Oil Price Uncertainty and M&A Activity

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The question on the impact of uncertainty on firms' investment activitiesis still unresolved, andthe current state of literature offers heterogeneous predictions both on the direction and on the magnitude of the relationship. In general, uncertainty impacts firm investments and, ultimately, M&A activity via the real options and risk management channels. The first strand of literature relates to the time value of the option. The value of waiting to exercise the option increases with uncertainty and leads to the deferral of investments until information becomes more complete. The second strand of the real options literature relates to compound options and opines that conducting investments not only sacrifices the value of waiting options but also results in the acquisition of future investment options. To contribute to this ongoing debate, we examine the impact of uncertainty on firms'investment activities, more specifically, mergers and acquisitions (M&A), using the oil and gas sector as the testing ground.

We investigate the impact of oil price uncertainty on M&A in the oil and gas sector. The main advantage of our approach is that the market prices of inputs and outputs are fully observable. Furthermore, the oil and gas sector is economically interesting to studyas the industry provides the foundation for investment decision making under the conditions of risk and uncertainty. Crude oil represents an output in upstream operations (producers)andaninputindownstream operations (refiners) and observed uncertainty in oil prices should provide a clear direction on the magnitude and direction of future investments. To establish the relationship between the uncertainty and investment we utilize on forward-looking measureofproduct marketuncertainty, namelythe implied crude oil volatility.

We conduct our analysis on a sample of 4,323 merger and acquisitions in the U.S. oil and gassector between 1994 and 2018. We report a negative relationship between product market uncertainty and M&A activity. Ourresults hold up after the inclusion of other widely-used uncertainty measures, both at the industry and firm-level.

Evidence of a Homeowner-Renter Gap for Electric Appliances

Lucas W. Davis[e]

This paper provides the first empirical analysis of the homeowner-renter gap for electric appliances. Using U.S. nationally representative data, the analysis shows that renters are signifi-

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cantly more likely than homeowners to have electric heat, electric hot water heating, an electric stove, and an electric dryer. The biggest gap is for electric heating. Whereas 49% of U.S. renters heat their homes primarily with electricity, only 29% of U.S. homeowners do the same.

The research documents a considerable homeowner-renter gap with renters between 9 and 20 percentage points more likely to have electric appliances. The gap is statistically significant at the 1% level for all four appliance categories, prevalent across regions, and persists after controlling for the type, size, and age of the home, as well as for climate and household characteristics.

This homeowner-renter gap likely arises from the same split incentives that lead to underinvestment in energy-efficiency. Researchers have long bemoaned the "landlord-tenant problem", pointing out that landlords have too little incentive to invest in energy-efficiency when their tenants pay the energy bills (Blumstein et al., 1980; Jaffe and Stavins, 1994; Gillingham et al., 2009; Allcott and Greenstone, 2012; Gillingham and Palmer, 2014; Gerarden et al., 2017).

By the same argument, landlords tend to prefer electric appliances because they are less capital-intensive. Electric resistance heating is cheaper to install than a natural gas furnace, and electric dryers and electric hot water heaters are cheaper to install than natural gas. Although in theory, the higher capital cost of natural gas appliances could be passed on in the form of higher rents, it can be difficult for landlords to effectively convey this type of information (Myers, 2020).

These findings are relevant for an emerging set of policies aimed at reducing carbon emissions through building electrification. In California, more than 40 cities have passed measures prohibiting or restricting natural gas in new homes, and policymakers are retooling state building codes to favor all-electric homes. In addition, the Biden administration announced in May 2021 its support for building performance standards and other initiatives aimed at building electrification.

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Futures prices are useful predictors of the spot price of crude oil

Reinhard Ellwanger[a] *and Stephen Snudden*[b]

Given the importance of crude oil in policy models, for making investment decisions, and for purchasing oil-intensive goods, there is wide interest in accurately predicting its prices. An established finding in the literature is that oil futures are not particularly useful for forecasting the spot price of crude oil. We revisit this finding by proposing a different way to construct futures-based forecasts and by extending the sample period, allowing us to also evaluate the effectiveness of multi-year-ahead forecasts. Contrary to the conventional wisdom, we show that futures forecasts significantly improve upon the accuracy of monthly no-change forecasts. This occurs for two reasons.

