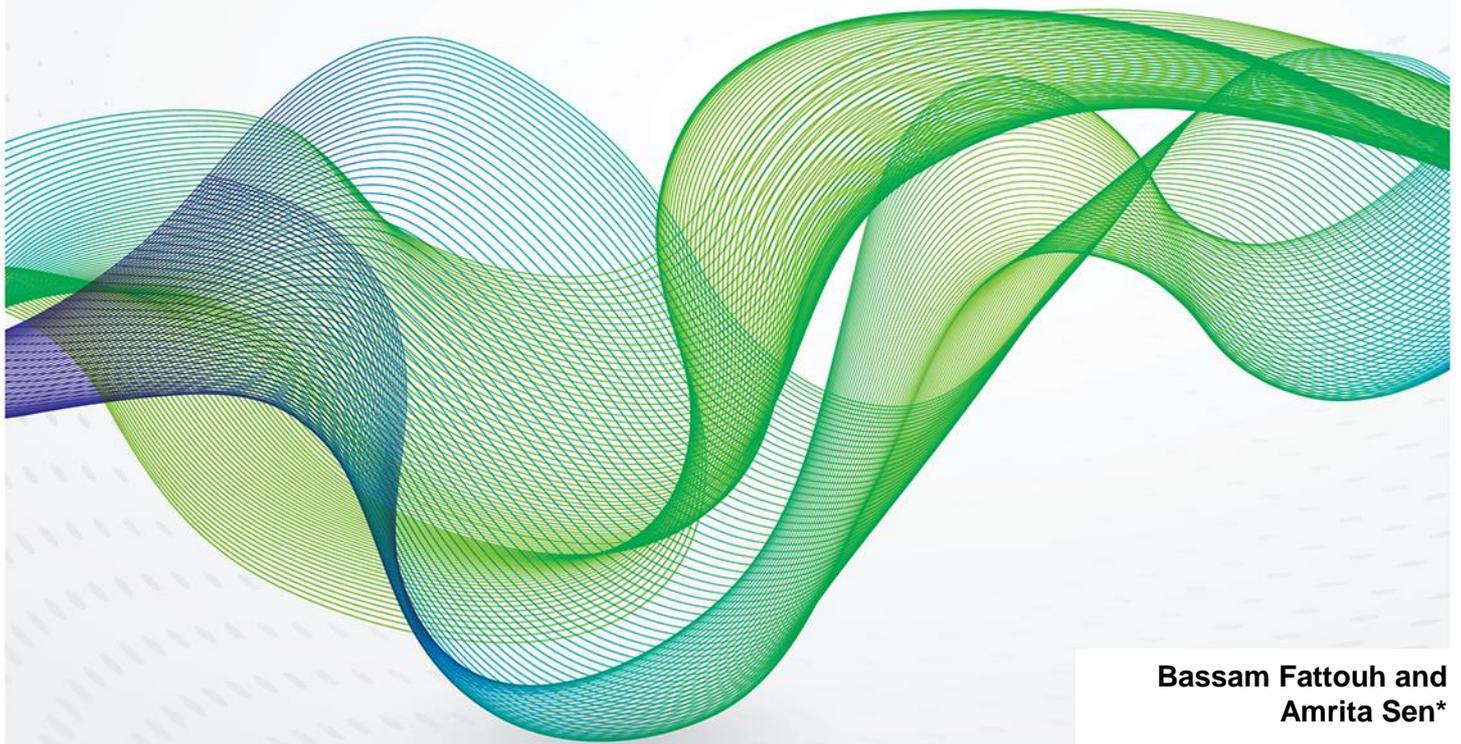




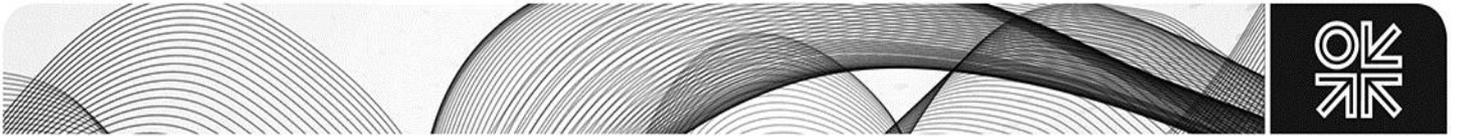
THE OXFORD  
INSTITUTE  
FOR ENERGY  
STUDIES

