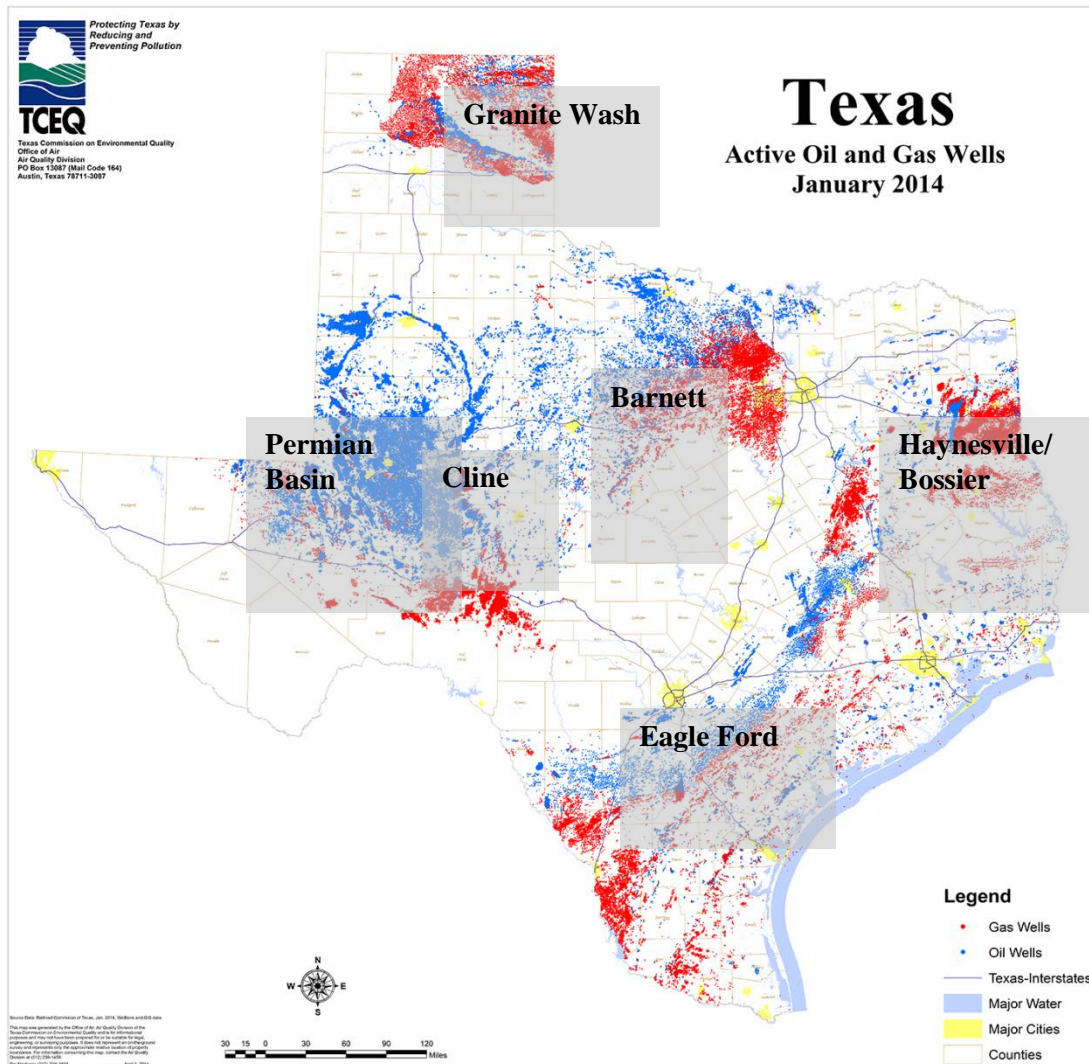


Figure 1. Well and shale locations within Texas, map from Texas Commission for Environmental Quality.

Table 1. Texas Shale Counties.