First, we show that futures curves constructed with end-of-month futures prices rather than monthly average futures prices have always had substantive predictive power of average spot prices at short horizons. Incorporating information from end-of-month futures prices improves the mean-squared prediction error and the directional accuracy of the no-change forecast for average spot prices by 40 percent at the one-month horizon. The improvements remain statistically significant for forecasts up to 12 months ahead. The forecast gains are remarkably robust and independent of the sample period.

Second, the predictive content of crude oil futures prices at longer forecast horizons has improved since the mid-2000s. We show that, whenever the end of the forecast evaluation period is extended beyond 2014, futures-based forecasts are found to be significantly more accurate predictors than no-change forecasts. The result holds for forecasts from one year to five years ahead. It is particularly strong for forecast horizons beyond two years, which were previously difficult to evaluate due to the illiquidity of longer-dated futures contracts. The enhanced effectiveness of the futures-based forecasts coincides with an increase in trading activity in oil futures markets over the same period.

The findings hold for both Brent and WTI crude oil, and can also be applied to the U.S. refiners' acquisition cost of crude oil. Moreover, the futures-based forecasts work well for both average nominal and real prices.

The results show that a decade's worth of additional data, as well as a simple modification to the originally proposed implementation of futures-based forecasts, change the evidence on the usefulness of oil futures as predictors of spot prices. Given their transparency and ease of implementation, futures-based forecasts provide a natural point of reference to evaluate the merit of alternative forecasts of the price of crude oil.

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The Distribution of Energy Efficiency and Regional Inequality

Puja Singhal[a] *and Andrew Hobbs*[b]

Energy efficiency in the building sector remains an important cornerstone of energy and climate policy in Germany. In order to maximize the economic benefits of energy efficiency, policies should prioritize investments that lead to cost-effective energy savings. At the same time, if the allocation of savings from energy efficiency contributes to increasing socioeconomic inequality, then overlooking the overall distribution of policy outcomes may make it more difficult to achieve long-run policy targets (e.g., climate neutrality by 2045). In order to target cost-effective, yet socially optimal investments, policy makers need a reliable indicator that measures improvements in the energy performance of the existing building stock, along with information on its socioeconomic and regional distribution. We contribute to this goal.

This paper uses unique billing data (3 million yearly heating bills from 2008 to 2018) on actual energy consumption to understand the heat energy requirements of the existing multi-apartment building stock in Germany. We estimate the response of heat energy demand to changes in the total annual sum of heating degree days as an approximate measure of building-level energy efficiency, and describe its distribution – giving particular attention to regional disparities.

We employ both fixed effects regressions and causal forests to study heterogeneity in the energy efficiency standards of buildings. Both methodologies lead us to the same qualitative conclusions. The distribution of energy efficient buildings is particularly inequitable in the West of Germany: higher efficiency buildings are concentrated in richer areas. The distribution of energy efficiency is more egalitarian in the East of Germany: zip codes associated with the highest unemployment rates, benefit from both the use of less carbon-intensive heating fuel type and an energy-efficient building stock, owing to renovation efforts that took place post-reunification in East Germany between 1990 and 2001. We confirm this in the data observed on Energy Performance Certificates (EPC) issued from 2014 to 2019: compared to the West, a significantly higher share of old buildings in the East, built before 1995 (“Altbau”), were certified to meet the energy standards set out in the national thermal insulation ordinance from 1995 (“Wärmeschutzverordnung” or WSVO). Finally, our results show that the current geographic distribution of energy efficiency outcomes in Germany is well-explained by regional differences in the intensity of the winter heating season.

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Does Income Affect Climbing the Energy Ladder? A New Utility-Based Approach for Measuring Energy Poverty

Luan Thanh Nguyen,[a] Shyama Ratnasiri,[b] and Liam Wagner[c]

Current approaches to energy poverty measurement invoke some strong and sometimes implausible assumptions. In most research and policy works, energy poverty is virtually synonymous with income poverty. In addition, they expect households to progress through the energy ladder as income increases to move away from polluted traditional fuels. However, data show that even in well-off households, the energy mix could consist of both carbon-intensive traditional biomass and clean, modern energy. Therefore, the current energy poverty measures, mainly based on affordability and accessibility to modern energy, hold limited relevancy, especially in countries with a varied residential energy mix. Consequently, energy poverty alleviation programs may be mistargeted and lose effectiveness.

