



Oil Refining Fitness Check

**EU Petroleum Refining Fitness
Check: Impact of EU Legislation
on Sectoral Economic
Performance**

**European Commission
Joint Research Centre (JRC)**

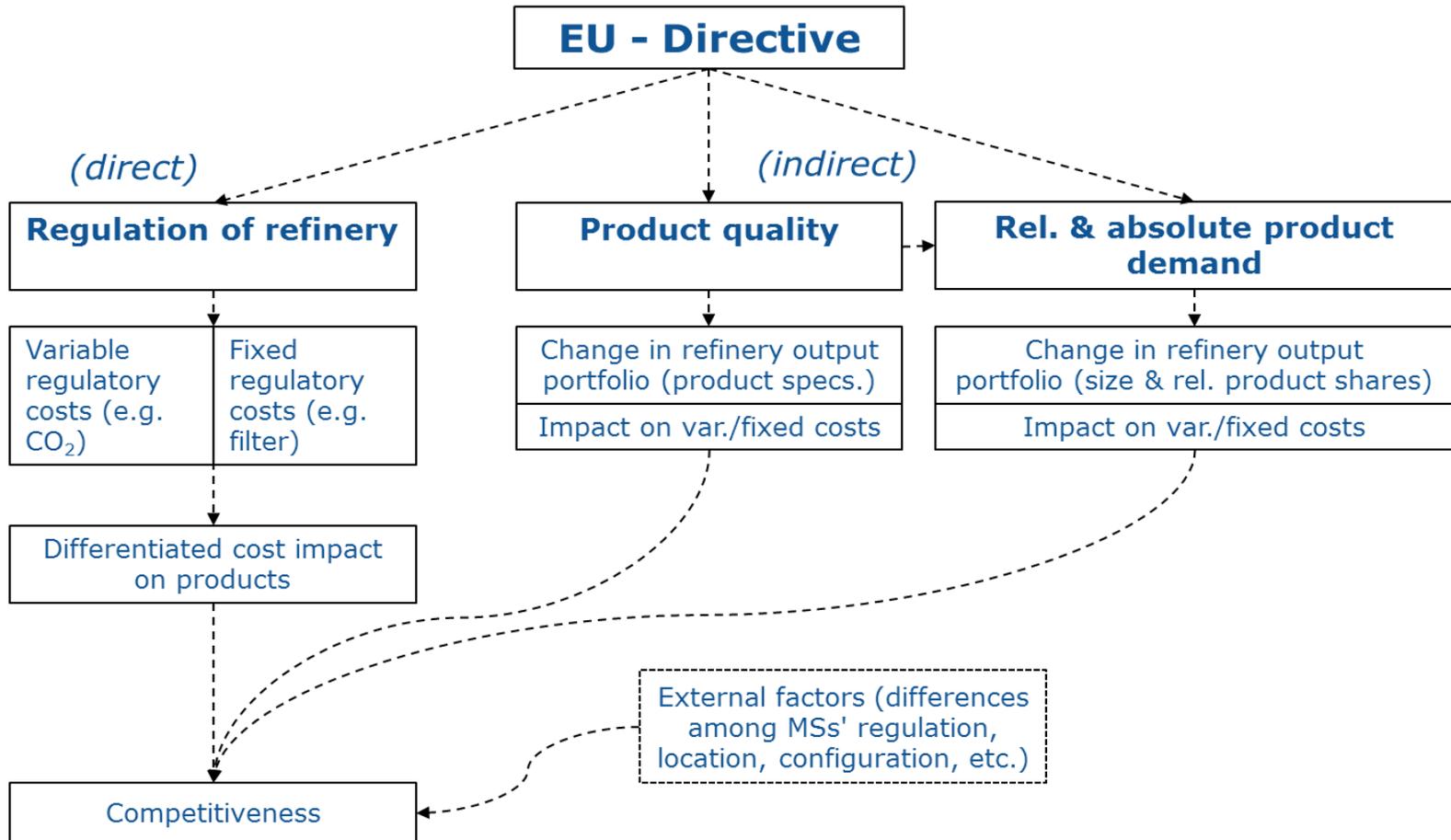
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- 1. Economic impact on refinery sector of directives analysed in Fitness Check*
- 2. International competitiveness of EU refining: trends 2000 to 2012*
- 3. Main conclusions*

