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COMMENTS ON THE MULDER/NERA (MN) REPORTS

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We will refer to the Mulder/Nera reports as MN throughout in our comments. Van Wijnbergen and van der Ploeg are international experts in international macroeconomics, public economics, and the economics of climate and exhaustible natural resources. They both have a wealth of policy making experience for and as part of the Dutch government and policy advice experiences in various supranational organisations and a wide variety of resource-rich economies. One of them has extensive experience as advisor/shareholder of Aurora Energy Research.

Our first reaction to MN is that they inadvertently display a remarkable ignorance on the structure of oil and gas markets and a regrettable lack of understanding of how prices are formed in markets.

I. MN ignore the dynamics of oil and gas markets

The main problem with MN is that they ignore the essential dynamics of oil and gas markets. But oil and gas markets are not like the market for oranges or sprouts: in oil and gas markets there is no perfect substitution between identical goods. The perfect competition assumption in MR is also debatable because there is substantial market power in oil and gas markets.

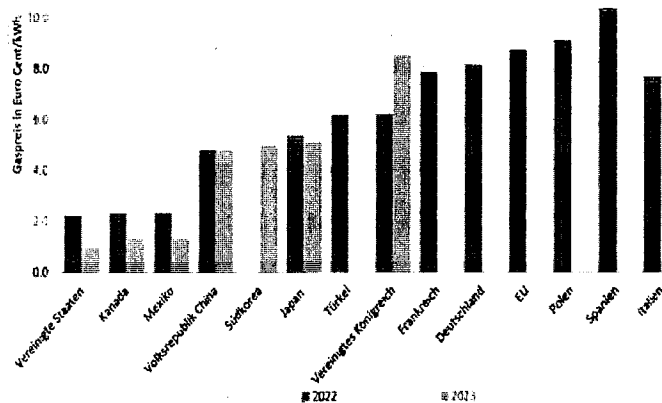
(a) Imperfect substitution

First, oil or gas today are something very different from oil or gas at some future date. Second, oil or gas in Rotterdam is very different from oil or gas in some U.S. state. So, the prices of oil or gas at different locations in the world and at different times will often be different.

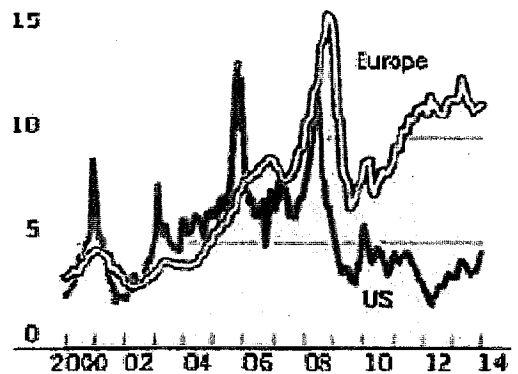
Consider first gas markets. Price differences in gas markets are larger, also before the Ukraine war as well as now, than oil price differences, although for different reasons. Gas, extracted from different sources is not much different chemically (as natural gas everywhere consists mostly of methane), but transport of gas is very inflexible since it takes decades to build pipelines. Of course, Liquefied Natural Gas (LNG) makes gas transportable outside pipelines, but liquefaction and

regasification facilities take years to build and there is only a small number of floating platforms available at any given time. And even if there is LNG transport capacity, marginal transport costs are also very high. It follows that very large price differences for gas at different locations can persist for years. In Asia LNG prices used to be about 5 times U.S. prices and in Europe about 3 times US prices before the Ukraine war. At the beginning of the war European LNG prices have shot up to above Asian prices (as European demand for LNG skyrocketed after the Russian invasion of Ukraine led to a boycott of Russian hydrocarbon exports).