In this paper, we developed a new method to evaluate energy poverty based on the disutility that occurs if households use polluted energy, e.g. solid biomass, or have to give up other demands to afford clean energy, e.g. electricity. We proposed an extension of the Exact Affine Stone Index (EASI) demand system to quantify implied disutility associated with consumer choices when facing different energy emissions and energy prices, called the EASI-E demand system. The results from our EASI-E demand system can capture the impact of emissions or potential health risks and the tradeoffs between energy and other demands. In addition, the EASI-E demand system does not require pre-setting the mandatory conditions of energy poverty in terms of income thresholds or fuel types.

In an illustration, we apply our model to three waves (2012, 2014, and 2016) of the Vietnam Household Living Standards Survey data. According to the empirical results, the number of households living in energy poverty in Vietnam remained around 44% from 2012 to 2016. The findings also show that household income may not encourage households to climb the energy ladder as many families in the highest income level continue to consume conventional fuels. In addition, using polluted energy does not necessarily link to energy poverty. However, homes at different income levels could be in energy poverty if they have the disutility, either because of excessive use of high emission energies or compromise other demands to consume clean energy.

From these findings, we suggest that the definition of energy poverty should not be tied to the income-poor but be expanded, where households at any income level could be in energy poverty. The key policy insights from the findings are (i) those low-income and middle-income households in energy poverty could receive more support and incentives, and (ii) higher-income families who consume dirty fuels should be encouraged to change their consumption habits in favor of cleaner and more healthy sources.

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Decentralised Cross-Border Interconnection

Claude Crampes[a] *and Nils-Henrik M. von der Fehr*[b]

Reaping the full benefits from cross-border interconnection typically requires reinforcement of national networks. When the relevant parts of the networks are complements, a lack of coordination between national transmission system operators results in investment below optimal levels in both interconnectors and national infrastructure. A subsidy to financially sustain interconnector building is not sufficient to restore optimality; indeed, even when possible, such subsidisation may have to be restrained so as not to encourage cross-border capacities that will not be fully utilised due to lack of investment in national systems.

Common Stock Returns around Farmout Announcements in the Oil and Gas Industry

Luiz Fernando Distadio,[c] *Andrew Ferguson,*[d] *and Peter Lam*[e]

A farmout occurs where a a permit owner or farmor exchanges partial exploration rights or working interests for benefits in the form of exploration activity commitments to be undertaken by the incoming party (farminee). Not surprisingly, farmouts are very popular with smaller, resource constrained oil and gas industry participants who own exploration permits that are expensive or difficult to develop. One of the main factors motivating the use of these cooperative arrangements is the increasing presence of small oil and gas exploration and developement firms, a sign of vibrant competition in the upstream oil and gas sector. Industry participants suggest that "without them (farmouts), some oil fields would simply remain undeveloped due to the high risks facing any single operator" (OilNow 2020). Currently, there is only limited descriptive evidence on these important contractual arrangements.

Applying the widely used event study method, we investigate three theories and provide empirical evidence in relation to stock price reactions to farmout announcements. First, resource pooling theory argues that participants conduct alliances to combine complementary resources, which in the oil and gas setting can be either financial or technical in nature. Second, certification theory assumes that characteristics of the farminee conveys quality signals on the prospect or the farmor. Lastly, we test real options theory, which considers investment projects as real options due to their sequential nature. Using a large sample of Australian farmouts, we find that farmout announcements generate a positive cumulative average abnormal return of 3.60% for farmors and 1.90% for farminees over a 3-day event window. Cross-sectional analysis of farmors' event returns provides results consistent with the resource pooling hypotheses. We also find that farmors' announcement returns are sensitive to the underlying oil price volatility, consistent with the real options view of farmout arrangements.