	6 Shales	Eagle Ford	Barnett	Permian Basin	Cline ¹	Haynesville/Bossier	Granite Wash
Shale Counties	108	30	25	38	13	10	3
Core Counties	46	15	4	15	7	4	3

¹Eleven Cline Shale counties are in the Permian Basin, including two overlapping core counties.

Table 2. Metropolitan Status of Shale Counties.

	Metro	Micro	Rural
Shale	27	20	61
Core	9	10	27
Eagle Ford	9	3	18
Barnett	10	5	10
Permian Basin	6	8	24
Cline	2	3	8
Haynesville/ Bossier	2	3	5
Granite Wash	0	1	2

All data used in this analysis are publically available. Growth in employment and number of establishments from 2008 to 2012 is based upon County Business Patterns data. 2008 was selected because it marks the entry of the Eagle Ford shale, which facilitates further analysis of this large shale. 2008 is also the last year before Texas entered the Great Recession.

Employment grew faster on average in shale counties than in non-shale counties, with 2008-2012 growth being 2.6% for shale counties but negative for non-shale counties (Table 3). The range of growth is larger for the shale counties and includes larger job losses as well as substantially larger gains. Of course, many rural shale counties have very small economies (small denominators), which results in large percentage changes from relatively small changes in the number of jobs. Despite positive average employment gains, more than half of shale counties lost jobs between 2008 and 2012. Again, Texas was hit by the great recession in 2009 but had largely recovered by 2012; the energy

sector appears not to have offset job losses in other industries during that time period. Also, while there is evidence that rural counties may have been less affected by the recession, rural farming regions, especially in the western part of the state, faced significant droughts in 2011 and 2012.

The core counties experienced greater employment growth at 8.3% versus -1.2% in non-core shale counties. Only 37.0% of core counties experienced employment losses between 2008 and 2012 while almost 70% of the shale counties outside the core areas experienced job losses (Table 3). Within the core counties, metropolitan and micropolitan counties averaged almost no growth with fully half reporting job losses while rural counties averaged 15.3% growth, and only 7 of 27 reporting core counties had employment losses (Table 4). Employment growth was stronger in core than non-core shale counties. Rural counties within the core, in particular, had stronger employment outcomes.

Table 3. Employment Growth in Shale and Non-Shale Counties

	Shale	Non-Shale	Core	Non-Core
Average Growth	2.6%	-2.4%	8.3%	-1.2%
Minimum	-45.3%	-38.7%	-43.4%	-45.3%
Maximum	190.2%	49.5%	146.8%	190.2%
% Neg Growth ¹	55.6%	61.6%	37.0%	69.4%

¹Share of counties with negative growth is based on shale v. non-shale and core v. non-core shale counties.

Table 4. County Employment Growth and Count of Counties with Employment Losses by Metropolitan Status.

	Shale Employment Growth	Shale County Job Loss Count	Core Employment Growth	Core County Job Loss Count
Metropolitan	-0.2%	16 of 27	-0.9%	5 of 9
Micropolitan	-0.9%	12 of 19	-1.1%	5 of 10
Rural	5.1%	32 of 58	15.3%	7 of 24

Patterns of establishment growth were similar to those for employment growth, although the ranges were smaller for the shale and core counties. Shale counties averaged slightly positive employment growth while, on average, non-shale counties experienced establishment losses (Table 5). Interestingly, while core counties had the highest growth (3.6%) in the number of establishments, non-core shale counties had greater average establishment losses than did non-shale counties

(-2.2% v. -1.1%), and a greater share of non-core counties had a net loss of establishments than did the non-shale counties (74% v. 70%).

Rural counties, particularly rural core counties, continued to outperform metropolitan and micropolitan counties in establishment growth. At 7.2%, growth in the number of establishments in rural core counties far exceeded growth in other counties, and rural core

counties were less likely to experience net establishment losses (Table 6).

Table 5. Establishment Growth in Shale and Non-Shale Counties (Change in Number of Establishments).