August 2014

# New swings for West African crudes



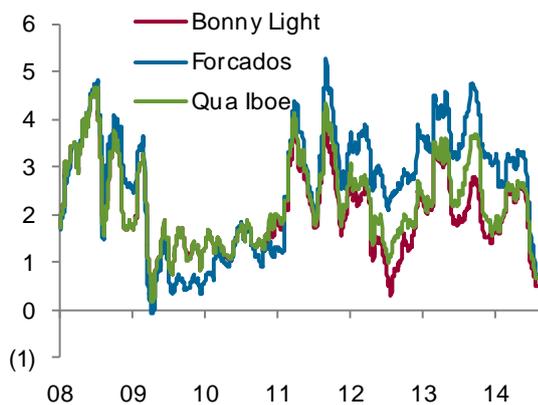
**Bassam Fattouh and  
Amrita Sen\***



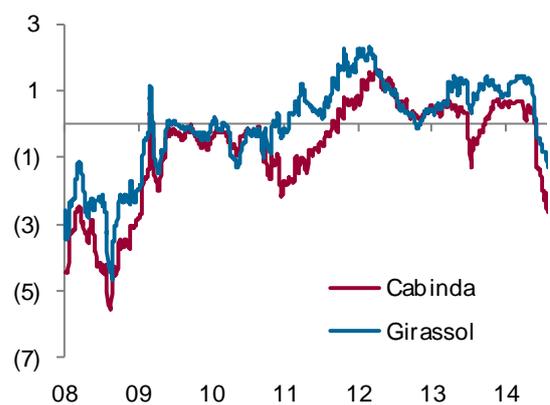
## I. Introduction

While most recent analysis has focused on the potential impact of the US ‘tight oil’ revolution on global oil supplies and oil price levels, the impact on the shifts in trade flows and on the dynamics of price differentials has received much less attention. This is quite surprising, as the recent transformations in the US energy scene have manifested themselves most visibly through changes in crude oil and product flows with consequences on the behaviour of time spreads, inter-crude spreads, and the pricing of various crudes in relation to global benchmarks. Perhaps this is most evident in the case of West African (WAF) crudes; these have been subject to structural changes, potentially opening the way for prolonged relative weakness and higher volatility in WAF crude prices. As Figure 1 and Figure 2 below show, Nigerian and Angolan grades have come under significant downward pressures in recent weeks, taking price differentials to a six-year low. While the recent deterioration can be explained by a combination of factors – such as deep European run cuts, a spate of unplanned refinery outages, and the lack of Chinese appetite to fill their SPR – there are some structural issues at work that are adding to West Africa’s woes, and these are unlikely to take a turn for the better anytime soon.