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Reaching New Lows? The Pandemic's Consequences for Electricity Markets

David Benatia[a] *and Samuel Gingras*[b]

The COVID-19 crisis has disrupted electricity systems worldwide. This article disentangles the effects of the demand reductions, fuel price devaluation, and increased forecast errors on New York's day-ahead and real-time markets by combining machine learning and structural econometrics. From March 2020 to February 2021, statewide demand has decreased by 4.6 TWh (-3%) including 4 TWh (-8%) for New York City alone, and the day-ahead market has depreciated by $250 million (-6%). The real-time market has, however, appreciated by $15 million (+23%) because of abnormally large forecast errors which significantly undermined system efficiency.

Oil price shocks and current account imbalances within a currency union

Timo Baas[c] *and Ansgar Belke*[d]

Global current-account imbalances have been a vital issue in the international policy debate for over two decades. The IMF and the G7 countries repeatedly pointed out the risks of large imbalances to the world economy's stability. These seem to have materialized in the government debt crisis that hit the European Union, especially the Eurozone, after 2009 and may reemerge with the Covid health crisis after 2020 and the energy crisis after 2022. Imbalances between member states in the Eurozone seem even more worrying, as an adjustment of exchange rates that drives balances back to equilibrium is not available. Instead, real prices and wages have to adjust. The adjustment of wages, however, depends on labor market institutions. As these institutions differ among member states, even symmetric shocks, such as, for instance, oil price shocks, can have asymmetric consequences. In this paper, we focus on oil price shocks, which seem to be among the leading sources of macroeconomic fluctuations.

Essentially, we build a two-country DSGE model of a currency union and show the transmission of oil price shocks on the current account depending on two institutions, the monetary authority, and labor markets. With this approach, we get three major insights:

First, imperfect labor markets decrease the speed of adjustment to a common shock so that it takes more than ten quarters for half of the shock's impact on tradable production and five to eight quarters for half of the shock's impact on employment absorbed. As a result, the foreign country's foreign debt, which we use to measure imbalances, may increase for up to 10 years after the shock.

Second, targeting core inflation in the wake of oil price shocks is an inferior strategy of a currency union's central bank, decreasing the production of tradables twofold and shrinking

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employment by an additional one-third. However, the foreign country's foreign debt fluctuates one-fifth less, reducing current account imbalances within the currency union, which might benefit an asymmetric monetary union.

Third, labor market institutions can reduce the burden of real adjustments. The more flexible labor markets are, the fewer costs a core inflation monetary policy target imposes. For example, reducing firing and vacancy posting costs, which were the subject of the labor market reforms in a variety of European countries at the end of the 1990s and the beginning of the 2000s, reduces the impact of a positive oil price shock on production. Tradable production fluctuates less by one-sixth, employment by two-thirds, and foreign debt of the foreign country, indicating the sum of current account imbalances, by one-fourth.

According to these findings, oil price shocks could widen current account imbalances in the Eurozone. However, an increase in the flexibility of labor markets may reduce current account imbalances and improve the currency union's internal shock absorption mechanism, but only in small amounts making monetary policy reactions still desirable. In such a setting, the central bank can target either CPI inflation or core CPI inflation, an inflation rate without energy prices. A CPI inflation target is superior in terms of stability of prices, production, and employment but comes at the cost of higher current account imbalances. Instead, a core CPI target reduces the impact of the shock on the current account and debt but leaves higher fluctuations for the other three macroeconomic variables. More flexible labor markets may mitigate these variabilities. Therefore, if reducing internal imbalances is a policy target of the currency union, labor market reforms that increase flexibility should be imposed.

Cross-border effects between the Spanish and French electricity markets: Asymmetric dynamics and benefits in the light of European market integration

Ignacio Mas Urquijo[a] *and Florentina Paraschiv*[bc]

In 2014, Spain was the European country with the highest interconnection deficit in the EU, with additional 6.8 GW required (mostly with France) to meet the 2020 EU interconnection goals. After more than 30 years without new interconnectors commissioned between Spain and France, a key step towards market integration to Spain was the commissioning of a new underground interconnector passing the Pyrenees, commissioned in October 2015. In this paper, we analyze cross-border effects between the Spanish and French spot electricity markets under different market integration regimes. We employ a number of cointegration tests, as well as fundamental modeling of hourly spot electricity prices.