Directives analysed in Fitness Check

- 1. The Renewables Energy Directive (RED);**
- 2. The Energy Taxation Directive (ETD);**
- 3. The EU Emissions Trading System (EU ETS);**
- 4. The Fuels Quality Legislation (FQL);**
- 5. The Directive on Clean and Energy Efficient Vehicles (DCEEV);**
- 6. The Industrial Emissions Directive (IED), the Integrated Pollution Prevention and Control Directive (IPPCD) and the Large Combustion Plants Directive (LCPD);**
- 7. The Strategic Oil Stocks Directive (SOSD);**
- 8. The Marine Fuels Directive (MFD);**
- 9. The Energy Efficiency Directive (EED);**
- 10. The Air Quality Directive (AQD).**

Main impact channels



Impact of directives: (i) on refinery operations

	Associated capital investments	Associated operating costs	Cost per barrel of throughput
<i>EU Emissions Trading System (EU ETS)</i>	No evidence for investments specifically targeting abatement of CO ₂ emissions	<ul style="list-style-type: none"> - No direct impact at sector level until 2012, because sector on average received more free permits than verified emissions - Indirect impact: possible higher price for purchased electricity 	Until 2012 only indirect effect could be experienced, but the purchased electricity's share is small, and the electricity costs grew at the same or slower pace as for the other energy sources. Thus, attributable impact likely negligible.
<i>Integrated Pollution Prevention and Control Directive (IPPC) and the Large Combustion Plants Directive</i>	Annual average of 5 Mio EUR per refinery, higher (6.4 Mio) after 2006	Estimated as 6.3% of capital investments, yielding 1.8 Mio annually per refinery	0.13 Euro per barrel over 2000 to 2012

Impact of directives: (i) on refinery operations (continued)

	Associated capital investments	Associated operating costs	Cost per barrel of throughput
<i>Strategic Oil Stocks Directive (SOSD)</i>	Implementation mechanisms differ strongly at national level. Majority of the costs incurred before 2000.	Considered of low relevance for refineries and affects them in a competitiveness-neutral way.	Own additional cost for refineries is negligible.
<i>Energy Efficiency Directive (EED)</i>	Has only been transposed very recently. The additional impact cannot be disentangled from the impacts of other legislations, as well as cost optimization goals of refineries.		Own additional effect is not discernible.
<i>Air Quality Directive (AQD)</i>	The additional impact cannot be disentangled from the impacts of emissions and effluent regulation, FQL and MFD.		Own additional effect is discernible.

