

Natural Gas and U.S. Economic Activity

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Relative to crude oil, comparatively little is known about the impact of the natural gas market on U.S. economic performance. This has become an important issue given recent dynamics in natural gas prices and production. Optimists continually tout the realized and potential economic benefits of the “shale-gas revolution,” while many others remain unconvinced about its importance or magnitude. Implicit in either view is an assumption about the past and future macroeconomic impacts of the U.S. natural gas market, but empirical work on which to base this assumption is relatively sparse.

In this paper we evaluate the importance of the natural gas industry on U.S. macroeconomic performance. Our primary goal is to provide an empirical basis on which to judge the possible impacts of recent developments. We further highlight the channels through which the natural gas market interacts with the U.S. economy, illustrate how this relationship may be changing over time, and consider possible explanations.

While there are many studies that use macroeconomic models to evaluate the economic importance of natural gas, recent empirical work on the macroeconomic impacts of the U.S. natural gas market is limited. The lack of recent empirical work on the relationship between the natural gas market and the U.S. economy is surprising given that natural gas accounts for nearly 25 percent of U.S. energy consumption, making it the second-largest source of energy behind

petroleum. Furthermore, consumer expenditures on natural gas have averaged about one percent of personal consumption expenditures (PCE) since 1987, and natural gas is used proportionately between the industrial, commercial and residential, and electric power sectors.

There are various ways in which the natural gas market can impact U.S. economic activity. Generally, they can be summarized as working initially through either the supply or demand sides of the economy. The most straightforward supply impact is that changes in the production of natural gas vary output in the oil and gas extraction sector, as well as associated industries. Natural gas also influences economic activity on the supply-side of the economy through the investment of firms. The application of hydraulic fracturing and horizontal drilling has made a very large resource base available. This potential supply has led to substantial investment in the oil and gas extraction and mining support sectors, as well as other related industries. The expectation that this resource base can support lower natural gas prices for a sustained period is also leading to investment by firms outside of the oil and gas industry which rely on natural gas as an input.

Lower natural gas prices, irrespective of their cause, lower input costs for firms. These can be passed on to consumers by allowing firms to supply the same amount of goods and services at lower prices. Firms may also realize higher profits, which can lead to additional hiring, capital investment, higher dividends, or saving. Each has a follow-on impact on the economy-wide demand for goods and services. Lower prices also directly influence demand through consumers. They can raise disposable income, lower precautionary savings (or raise it in the case of a price rise), or cause consumers to change their plans for the purchases of durable goods.

With these various channels in mind, we construct a model to assess the impact of the natural gas market on U.S. economic activity. The model and related sensitivity analysis lead to two primary conclusions. The first is that natural gas supply changes are the primary means through which the U.S. natural gas market impacts domestic economic activity. Variations in natural gas demand for heating and power or other factors, while important for the natural gas price, do not impact economic activity in a substantial way. Our second conclusion is that the shale gas revolution has in fact changed the relationship between natural gas supply and U.S. economic activity. The responses of industrial production to the same increase in natural gas supply are larger after 2008 than before, although the size of this change remains unclear at this point.

Both time and further research are required to know if the changes reflected in the model after 2008 are temporary or permanent. It is possible that if the changes are driven by higher investment they will be temporary. This is because the benefits of investment are generally considered to decline as additional projects are undertaken, reducing the incentives for further expenditures. If, however, greater natural gas production leads to higher production per worker in the economy, possibly because it advances technological progress, then the changes after 2008 could be permanent.