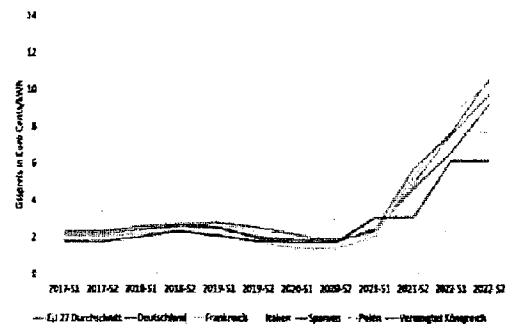
The reason for these persistent price differences is that LNG has been effectively free in the US because it was an unwanted byproduct of shale oil fracking, and the U.S. Environmental Protection Agency (EPA) does not allow for flaring. But, international LNG transport is way too capacity constrained and even when feasible it is way too expensive to have these large price differences arbitrated away.



Costly sources Natural Gas prices \$/mbtu



Source: World Bank



Oil comes in many different grades too. Therefore, there is no such thing as “the” oil price: oil trades in many different varieties that are very imperfect substitutes, especially in the short term. For example, even before the Ukraine war, Russian oil traded at close to 25% below the North Sea benchmark (Brent) which in turn often has been substantially below West Texas Intermediate, the

benchmark for US markets. These varieties, ranging from Saudi light oil to heavy Ural oil require different refining technology which cannot be easily adjusted to a different variety.

(b) Supply of oil and gas takes a long time and huge investments

The analysis of MN also makes the unrealistic assumption that the supply of oil or gas is infinitely elastic. This may possibly be true for coal, but not for oil or gas where substantial costs must be made upfront to fund risky exploration investments. And, if and once oil or gas fields are discovered, further costs need to be made for exploitation investments. This second phase can easily take 5 to 7 years before oil or gas can be pumped. Clearly, the MN assumption of infinitely elastic supply in oil and gas market at any moment of time is wholly unrealistic.

Oil and gas companies must make investments well before the oil and gas can be delivered to the market. Future prospects for gas and oil prices and for the investment climate in general can have changes in such a way that ultimately the decision is taken not to incur the expenses necessary to develop and exploit a given well or field. This means that there is not necessarily additional supply to the market in the future despite the decision to do more exploration investments today. The problem with the MN analysis is that it erroneously models exploration and exploitation in one go, and thus that the decision to explore immediately lead to new supply.

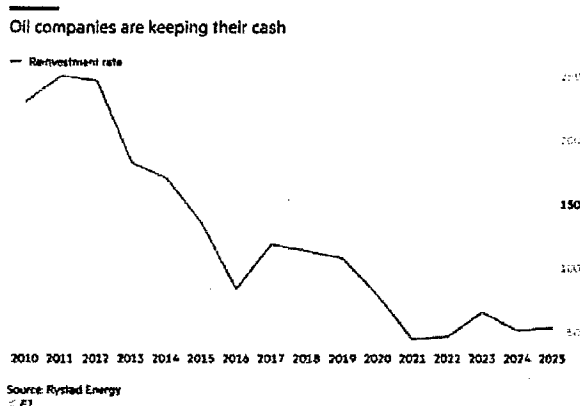
The MN analysis ignores the structure of production in all producing countries (except maybe Saudi Arabia about which more below). A typical oil well is very expensive to develop and very cheap to use. They are thus typically run flat out at full capacity, which makes the short run supply elasticity zero, the very opposite of infinite.

Saudi Arabian fields are naturally under pressure, so can be turned on or off at will. But at the 2023 COP in Dubai, it already became clear that the oil and gas producers in the Middle East are hesitant to undermine the energy transition, presumably for fear of the equivalent of border carbon taxes (like the CBAM mechanism at the border of the European Union) being implemented for CO₂ emission permits. For example, the Saudi Arabian Oil Group (Saudi Aramco) recently decided not to expand its oil production capacity.