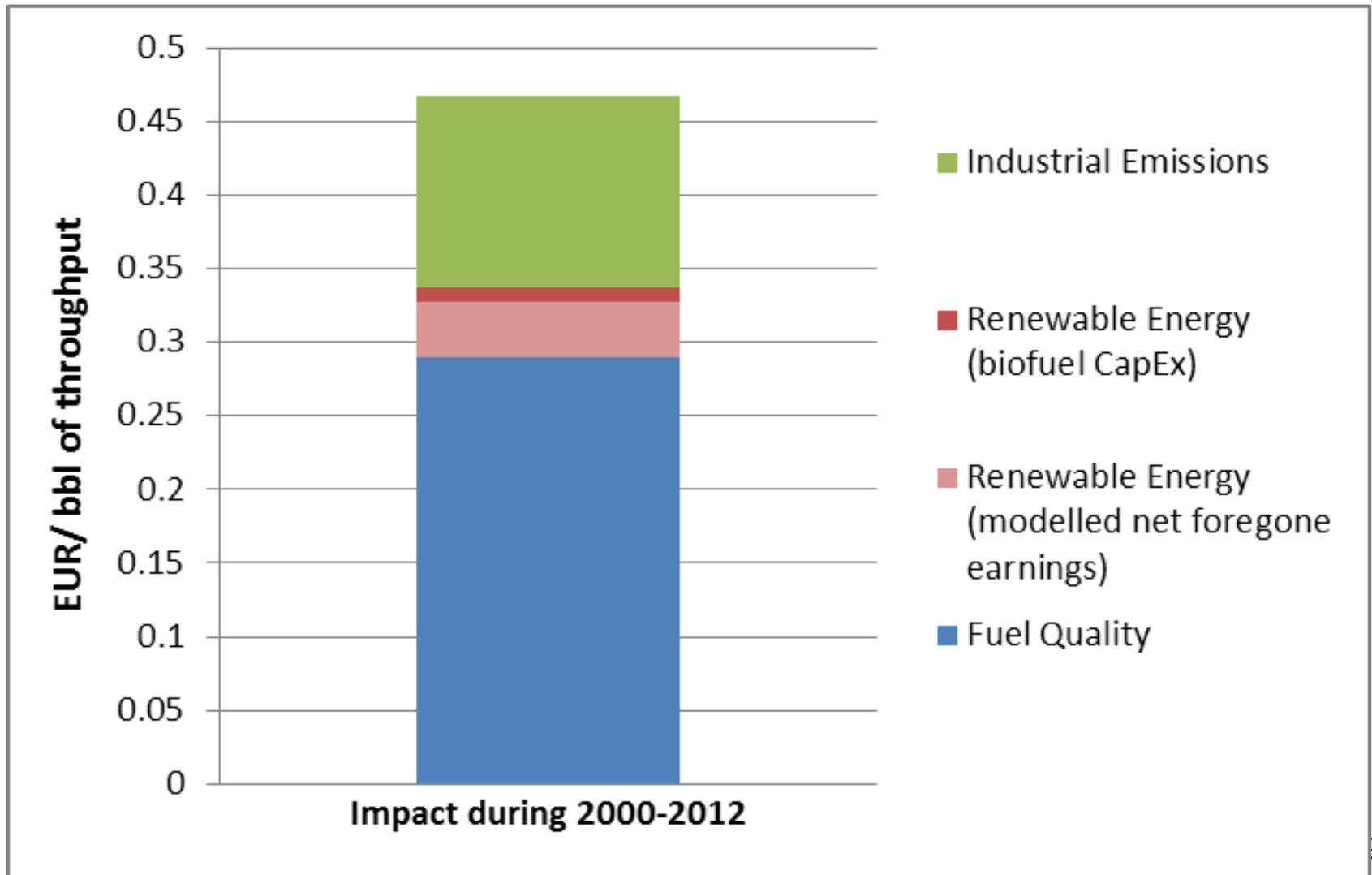
Impact of directives: (ii) through product specification

	Associated capital investments	Associated operating costs	Cost per barrel of throughput
<i>Renewables Energy Directive (RED)</i>	New blending, storage, and transport facilities: 0.5 Mio EUR per year per refinery (CONCAWE 2014)	Not estimated	0.01 EUR per barrel over 2000 to 2012
<i>Fuels Quality Legislation (FQL)</i>	On average 8.5 Mio EUR reported investments per year per refinery.	Estimated 8.9 Mio EUR annually per refinery over 2000 to 2012	0.29 EUR per barrel over 2000 to 2012.
<i>Marine Fuels Directive (MFD)</i>	Negligible, given that the required fuel specifications were achieved by using low-sulphur crude oil and by re-blending.	Only logistical costs associated with re-blending.	Likely negligible due to use of existing blending capacities