**Fig 1: Nigerian diffs to Dated, \$ per barrel**

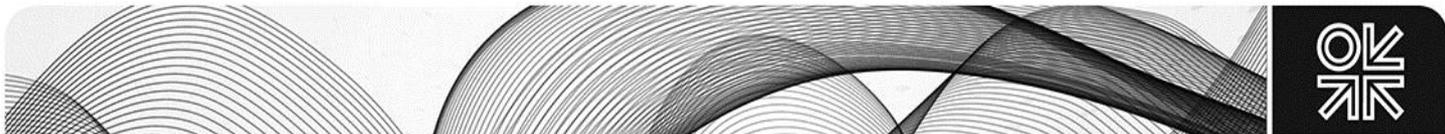


**Fig 2: Angolan diffs to Dated, \$ per barrel**



Source: Datastream

This Comment explores some of the structural issues affecting WAF crude trade flows, providing a case study of how the US tight oil revolution is shaping oil market dynamics. The growth of US tight oil led to the first wave of structural change as the USA gradually backed out imports from West Africa, but because of a variety of factors (such as higher appetite from Asia, the loss of Libyan production making Europe switch to WAF barrels, and a spate of disruptions to WAF output) the loss of the US market was not fully felt on WAF crude prices. However, beyond these temporary factors, a couple of ongoing trends are forming the second wave of structural changes impacting West African differentials. The first of these is the changing structure of global refining. Much higher US, Russian, and Middle Eastern runs have meant that Europe is now the balancing point for global refining, a trend which is expected to continue. The second is the further backing out of WAF crudes from North America. While the USA largely backed out WAF grades by the second half of 2013, as domestic output and infrastructure continued to improve, this year has seen a significant increase in US crude exports to eastern Canada. As a result, Canadian imports of WAF crudes have fallen, implying that there is more crude oil available for clearing in the Atlantic Basin. In a way, WAF has become the swing barrel heading to North America, depending broadly on WTI–Brent differentials. But the implications have not been limited to markets in the USA and Canada. Since the marginal barrel sets the benchmark price, backed WAF barrels from North America are playing a more important role in the Brent price formation process.



## II. The first wave of structural change

The first wave of structural change dates back to 2010, to the start of the tight oil revolution in the USA. At the time, US imports totalled 9 million b/d, with WAF accounting for about 1.6 million b/d of those and Nigeria the lion's share within the WAF. Since then, as US production has increased sharply and the US Gulf Coast (USGC) started to back-out imports, uncommitted light sweet barrels were the first to go. Of course, this wasn't an overnight process. Refiners in the USGC and US East Coast (USEC) faced various constraints before they were able to rely more heavily on domestic rather than imported grades. Logistical bottlenecks were an issue, as the midstream lagged the pace in upstream development. Moreover, refiners had to go through various upgrades to be able to process the much lighter domestic crude, as they were initially set up to process grades with API gravity in the 35–40 range. The downward trend in imports started in the second half of 2010, which is anecdotally the time where Eagle Ford production started to exceed 0.1 million b/d. In 2011, for the first time in at least a decade, PADD3 imports of light crude oil fell below 1 million b/d. The structural change had begun.

By the end of 2013, crude imports from West Africa into the USGC had fallen to zero from a peak of over 1.3 million b/d in 2007, with imports now directly linked to Brent–LLS differentials. WAF barrels are only attracted into USGC when LLS prices pick up on the back of strong refinery runs, or other specific supply issues. Even so, the volumes are well below 50 thousand b/d (in comparison to 1 million b/d in the first half of 2010). Similarly, WAF exports to the US East Coast have declined sharply following the growth of crude-by-rail, which allows more Bakken crude to arrive at USEC refineries. USEC refineries, which are biased towards producing more gasoline and hence prefer Nigerian barrels, have not entirely backed out imports from WAF, but imports have dropped from a high of 0.45 million b/d in 2006 to less than 75 thousand b/d today. Much like the USGC, the USEC only pulls greater quantities of WAF barrels when Bakken prices are too high (due to weather or infrastructure-related production problems). In other words, WAF has become the swing barrel heading to the USA, depending broadly on WTI–Brent differentials.