	Shale	Non-Shale	Core	Non-Core
Average Growth	0.2%	-1.1%	3.6%	-2.2%
Minimum	-23.5%	-25.0%	-23.5%	-19.6%
Maximum	55.6%	225.0%	26.9%	55.6%
% Neg Growth ¹	54.6%	69.2%	28.3%	74.2%

¹Share of counties with negative growth is based on shale v. non-shale and core v. non-core shale counties.

Table 6. Average County Establishment Growth and Count of Counties with Establishment Losses by Metropolitan Status.

	Shale Employment Growth	Shale County Job Loss Count	Core Employment Growth	Core County Job Loss Count
Metropolitan	-0.6%	15 of 27	0.2%	5 of 9
Micropolitan	-2.3%	14 of 20	-2.9%	6 of 10
Rural	-0.2%	31 of 61	7.2%	2 of 26

While more hotels, motels, and similar establishments were opened in non-shale counties, employment increased more within shale counties (Table 7). Unlike general employment and establishment growth, non-core counties had greater growth in the accommodation sector than did core counties. Shale counties, and especially core counties, saw greater growth in food service employment and establishments between 2008 and 2012. While workers need to be fed near where they work, they may be able to commute longer distances to hotels.

Many regions with active energy drilling report that other local industries are facing pressure from high oilfield wages. If high labor prices cannot be passed on to consumers, export-oriented businesses may struggle to remain profitable. If prices can be passed on, high

labor costs are a less important issue, at least to firms. On average, shale and core counties saw significant growth in the number of manufacturing establishments. Again, it is important to note that many counties had few manufacturing establishments in 2008 (small denominator) so gaining a few businesses resulted in a large relative change. However, manufacturing employment on averaged decreased more in shale and especially core counties than in non-shale or non-core counties. This may be evidence that workers are migrating to the energy sector. Without further exploration (which difficult in rural counties due to data disclosure issues), it cannot be established whether new manufacturing establishments are serving the energy sector, although evidence from those counties suggests this is often the case.

Table 7. Employment and Establishment Growth in Accommodation and Food Service, 2008-2012.

	Accommodation Employment	Accommodation Establishments	Food Service Employment	Food Service Establishments
Shale	44.5%	20.4%	0.3%	4.9%
Non-Shale	15.4%	48.8%	-1.2%	2.0%
Core	41.8%	13.4%	2.7%	8.0%
Non-Core	46.2%	25.1%	-1.4%	2.6%

Table 8. Employment and Establishment Growth in Accommodation and Food Service, 2008-2012.

	Manufacturing Employment	Manufacturing Establishments
Shale	-14.2%	54.9%
Non-Shale	-5.4%	0.1%
Core	-22.2%	139.9%
Non-Core	-8.9%	-8.8%

A look at the Eagle Ford

Growth in employment and the number of establishments varies greatly between shales (Table 7). Overall, the Eagle Ford tended to have consistently

larger employment and establishment growth. The three-county Granite Wash saw two-digit employment growth but a decline in the number of establishments between 2008 and 2012. The Permian Basin averaged 4.5%

employment growth across the shale, which was higher than core growth. The highest growth within the Permian Basin occurred along its eastern edge overlapping the Cline shale, where three counties had greater than 25% employment growth.

Sales data from the Texas Comptroller of Public Accounts indicates that gross sales, a measure of basic economic activity, grew much faster in core counties than in non-core counties, although core sales growth dropped in 2013 (Figure 2). Further, sales in rural counties grew faster than metropolitan or micropolitan county sales both in dollars and as a percent of prior year sales (Figure 3), and rural counties within the core grew fastest (Figure 4). Growth of micropolitan areas lagged.

County growth rates varied greatly. Even amid Eagle Ford rural core counties, growth patterns exhibited a range of activity since 2008 (Figure 5); in fact Live Oak and Gonzales counties were excluded from the figure because their growth and magnitudes dwarfed the other counties, distorting the figure. Of course, the economic outcomes of cities within a county can vary greatly. County level data are used in this analysis to facilitate data analysis across several states and to conform to national definitions of metropolitan, micropolitan, and rural areas. Case studies of the economic performance of individual communities within county groupings will be explored in related research.