Shale oil producers too are not a source of (almost) infinitely elastic supply. Various reasons stand out. First, at current oil prices, the oil price is below the break-even point U.S. shale oil investment: HSBC recently indicated that the break-even point is USD 77, which is above the current WTI

crude oil price of USD 72 per barrel. To be fair, other sources indicate a break-even point as low as USD 55 per barrel. On the other hand, U.S. shale oil producers even indicated that they would stop new drilling unless oil prices would recover to at least USD 100 per barrel.

As a result, there has been a steep decline in new drilling for shale oil: see figure below.



This means that the supply elasticity of shale oil producers is down to zero since existing wells are already run at full capacity and no new wells are under consideration. Since the lifetime of a fracking operation is about two years, we should expect steep declines in shale oil production in the near future. And, if the price does go above the break-even price (or indeed any other that is acceptable for shale oil producers), there will still be time needed for investment and to make wells ready for production.

(c) Summing up

The MN view of uniform identical goods and almost immediate and perfect substitution of each other makes a mockery of the structure of oil and gas markets.

II. Shell is an essential world expert in highly complex oil and gas fields

It is worrisome that the MN report totally ignores the very large role Shell plays as an expert in developing technologically complex oil and gas fields. This makes their impact many times larger than what would be indicated by their direct production. An example is the very large LNG facility on the Russian island of Sakhalin. The Russian PJSC Rosneft Oil Company would not have been able to develop that facility without the participation and expertise of Shell. The Russians may be

able to operate the LNG facility once in place, but its development is an entirely different ball game.

Shell is unique in its expertise in high cost/high complexity fields. Its withdrawal from this market can therefore not easily be offset by other oil producers. This undermines one of the key arguments in the MN report, which is based on the mistaken notion that any cut in oil or gas production by Shell will immediately be taken up by other oil and gas producers.

So even if the case against Shell would not affect other oil and gas companies, there will still be substantial and socially beneficial emission reductions as Shell is in world markets a very large player. Of course, it is more than likely that a successful case against Shell will send signals of caution and imperatives to change to other oil and gas companies as well; in that case the effects on emissions reductions would be even bigger than can be expected from the standalone case of Shell.

III. Shell and the Paris Agreement (COP21)

The case against Shell is of crucial importance for complying with the Paris Agreement made at the COP21 in 2015. Action of both state and non-state actors is crucial for achieving the Paris goals. The MN report assumes that if she loses the appeal proceedings, Shell would be the only player to comply with the Paris Agreement. Hence, it comes to the fallacious conclusion that there are plenty of other producers who would take up the slack.

But the MN conclusion belies the fact that virtually all countries in the world have committed to the 2050 targets and corresponding intermediate targets that follow from the Paris Agreement. So have a lot of companies and other non-state actors. All signatory states have agreed to submit to the mandated annual assessments. National frameworks are increasingly adopted or planned to implement necessary actions through regulation and various pricing and subsidy mechanisms.

The Paris Agreement depends crucially on avoiding free riding behavior and not allowing arguments such as “if I am the only one who does not comply, it won’t affect the outcome”. If everybody would follow this attitude, the whole Paris Agreement would clearly unravel. Thus, if Shell wins its appeal, this will set a disastrous precedent, particularly if this would have the legal con-

sequence that the other oil and gas companies would be entitled to the same exemption. Conversely, if Shell does not win its appeal, this will set a positive precedent.

Finally, the MN report claims that anyhow climate problems will need to be addressed first and foremost by cutting coal. It is true that ceasing global coal production will have the biggest impact on global warming. But the phasing out of coal cannot take place instantaneously since countries like India, China and Poland still heavily rely for their energy supply on coal, therefore phasing out coal will take time. The big coal reductions assumed by Nera/Shell (which is also assumed in most integrated assessment model exercises) simply cannot take place early enough to bring the Paris goals in reach. Given that we are already on a course of overshooting the 1.5 degrees Celsius target, attaining the corresponding global carbon budget requires severe cutbacks in oil and gas production too. Of course, if it feasible to say halve coal production globally, then oil and gas companies must surely scale back their activities too.