We found that benefits of grid integration are asymmetric, whereby especially users in import-dependent Spain take advantage of the development of the cross-border infrastructure with France. Driver of the low import prices is not only the historically nuclear-based energy production in France, but also the undergoing energy transition in the country. In addition, the substitution between domestic fuel-based units and imported green electricity allows Spain to further decarbon-

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ize its energy mix and increase security of supply at EU level. The expansion of the cross-border grid until 2030 will be key for a successful phasing out of remaining coal-based units, and to reduce the dependency of EU countries as Spain on imported fossil fuels.

Although European initiatives rely on the principle of solidarity of the EU, upcoming projects should be financed considering the asymmetric benefits of grid integration and especially the apparently limited interest from net exporting countries like France, which has a relatively low degree of market liberalization as compared to other European peers. In addition, the integration with a country with a high share of variable RE, as is the case for Spain, results in an undesired increase in volatility in the French electricity market. The financial support for involved participants should be granted inversely in relation to the economic savings perceived from the infrastructure project. Such support scheme design could efficiently align incentives of participants and lead to a faster and successful achievement of the common interconnection goals. Our results also raise the question of whether the development of RE in net exporting countries should at least in part be financed by import-dependent neighbors or even with EU funds. Our empirical evidence is relevant not only to EU policy makers, but also to Spanish and French energy players. Results allow to derive conclusions on the promotion of renewable energies and on the design of their support schemes.

Finally, our results highlight the reliance of countries with a high share of variable RE generation like Spain on the backup provided by countries with a high share of dispatchable (nuclear) generation like France, a finding which is relevant in the context of the new EU Taxonomy, which among others recognizes nuclear generation as a necessary transitional technologies to achieve climate neutrality by 2050.

Turkish Straits and an Important Oil Price Benchmark: Urals

Duygu Ekin Ayasli,[a] Yeliz Yalcin,[b] Serkan Sahin,[c] and M. Hakan Berument[d]

Nearly 45,000 vessels transit the Turkish Straits, namely İstanbul and Çanakkale, each year, and transmit around 4% of the global crude oil and petroleum products trade. Being narrower than the straits of Hormuz and Suez, the Turkish Straits are subject to strong currents, sharp turns and variable weather conditions. Thus, the straits are one of the most congested straits in the world. In busy periods, the combined waiting time for tankers carrying crude oil and petroleum products to pass İstanbul and Çanakkale straits may be as long as 54 days. Delay due to congestions on the Turkish Straits is important for Mediterranean refineries as well as for the global oil and petroleum products flow. As of 2020, around 15% of total Russian crude oil exports sailed via Turkish straits annually. Russian Urals crude oil accounted for a 26% share of all crude oils passing the Turkish straits, second only to Kazakhstan's CPC crude with a share of around 67%.

Following the increase of light crude oil supply globally, due to the increased amount of US shale oil activity, and the increased demand of middle distillate products such as gas oils and kerosene, the importance of medium crude oils including Russian Urals crude oil has increased. Wlazlowski, Hagstromer and Giulietti (2011) note that even if Dubai blend, which is often taken

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as a benchmark, statistical evidences suggests that "*Russian Urals* (Mediterranean landed price) […]*is, in spite of little public and media attention, third global price setter.*" After WTI and Brent, the "*Mediterranean Russian Urals is a very clear price setter in the* [middle distillates] *segment*." 66.22% of total Urals crude supplied in the Mediterranean market is shipped from the Black Sea Port of Novorossiysk passing through the Turkish Straits. The empirical evidence provided in this paper suggests that as the waiting time in the İstanbul and Çanakkale Straits increases, then Urals price increases can fluctuate as much as 5.05% and 3.09%, respectively.

Thus, higher landed oil prices due to higher transportation cost as well as potential disruptions in supply due to Turkish straits congestions make the Urals crude oil less reliable to use as a crude oil benchmark. Russia would need to be open to potential scenarios to solve the increasing congestion in Turkish straits, such as the ongoing Kanal İstanbul or Samsun-Ceyhan pipeline projects that would theoretically shorten voyage times of oil between Black Sea and Mediterranean ports, as well as decreasing congestion times.