Table 7. Average County Growth in Employment and Number of Establishments by Shale, 2008-2012.

Shale	Shale County Average Employment Growth	Shale Core Average Employment Growth	Shale County Average Establishment Growth	Shale Core Average Establishment Growth
Eagle Ford	8.1%	18.9%	1.9%	5.2%
Barnett	-4.2%	-3.7%	-4.3%	-0.9%
Permian Basin	4.5%	1.7%	0.0%	-1.9%
Cline	17.3% ¹	4.8%	7.4%	6.3%
Haynesville/ Bossier	-2.3%	-0.3%	0.6%	1.4%
Granite Wash	12.9%	n/a	-5.8%	n/a

¹If Kent county with 190% growth is excluded, average growth for the Cline shale is 2.7%.

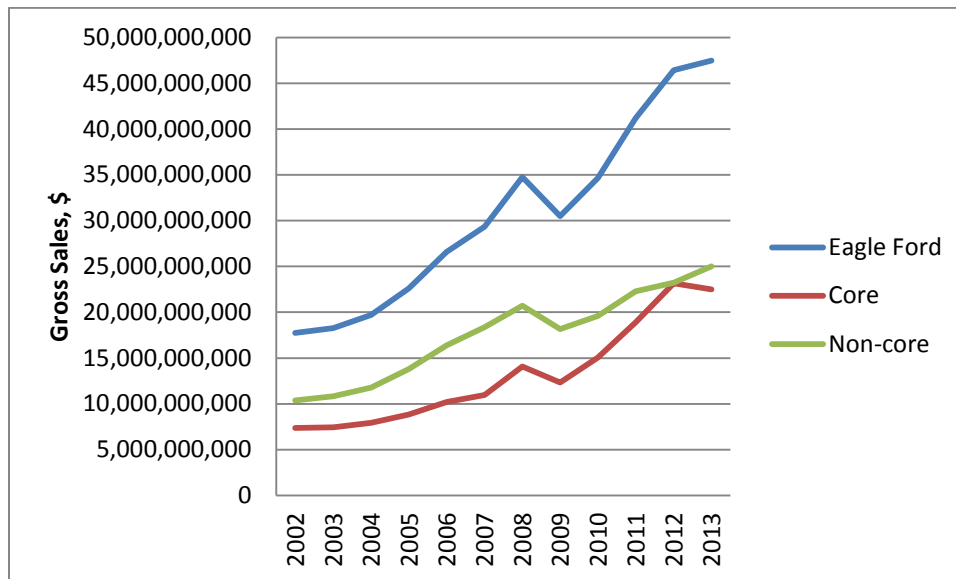


Figure 2. Eagle Ford gross sales by core/con-core status.