V. Risk of stranded assets

So, dithering about future public policies needed to enforce what is needed to comply with the Paris Agreements gives the wrong signals to the market. As a result, oil and gas firms but also firms that use a lot of oil and gas will delay switching to a green production structure and will continue to invest in brown assets. Even though total reserves of oil, gas, and coal companies are already 7 times as high as the global carbon budget (3.5 trillion tons of CO₂ versus 400 to 500 billion tons of CO₂), they continue with substantial investments in exploration. Global oil and gas reserves keep on growing, yet it is clear they cannot be burnt if we are going to stick to the Paris Agreement.

It is crucial that oil and gas companies implement credible commitments to a long-term path of emission reductions. Otherwise, there is a risk that their investments and those of carbon-intensive companies will become stranded. This will hurt not only those companies but will also hurt private investors and institutional investors.

It is important that one is aware that legal action can shift or amplify physical and transition risk exposure and creates additional climate risk exposures ("Climate risk assessments must engage with the law – Legal Actions determine the allocation and magnitude of climate-related financial

risk exposures”, *Science*, Vol. 383, by Thom Wetzer, Ruper Stuart-Smith, and Arjuna Dibley). Since legal actions are likely to increase in the future, oil and gas companies, and governments should be aware of the risks these impose and that it is therefore better to comply with the Paris Agreements with the required urgency.

VI. Conclusion

The analysis of the MN report is based on unrealistic assumptions and has little or nothing to do with global oil and gas markets. They ignore the dynamics of oil and gas markets, that the substitution is imperfect and that new supply of oil and gas takes both time and huge investments. Also MN disregard the fact that Shell is an essential world expert in highly complex oil and gas fields, which position is not as easily substituted as MN seem to assume. If Shell is successful in its appeal, this will set a bad precedent for other oil and gas companies and will make it much more difficult if not impossible for the world to comply with the Paris Agreement. There is a risk of stranded assets, both for oil and gas companies and for those who have invested in these companies. Companies and governments when they undertake long-term investments should take account of the fact that many governments, companies and other non-state parties such as cities are moving towards Net Zero already, and what this means for their business in the short and long run.

Sincerely,



Sweder van Wijnbergen, Amsterdam, 25 February 2024



Rick van der Ploeg, Amsterdam, 25 February 2024

Appendix: Author Biographies

Sweder van Wijnbergen studied Physics and Econometrics in the Netherlands and obtained his PhD in Economics from the Massachusetts Institute of Technology in the U.S. He has been a professor at Warwick University, Princeton and the LSE and is currently professor (em.) at the University of Amsterdam and a Board Advisor at Dutch National Bank (DNB). Before his academic career, he worked at the World Bank for 13 years, on Mexico and Egypt among other countries, in both cases with special focus on the consequence of oil reservoir discoveries and the optimal extraction and pricing of oil and natural gas. He has many publications in international top-journals on oil pricing, optimal extraction policy and the macroeconomic consequences of oil price shocks. He has acted as an advisor to international institutions and to many resource rich countries, like Norway, Azerbaijan, Nigeria and Mexico among others. Finally, he has also been Secretary General at the Dutch ministry of Economic Affairs with special responsibility for competition policy and energy market reforms.

Rick van der Ploeg is Professor of Economics at the University of Oxford, part-time University Professor at the University of Amsterdam, and Research Fellow of CEPR, CESifo and the Tinbergen Institute. His research is on the economics of climate change, energy and the economics of resource-rich economics, focusing mainly on macroeconomic growth and open economy issues, financial questions, and problems in public economic and political economy. In the past he has been at the University of Cambridge, LSE, Tilburg, VU and the European University, Florence. He has also been a Chief Financial Spokesperson in the Dutch Parliament, State Secretary for Education, Culture and Science in the Netherlands, and Vice Chair of the UNESCO World Heritage Committee. He has extensive consultancy experience with supranational organisations, governments, and private businesses.