Impact of directives: (iii) demand reduction

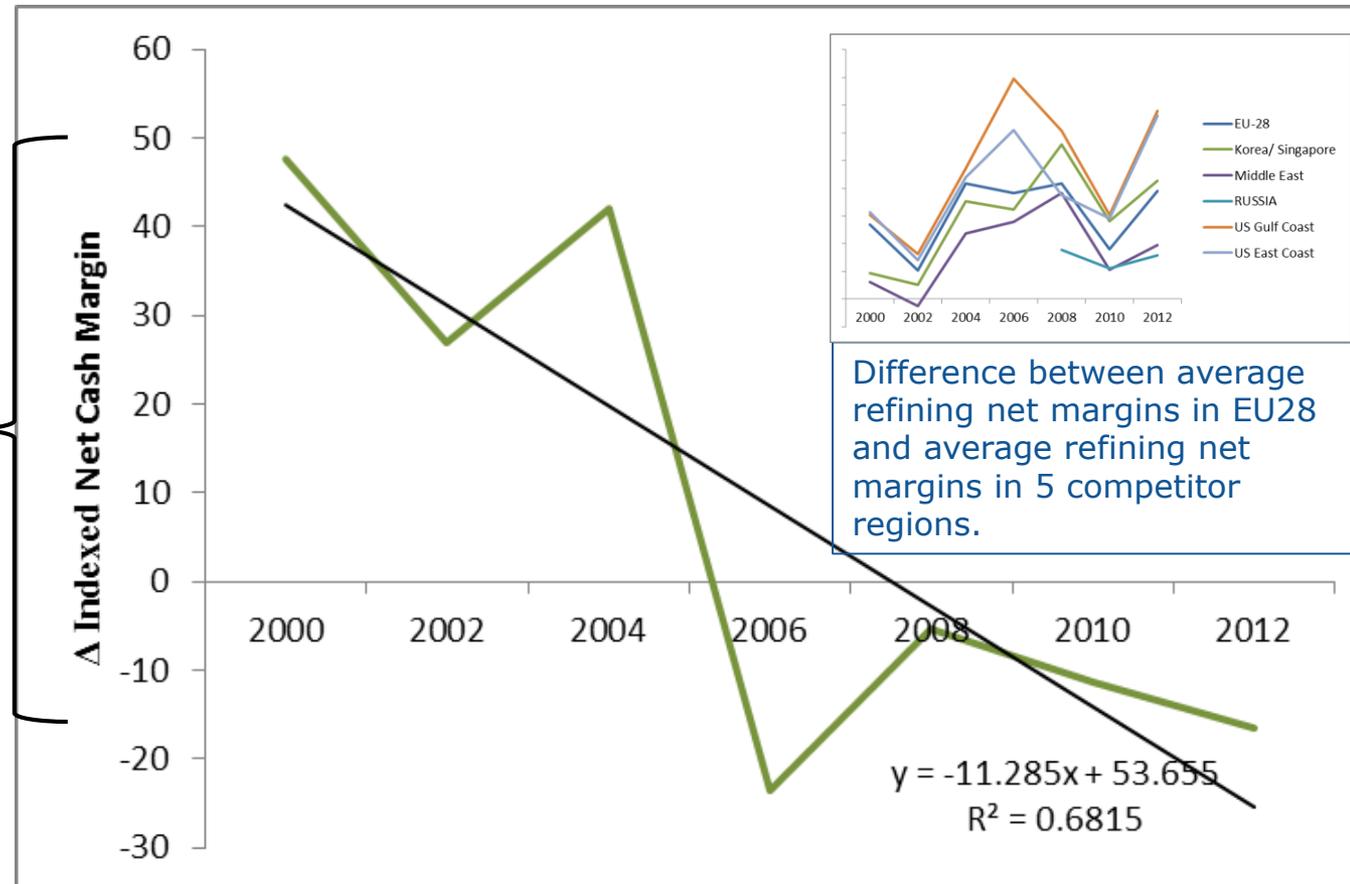
	Demand impact	Impact on refineries
<i>Renewables Energy Directive (RED)</i>	1% gasoline average demand reduction during 2000-12, 3% reduction in 2012	Could have contributed to utilization rate reduction (0.9 to 1.9%). The OURSE model estimates the forgone revenues from lower utilisation at 3.7 eurocent per barrel of crude.
<i>Energy Taxation Directive (ETD)</i>	Estimate of 0.2% average annual demand reductions for both gasoline and diesel	Likely negligible due to a very small effect on fuel demand.
<i>Directive on Clean and Energy Efficient Vehicles (DCEEV)</i>	During 2000-2012 the impacts on the car and, thus, fuel markets were insignificant.	The potential effect on the oil refining sector is second-order and is so far negligible as well.
<i>Integrated Pollution Prevention and Control Directive (IPPC) and the Large Combustion Plants Directive</i>	Reduction of heavy fuel oil demand from power sector (combined effect with Sulphur content of fuels Directive)	Requires refineries to react to reduced fuel oil demand: deeper conversion, orientation towards marine fuels, or shut down. The average effect cannot be quantified directly.
<i>Energy Efficiency Directive (EED)</i>	The impact cannot be disentangled from those of RED, ETD and IED.	Own additional effect is negligible.
<i>Air Quality Directive (AQD)</i>	The impact cannot be disentangled from those of FQL, MFD and IED.	Own additional effect is negligible ₈

