

Title: “Asymmetric Information, Royalty Distortions, and Drilling Deadlines: Understanding Oil and Gas Lease Contracts”

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Abstract:

During the last decade, hydraulic fracturing and horizontal drilling have driven a considerable expansion in U.S. oil and natural gas exploration and production. The rights to extract this oil and gas are often controlled by private landowners, who contract with firms to extract and market the resources. The incentives created by these contracts, or lease agreements, could have a substantial impact on the productive efficiency of this large and quickly changing industry.

This paper estimates the impact and explains the presence of a pervasive and distortionary feature of private mineral leases: the primary term. The primary term is the period of time granted to the firm to exercise its option to drill a well on the lease. This term is typically three to five years in the private land setting. If the firm does not drill and produce oil or gas by the end of the primary term, it loses the lease; the mineral rights owner is then free to sign a new contract with another firm. If, however, the firm does commence production, the lease enters a “secondary term”, which lasts until the firm ceases oil and gas production. A lease in its secondary term is considered “held by production” (HBP). In exchange for the option to drill, the firm pays the lessor an up-front cash “bonus” when the lease is signed, along with a royalty stream on all oil and gas that is extracted. This royalty is a percentage of sales revenue, not profits, which drives a wedge between lessor and firm incentives.

If the lease is set to expire at a sufficiently suboptimal time to drill, the firm has an incentive to negotiate a lease extension rather than drill immediately. However, firms are known to drill highly unprofitable wells solely to hold their leases. For instance, when natural gas prices fell sharply in 2010-2011, firms did not immediately reduce the rate at which they drilled natural gas wells. Numerous anecdotes and corporate statements surfaced regarding widespread drilling plans that were undertaken solely to prevent lease expiration. In recent months, producers have responded similarly to plunging oil prices, drilling costly wells in South Texas and North Dakota despite unfavorable market conditions.

This paper seeks to explain these seemingly inefficient contracting features and drilling outcomes. First, we estimate the share of recent oil and gas drilling that has been driven by the firm's desire to hold its leases. We link private mineral lease agreements from the Haynesville Shale in Louisiana and the Eagle Ford Shale in Texas to drilling decisions. We find preliminary evidence that the timing of well drilling is indeed distorted by lease expiration dates. Second, we outline an end-of-lease bargaining model that generates unprofitable and inefficient well drilling due to HBP incentives. The wedge between royalties and profits

can undermine extension agreements when the owner cannot distinguish between similar offers that are driven by high costs versus those driven by low expected revenues.

Given these distortions, we explore why these costly deadlines are included in lease contracts to begin with; the results generate new insights into contract design in the presence of asymmetric information. The lessor, who pays no share of the costs, wants drilling to take place as soon as possible. The firm, however, must pay a substantial irreversible drilling cost and therefore views the right to drill as a real option. Moreover, the firm's expected revenue from production is diminished by the royalty. Thus, the firm will want to delay drilling until its expected profits are significantly greater than zero (depending on the volatility of output prices), and indeed beyond the socially optimal drilling time (depending on the size of the royalty). A lease expiration date can be viewed as a coarse response to this misalignment of incentives, in that it pulls the firm's expected drilling time forward on average. In ongoing work, we seek to quantify the effects of royalties and primary terms (and alternative contractual forms) by developing a structural model of leasing, drilling, and end-of-lease bargaining.