Fig 3: US imports from West Africa, mb/d

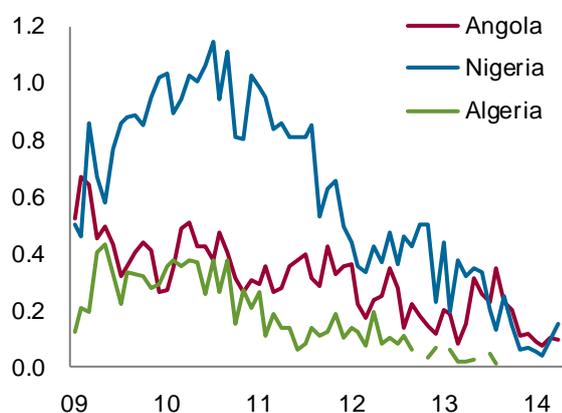
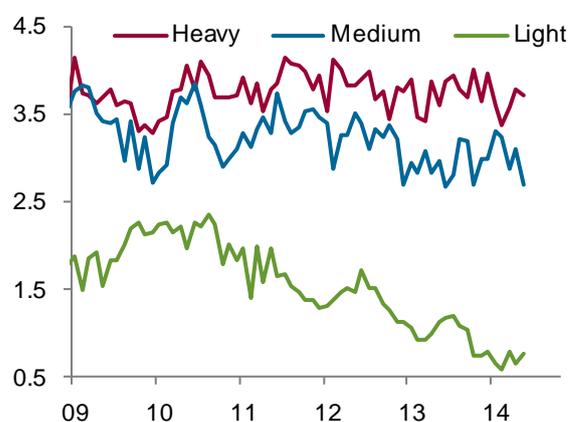


Fig 4: US imports by API gravity, mb/d

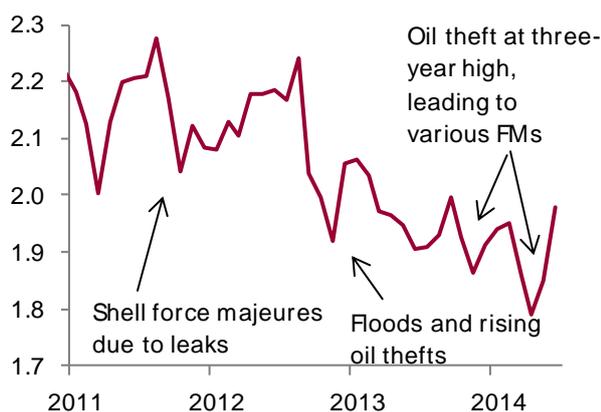


Source: EIA

But the loss of the US market was not felt strongly in the WAF market until recently. In fact, differentials for Bonny Light and Forcados relative to Dated Brent have even climbed to above \$5 per barrel in 2011, due to a combination of stronger pull from Asia (as both India and China bought additional WAF barrels) and the loss of Libyan production in 2011. Since 2013, the loss of Libyan and Kirkuk output has also resulted in increased European refinery appetite for WAF light sweet crude. Broadly, WAF differentials have stayed range-bound between a \$1 and \$3 premium to Dated Brent since 2011, with the ebb and flow of refining demand and geopolitical supply outages determining the differentials. A constant string of outages in the WAF itself – in the form of *forces majeure* in Nigeria or technical problems in Angola – have also helped. Indeed, at least three factors have supported WAF grades over the past three years:

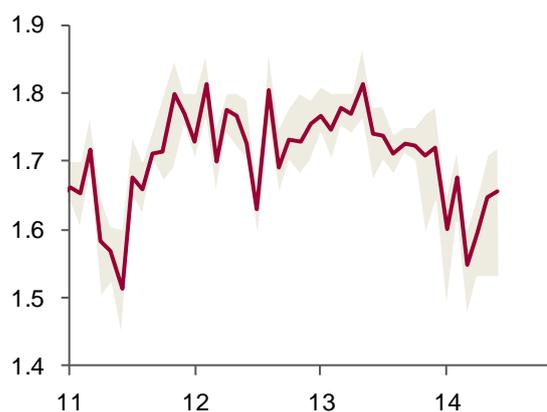
- First, coinciding with the backing out of WAF barrels from the USA, new refining capacity came online in Asia, boosting the region's appetite for crude. Nigerian grades are popular with Indian refineries and this helped raise Nigeria's Qua Iboe grade differentials. Indian imports of Nigerian crudes climbed to over 30 per cent of total Nigerian exports (although this remained lower than the 45 per cent formerly exported to the USA). Chinese refineries prefer the more acidic Angolan crude for their refinery specifications.
- Second, the constant string of supply disruptions, not only in Libya, Iraq, and Iran but also in Nigeria and Angola itself, helped to absorb the lack of US buying. In late 2012, Nigerian output fell below 2 million b/d and struggled to exceed this figure until July 2014. Floods, a spate of sabotages, and various *forces majeure*, coupled with rising oil theft, left Nigerian output at a paltry 1.79 million b/d earlier in 2014. The Trans Niger and Nembe Creek pipelines were under constant attack. Angolan output fared better initially, but from mid-2013 also started faltering, due to technical problems, salt water issues at the Plutonio fields, and even an attack by a blue marlin. This led to heavy maintenance works as well, curbing output further.
- Third, Europe became a very important source for Nigerian barrels, due to the loss of light sweet crude from Libya (following the overthrow of Gaddafi and increased protests closing off oil infrastructure) and also the slow pace of European refinery shutdowns, despite weak margins and global overcapacity.