Quantified Impact of directives: total cost impact



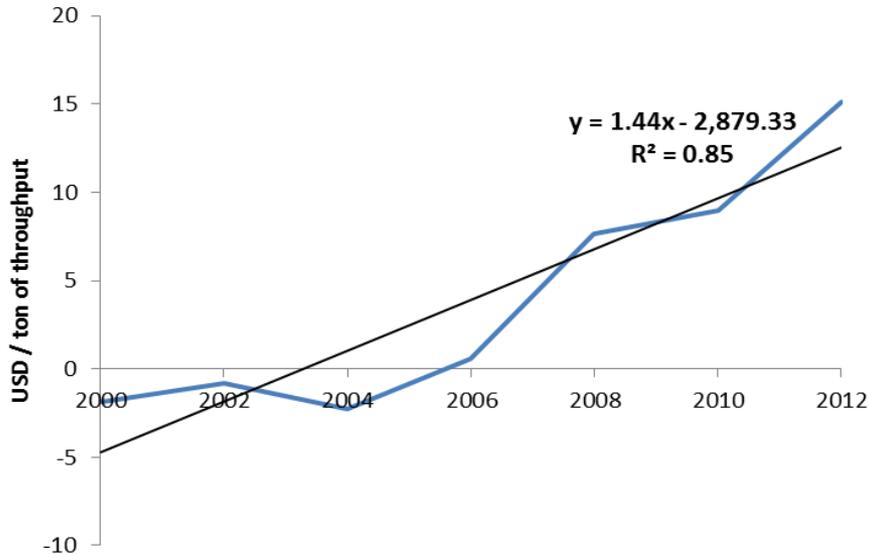
Refining margins in EU28 vs. US/ME/Russia/South Korea & Singp.

- By 2006 average EU28 net margins have fallen below those of the competitor regions
- EU28 net margins have lost 2.1 USD/bbl over 2000-12.

