OVERVIEW

Natural gas flaring is a urgent problem for the Permian Basin. When companies flare gas, they release significant volumes of CO2 and local air pollutants. Royalty owners and state tax authorities miss out on potential revenues since the gas is never monetized. Rystad Energy estimates that flaring in the Permian will reach 600 million cubic feet per day in mid 2019 (Collins 2018), and some analyses based on satellite data find that actual flaring volumes could be twice as big (Collins 2018; Leyden 2019). To date, studies of flaring in the Permian have been done at an aggregate level (Palacios and Leyden 2018, Gilbert and Roberts (2019)). In this study, we use highly detailed data on individual wells, their production, and their wellhead prices to provide further detail on how flaring is taking place over space, between wells, between operators, and within a well.

First, we examine spatial variation in flaring, production, and wellhead prices. We test whether flaring is uniformly spread throughout the Permian or concentrated within different regions of the play. This provides descriptive evidence about whether constraints on localized infrastructure contribute to flaring, in addition to constraints linking Permian Basin hubs to demand centers.

Second, we examine how flaring takes place within a well’s lifetime. If flaring is a discrete, all-or-nothing decision, then gathering infrastructure simply not have been built. However, if flared volumes represent only part of natural gas production, then wells may simply be insufficient to handle the quantity of gas being produced. In this case, there are two additional possibilities: constraints may be more widespread and intermittent, or they may occur at the beginning of a well’s life. If it is the latter, then firms may simply be recognizing that the capacity required to handle initial volumes of gas will go underutilized since production declines rapidly.

Third, we examine which operators are flaring. Anecdotal evidence suggests that smaller firms are more likely to flare gas compared to large firms (Elliott 2019). One economic explanation is that smaller firms have higher costs of capital, causing them to accelerate initial production. Accelerated production may increase the share of natural gas produced, hence decreasing reservoir pressure and lowering lifetime oil recovery. In contrast, larger firms may choke back production, lowering the share of gas recovered and the need to flare. Another economic explanation for flaring centers on the relative bargaining strength of operators on one side and gathering and processing infrastructure on the other. Large operators may be able to negotiate lower prices for gathering and transportation services, increasing the value of gas at the wellhead and decreasing the likelihood of flaring.

Fourth, we gather preliminary descriptive evidence on whether processing facilities are able to exploit localized market power to increase the price of processing services, thereby lowering the value of gas at the wellhead and incentivizing operators to flare additional volumes. To do this, we count the number of processing facilities that each well is connected to, as well as the ownership of the processing facilities. Conditional on the number of processing facilities a well is connected to, being connected to multiple processing firms compared to one should increase competition, decrease processing fees, and lead to reduced flaring volumes.

METHODS

Statistical analysis of spatio-temporal data on individual wells in the Permian, including drilling, production, flaring

RESULTS

Our initial analysis of well-specific average wellhead prices from tax data shows that the value of natural gas at the wellhead varies tremendously across wells in the Permian. This suggests that there are significant intra-basin constraints that may drive which wells flare, in addition to the regional constraints on pipelines that tend to be
discussed in the news. We are currently in the process of analyzing datasets from Drillinginfo and the Texas Railroad Commission and look forward to presenting additional results in November.

Conclusions

Flaring in the Permian Basin is a significant environmental issue, and there is an urgent policy need for rigorous economic and statistical analysis of the problem. While the costs of capturing all flared gas may not be economically justifiable, there could be economic inefficiencies like market power or imperfect capital markets that drive flaring. If this is the case, then policy remedies may be able to enhance economic efficiency and environmental quality. The statistical analysis in this paper is a key first step towards understanding and resolving this issue.

References