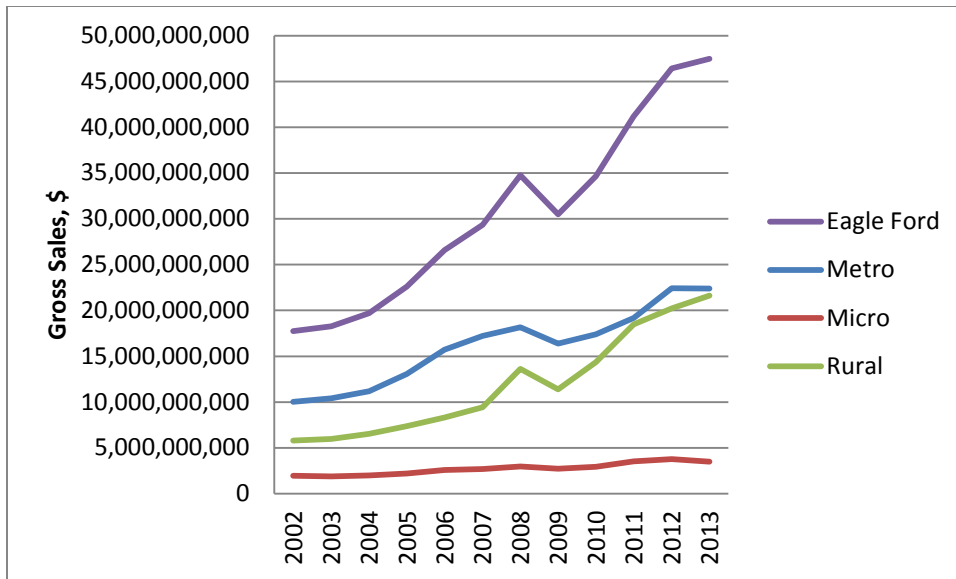


Figure 3. Eagle Ford gross sales by metro status.

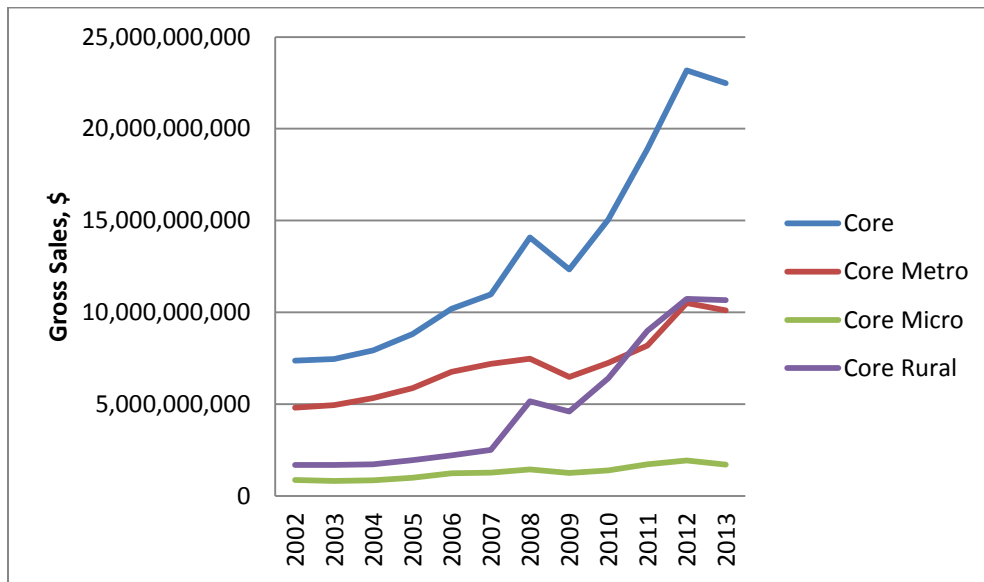


Figure 4. Gross sales by metro status of Eagle Ford core counties.