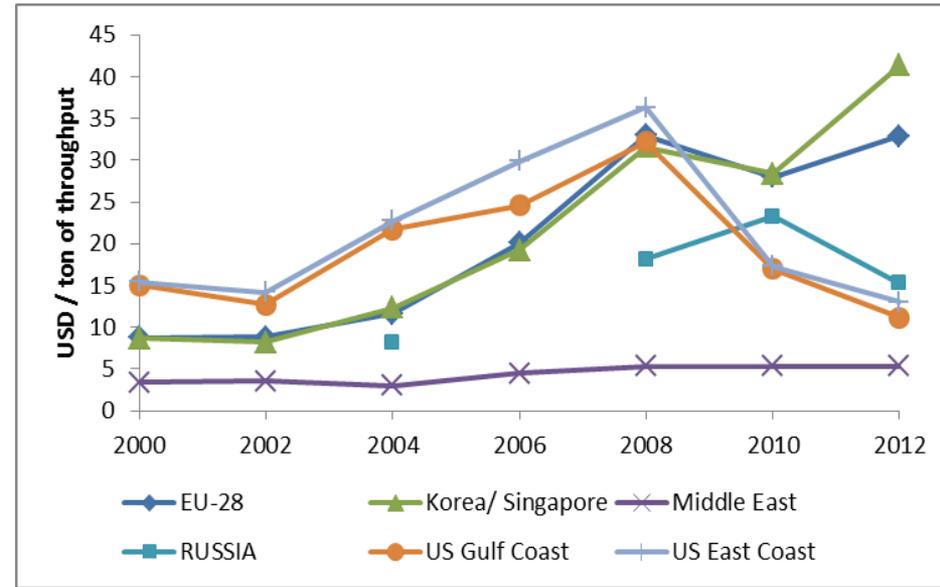


Refining margins in EU28 vs. US/ME/Russia/South Korea & Singap.

Difference between *energy costs* in EU28 and average *energy costs* in 5 competitor regions.



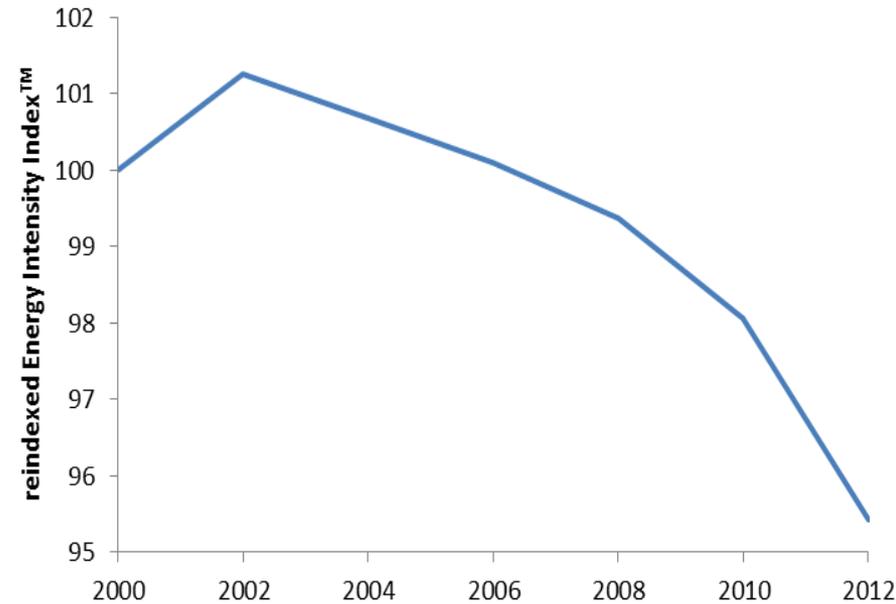
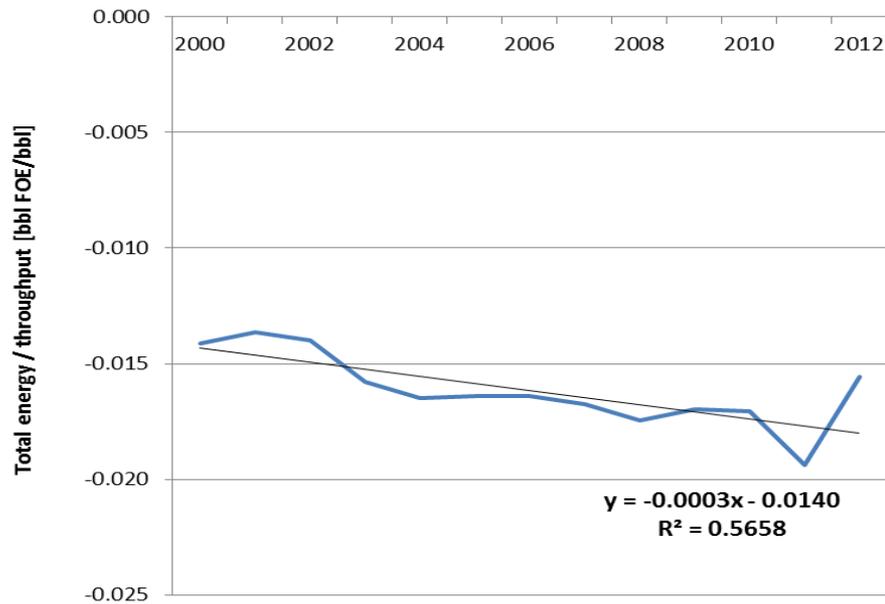
Average energy costs in EU28 and 5 competitor regions.