**Fig 5: Nigerian production, mb/d**



Source: MEES, Energy Aspects

**Fig 6: Angolan output, mb/d**

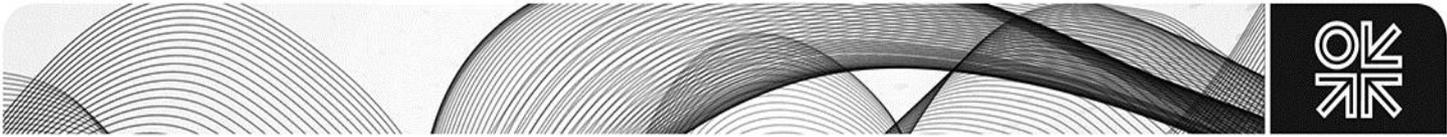


Source: EIA, IEA, MEES, Platts, Reuters, BBG, Energy Aspects

Having disappointed through April this year, however, output from both Angola and Nigeria has picked-up since May by a combined 0.15 million b/d. Angolan production, which had fallen to a low of 1.4 million b/d earlier in the year, is starting to average around 1.7–1.8 million b/d, although it is unable to climb to 2 million b/d because of natural declines. Nigerian disruptions, meanwhile, are a complete unknown. While production has managed to climb above 2 million b/d for the first time in two years, underlying structural problems in the Niger Delta persist, so output could easily be disrupted again. The increase in WAF output is thus not an ongoing structural change, as it could be quickly reversed. However, for now, the increase in WAF output and slowdown in Asian buying has led to WAF grades coming under downward pressure.

### III. The second wave of structural change

While production problems in key West African producers can easily reappear, a couple of ongoing trends are being seen as forming a second wave of structural changes impacting West African differentials. The first of these is the changing structure of global refining, while the second is the further backing out of WAF crudes from North America – particularly from Canada.

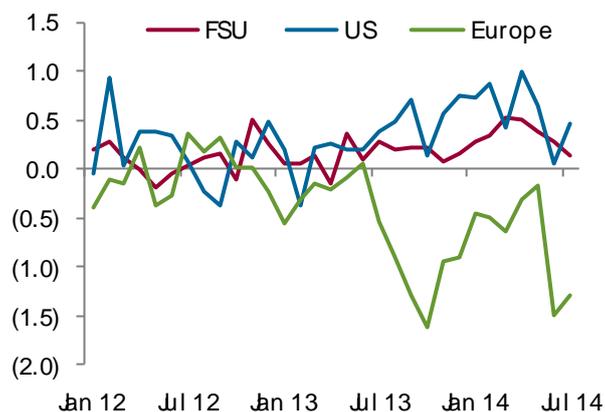


## Changes in global refining scene

While the global refining scene has been in a state of transformation for quite some time now, this year the Atlantic Basin has had to contend with higher Middle Eastern refinery runs, in addition to finding itself caught between the US and Russian refining juggernauts that are increasingly squeezing weaker refineries in Europe. Both Russia and the USA enjoy structural advantages that in many respects make them immune to price pressures on products and indifferent to refining margins. The structure of the Russian oil tax system, which taxes exports of refined products far less than those of crude oil, encourages integrated oil companies to maximize throughputs and exports of refined products, even when refining margins elsewhere are negative. In the USA, surging domestic oil output and an effective ban on the export of domestic crude oil means that inland oil prices must eventually adjust lower to ensure that refinery runs are maximized to clear the market. In other words, US Gulf Coast refineries enjoy an implicit guaranteed minimum refining margin. Additionally, increased self-sufficiency in the Middle East for products has meant that spot buying by companies such as Saudi Aramco has been limited, as the company is largely able to cover any spot requirements by taking barrels from its export refineries into its own system.