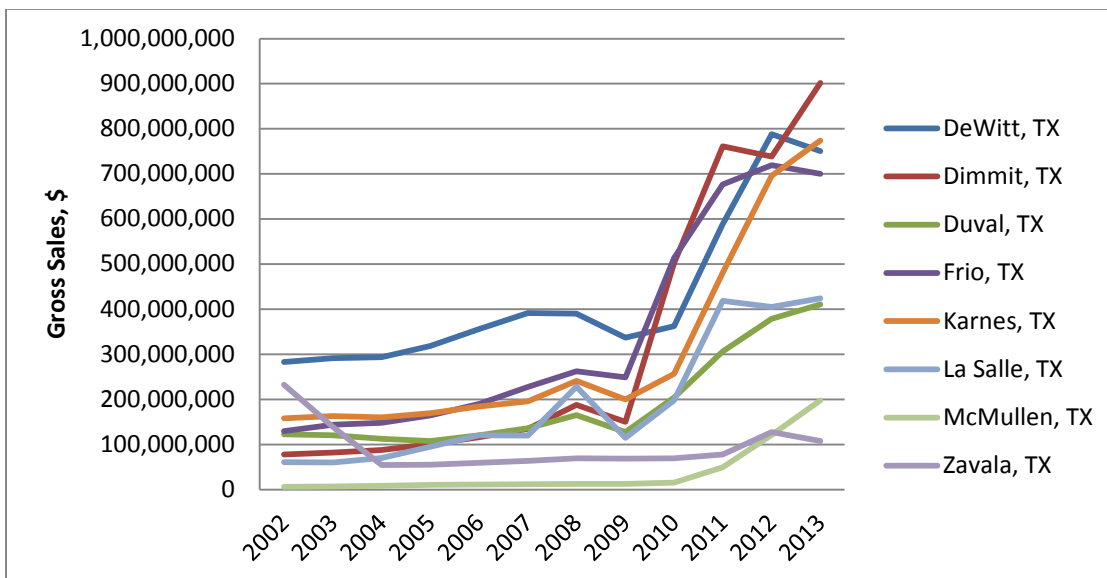


Figure 5. Gross sales for Eagle Ford rural core counties, except Live Oak and Gonzales.

3. Discussion

This paper considers some economic effects of oil and gas drilling on counties within six Texas shales, with additional focus on the Eagle Ford shale in South Texas. While the project is still in the very early stages, patterns of development are evident, at least for Texas and its Eagle Ford shale. Nascent results related to the project hypotheses are noted below.

1. Rural counties more proximate to a shale's epicenter receive a greater boost in both income and employment. Across Texas shales, core counties experienced greater growth in jobs and number of establishments. Core counties of the Eagle Ford also had higher growth in gross sales than did non-core counties, although core gross sales dropped in 2013.
2. Oil and gas exploration increases the number of businesses and the sales volume in rural counties during the drilling phase. Although causality is not explored in this paper, rural counties outperformed metropolitan and micropolitan counties in terms of employment and establishment growth rates across the six shales. Rural gross sales also grew faster than did sales in more urban counties. Sales growth in rural core counties was even larger. A future component of this research will consider gross sales and establishment effects on individual communities within rural counties. Community-level effects are expected to be even more variable than county effects.

The results regarding food and beverage establishments and lodging establishments were mixed for the Eagle Ford. Food needs seem to be served within the core counties, while accommodations may be located further from drilling sites. Shale and core counties experienced faster growth in the number of manufacturing establishments than did non-core or non-shale counties. At the same time, these shale and core counties also lost manufacturing employment at a greater rate, suggesting a migration of labor to energy services among persons with appropriate skills and qualifications.

3. Contrary to expectations, overall economic growth, during drilling and subsequent phases, did not favor regional trade centers providing higher-ordered goods and services. In fact, rural areas consistently outperformed micropolitan and metropolitan counties in growth in employment and establishments. Exploration of Eagle Ford data showed the rural areas also outperformed their more urban counterparts in terms of sales growth. While rural economies with smaller bases can demonstrate larger relative changes due to small denominators, the Eagle Ford data showed strong absolute growth

among rural counties. However, county level data ignores the different economic responses of cities within counties, a topic that will be explored through case studies in related research.

4. The Texas energy boom may not reverse the consolidation of rural economic activity into rural regional trade centers. However, Eagle Ford data do show some convergence of rural and micropolitan counties.

A good deal of work remains for this project. The study is currently being expanded to include six Great Plains states: Texas, Oklahoma, Kansas, Nebraska, South Dakota, and North Dakota. At the same time, case studies are underway for individual communities within the Eagle Ford and Cline shales. Additional case studies will be identified for the northern states. While differences in the economic effects shales were evident within Texas and are likely to be even more pronounced across state lines, the larger data set will provide a richer analysis. In addition to growth in employment, establishments, and sales, the project will consider expanded tax bases. The results of the study will help rural communities and counties to plan within the context of current changes and historic energy industry cycles and changes in the rural-urban relationship.

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