- The relative decrease of EU net margins is due to the relative increase of *operational costs* in the EU
- More specifically, it is due to the relative increase of *energy costs* in the EU

Explaining EU energy cost deterioration

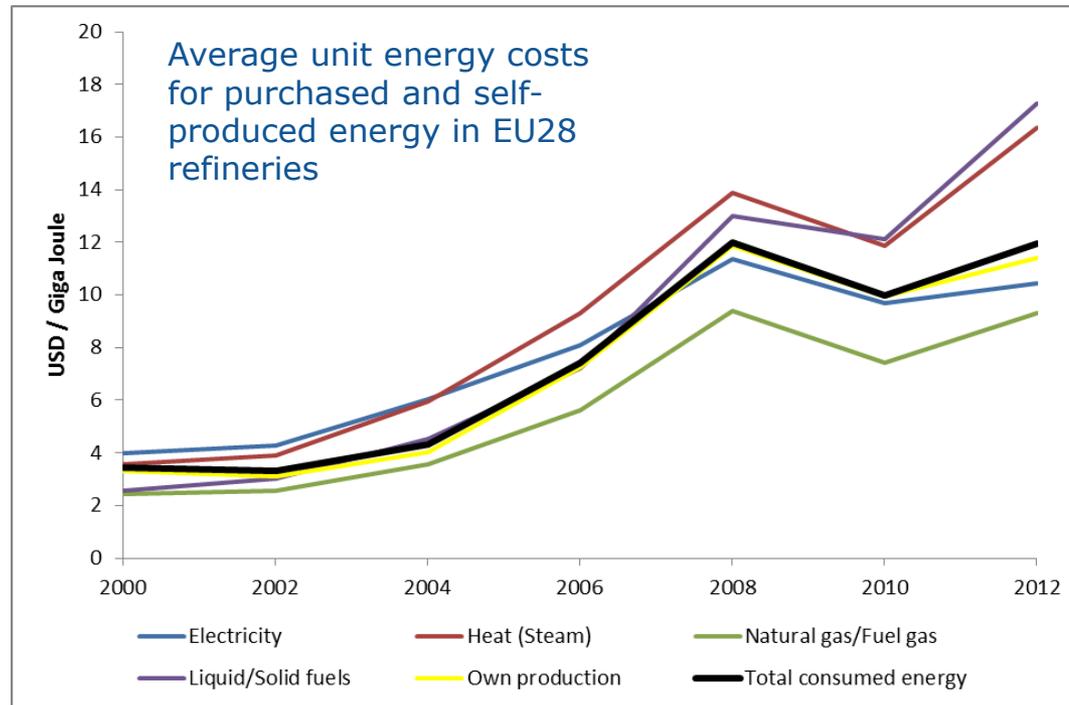
Energy costs **did not** increase due – relative to competitors – energy efficiency



Difference between average refining energy per throughput (barrels of fuel oil equivalent per barrels of throughput) in Europe and 5 competitor regions.

Solomon Energy Intensity Index™ (EII™) for EU28, re-indexed to year 2000 value.