These changes mean that export-dependent refiners elsewhere, particularly in Europe, must bear the brunt of the push to rationalize capacity. Even though Europe is short in middle distillates, its refineries need access to export markets for light ends if they are to be profitable. Structural changes in gasoline markets – whereby the USA needs smaller gasoline imports and is increasingly taking market share in Latin America and Africa away from European refineries (the latest EIA data show gasoline exports to Nigeria, for instance, rising to a record high) – are undermining European refinery economics. This therefore implies that if global oil demand slows down, refinery runs will have to fall somewhere to keep the market in balance. For the most part, this is most likely to occur in Europe (see Figure 7). If these European refineries are going to be the balancing factor from here on, and given that European refiners (and some Asian refineries) are the main buyers of WAF crudes, in a weak market the downward pressure will be felt predominantly on WAF grades. Furthermore, the swings in European refining runs may imply an increased volatility in WAF crude prices.

**Fig 7: Refinery runs, year-on-year change, mb/d**



Source: EIA, CDU-TEK, JODI

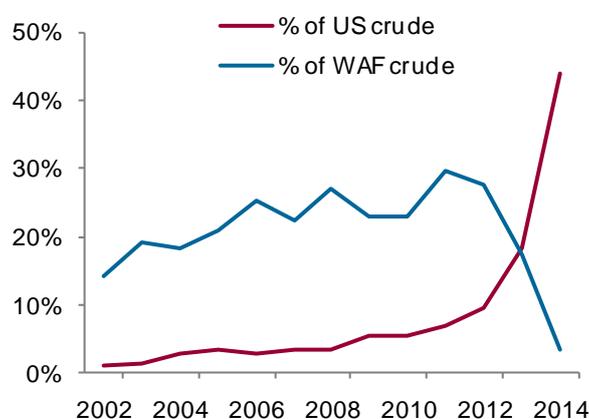
## Canada has backed out WAF imports and more to come?

The other factor making up the second wave of structural change concerns the further backing out of West African crudes from North America. While the backing out of WAF grades from the USA is largely complete, WAF exports to Canada remained largely untouched during this process. The lack of pipelines, together with the vast distances to be covered by rail, meant that the production growth seen in Western Canada never reached

the 1.3 million b/d refining hub in the East. Moreover, the gasoline-biased simple refineries on the East Coast have a preference for lighter grades, in comparison to the heavy production in the West. Eastern Canada imports are close to 0.7 million b/d of crude, mostly from the Atlantic Basin (particularly West Africa), with the rest being met by domestic offshore output. Aframax tankers unload in Portland in Eastern Canada, from where a pipeline feeds line 9, which then delivers light sweet crude oil to refineries around Sarnia.

But heavily discounted US light crudes have become an extremely attractive proposition for these refineries, while exports to Canada became one of the few ways for producers to get rid of the glut facing them. The Jones Act – which states that the transport of crude oil between US ports is reserved for vessels built and registered in the USA – does not apply to the transport of US oil to Canada. It costs approximately \$3.10 to ship Nigerian oil to the East Coast of Canada and about \$2–\$2.50 to barge oil from the USGC to the same destination, so as long as LLS is trading \$2–\$3 below Brent/WAF, East Coast Canadian refineries will favour discounted USGC crudes. Once the required infrastructure (rail terminals, offloading docks) was built, therefore, US exports to Canada soared, hitting a record high of 0.26 million b/d in April and May this year, likely having touched 0.3 million b/d in June. In fact, US exports to Canada have consistently been above 0.2 million b/d this year, higher year-on-year by 0.15 million b/d. As a result, the USA has captured significant market share from WAF, with the percentage of Canadian imports being met by the US surging to 50 per cent, while those from WAF dipped below 10 per cent (see Figure 8). Indeed, only about 0.2 million b/d of Canadian imports now come from West Africa.<sup>1</sup> This has been one of the reasons for the current Atlantic Basin crude fundamentals weakness: as the USA managed to get rid of a large part of its crude overhang by sending crude to Canada, Canada has backed out crude to the rest of the world. Exports from the USGC to Eastern Canada are largely dependent on Brent–LLS spreads, as exports tend to rise when LLS prices fall, but on the whole this trend is expected to continue, as it is one of the limited means to clear the US domestic crude market.

