RESEARCH HIGHLIGHTS

The Economics of Time-Limited Development Options: The Case of Oil and Gas Leases

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Are oil and gas companies drilling wells that – based on fundamentals like prices, costs, and production – they wouldn't normally be drilling, but for the need to preserve their leased acreage? And if so, why do firms and landowners write leases with primary terms that wind up forcing firms to drill wells they'd prefer not to drill?

Context

The hydraulic fracturing revolution led the United States to become the top oil and natural gas producer in the world. The rights to extract this oil and gas are often controlled by private landowners, who contract with firms to extract and market the resources. These contracts take the form of mineral leases that grant the firm an option, but not an obligation, to drill wells and extract the hydrocarbons. In exchange, the mineral owner gets to share the spoils from exploiting the resource. Some of the owner's payment comes up-front, via a "bonus" payment when the lease is signed. On top of that, the owner will receive royalties on the extracted oil and gas. These royalties are often significant, since royalty rates for shale oil and gas are often as high as 25 percent.

On top of the bonus and royalty, U.S. oil and gas leases ubiquitously include what is known as a primary term. The primary term specifies a period of time (typically three to five years in shale plays) that the firm has to drill at least one well and commence production. If it does so, the lease is then ``held by production'' and enters a secondary term that lasts until the firm ceases production. During the secondary term, the firm may also drill additional wells on the parcel to increase its overall production rate. On the other hand, if the firm does not commence production by the end of the primary term, the lease terminates, and the mineral owner is then free to sign a new contract with another firm or re-contract with the original firm.

This lease structure gives the firm a strong incentive to drill at least one well before the primary term expires. This incentive has received considerable attention within the industry, with numerous reports of firms drilling unprofitable wells for the sake of holding their lease acreage.

For instance, the San Antonio Express News reported in 2012 that "many companies . . . are drilling quickly simply to meet the terms of their contract and keep their leases---not because they want to drill gas wells now''.[1]

Methods

To study whether primary term expirations are influencing drilling decisions, the authors gather data from the Haynesville Shale in northwest Louisiana. This natural gas shale play experienced a boom in leasing in early 2008, followed several years later by a surge in drilling and hydrofracking. The authors first match leases to Haynesville pooling units, which are government-recognized collections of leases such that, if a well is drilled anywhere in the unit, production from that well can hold all leases in the unit. The authors then match wells to units, allowing them to compare when each well was drilled versus when the underlying leases expire.

To study landowners' incentives for including primary terms in their leases, the authors develop both an analytic and a computational model of firms' drilling decisions and how they are influenced by their leases' royalty and primary term clauses. The royalty effectively acts as a tax on oil and gas revenue, leading firms to delay drilling. The primary term, however, can accelerate drilling because drilling prior to expiration allows the firm to continue the lease without paying an extension bonus. The model incorporates a key asymmetry between landowners and firms: firms are much better informed about expected oil and gas production than are landowners, since landowners typically lack expertise in geology and petroleum engineering. Landowners then face the problem of setting a bonus, royalty, and primary term in a way that maximizes the expected present value of their revenues, even though they are unsure of how productive the firms will be. ▪

**The analysis and conclusions expressed herein are solely those of the authors and do not represent the views of the U.S. Congressional Budget Office.*

1 Jennifer Hiller, "Eagle Ford Lease Deadlines Driving Drilling", San Antonio Express-News, 25 Nov., 2012.

Key Findings

- The authors' empirical analysis shows that there is substantial bunching of Haynesville drilling in the months just prior to lease expiration. That is, the probability any given pooling unit is drilled is sharply higher just before the unit's first lease expiration than it is at any other time. In cases where the first expiring lease includes a built-in two-year extension clause, the bunching occurs just prior to the end of the extension rather than at the end of the primary term itself.

- Many leases -- especially those in less productive areas of the Haynesville -- are characterized by having only a single well that was drilled just before lease expiration, suggesting that drilling in these areas was primarily motivated by holding acreage for future wells rather than by immediate profits.

- Despite the ex-post inefficient bunching of drilling that is induced by primary terms, the model reveals that including a primary term in a lease can actually increase both the landowner's expected revenue and the total (landowner + firm) expected surplus from a lease. The primary term is beneficial because it counteracts the delay incentives generated by the royalty, which would otherwise cause firms to drill too late. Ultimately, the royalty and primary term serve as complements to one another. The royalty helps the landowner recover the value of the resource rather than leave that value with the firm, and the primary term mitigates the incentive problems caused by the royalty.

- Primary terms are most beneficial to landowners when pooling units can accommodate at most a single well. In contrast, when drilling one well allows the firm to hold a unit that is large enough to drill several follow-up wells in the future (as is the case in the Louisiana Haynesville), primary terms do not substantially improve landowners' take. A key problem is that primary terms only counteract the royalty-induced delay for the first well, but not future wells. This result may help explain why mineral owners in Louisiana have litigated over Louisiana's unitization policies and why mineral owners in other states are adopting lease clauses that prevent firms from holding large amounts of acreage with a single well.

Drilling Activity in the Months Around Lease Expiration

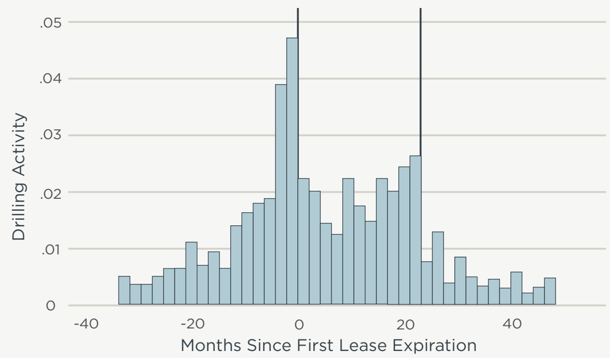

Figure shows a histogram of the frequency with which the first Haynesville well is drilled in a unit on a given date, relative to the expiration date of the first lease within the unit to expire. Vertical lines are drawn at the date of first lease expiration and two years after first lease expiration (two years is the standard length of built-in extensions for leases that include them).

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