**Fig 8: Canadian imports by region, %**

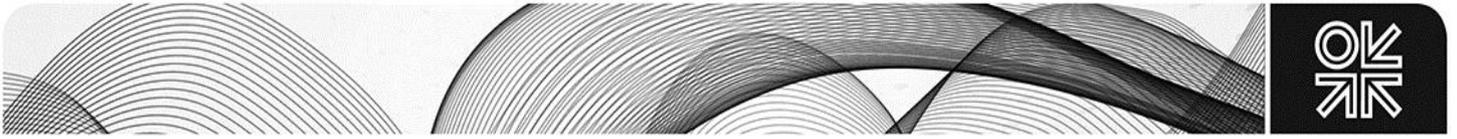


Source: EIA, CAPP, Genscape

#### IV. Implications for global benchmarks and pricing

The shifts in trade flows caused by the US tight oil revolution are having wide repercussions on the price formation process. This Comment has focused on a key recent dynamic: the backing of WAF crudes initially

<sup>1</sup> Moreover, the reversal of the line 9 pipeline between Sarnia, Ontario, and Montreal by year-end (or early 2015) will back out the remaining 0.25 million b/d of foreign imports from Eastern Canada, as Canadian light crude, and potentially some Bakken, will then be able to reach these refineries. Enbridge also has plans to expand line 9 by 60 thousand b/d, taking its total capacity to 0.3 million b/d. Moreover with line 9 reversed, it will also be logistically impossible for WAF crude to reach the refineries near Sarnia. Line 6B's expansion (which helps feed crude into line 9) will ensure more Western Canadian and Bakken crude gets dispersed in the north.



from the USA and now from Canada. What are some of the implications of this shift in trade flows? By the first quarter of 2015, almost all WAF barrels could be backed out of North America, putting downward pressure on WAF grades. Furthermore, WAF crudes will become the swing barrel into Canada, much as in the USA, depending on the Brent–LLS spread. Whenever LLS prices weaken, more USGC crude will head to Eastern Canadian refineries relative to West African and North Sea barrels (as we have seen recently) and vice versa.

But the implications will not be limited to markets in the USA and Canada. Growing competition from export refineries in India, the Middle East, and China means that European refineries are going to be the balancing factor; given that these refineries (along with, potentially, some Asian ones such as South Korea and Japan) are the main buyers of WAF crudes, the clearance of crude in the Atlantic Basin (which is the marginal barrel) will be key to setting the Brent price. Therefore, any weakness in demand will be reflected in the weakness of WAF crudes, which will feed eventually into the Brent structure. This would also work in the opposite direction: any increase in demand from Asia or elsewhere which results in the clearing of WAF barrels is likely to signal a rebalancing of the market, causing WAF differentials to strengthen and in turn feeding into the Brent structure. In other words, although the USA still maintains a ban on crude oil exports, the fact that backed WAF can freely move between markets can impact prices and differentials in different regions.

There is also a wider lesson from these recent changes in oil market dynamics. Oil price levels have been remarkably stable, trading within a narrow price range over the last three years as the US supply shock was offset by disruptions in other parts of the world. But behind this stability in the price level, there have been many moving parts; it is the adjustments in price differentials, rather than any movement in price levels, that have given a better reflection of these transformations in the oil market so far.