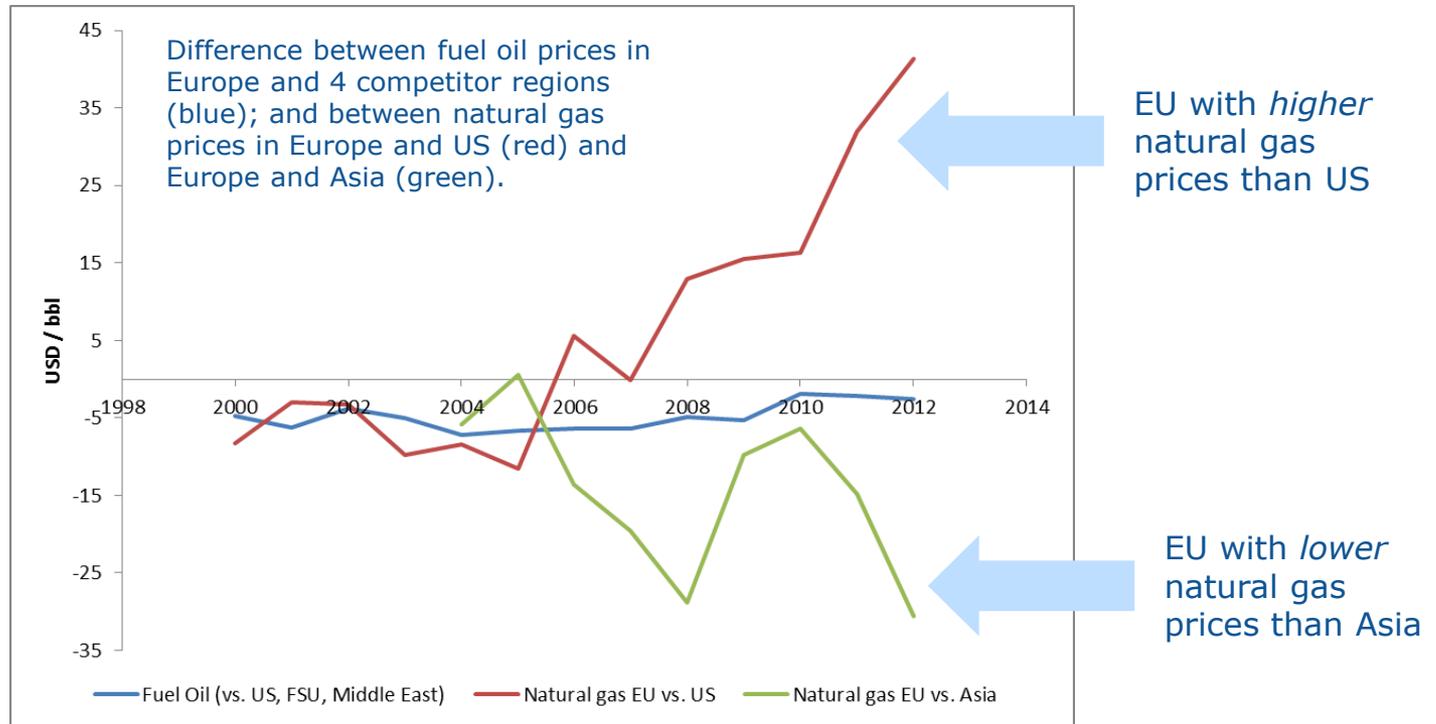
Explaining EU energy cost deterioration



- **No composition effect**

- **3.5-fold increase** in the cost for 1 unit of refining energy,
- **All forms of energy with similar trend:** 3-fold increase for price of electricity, 4-fold for natural gas, 5-fold for heat/steam, 7-fold for liquid/solid fuels, 3.5-fold for own-produced energy
- Natural gas always cheapest form of energy

Explaining EU energy cost deterioration



- Slight appreciation of fuel oil prices in Europe vis-à-vis competitors (against background of 4-fold increase in int'l crude oil prices).
- Natural gas prices increased almost 4-fold in Europe, while in the US the price of 2011 equals that of 2001. But prices in Asia are even higher than in Europe.

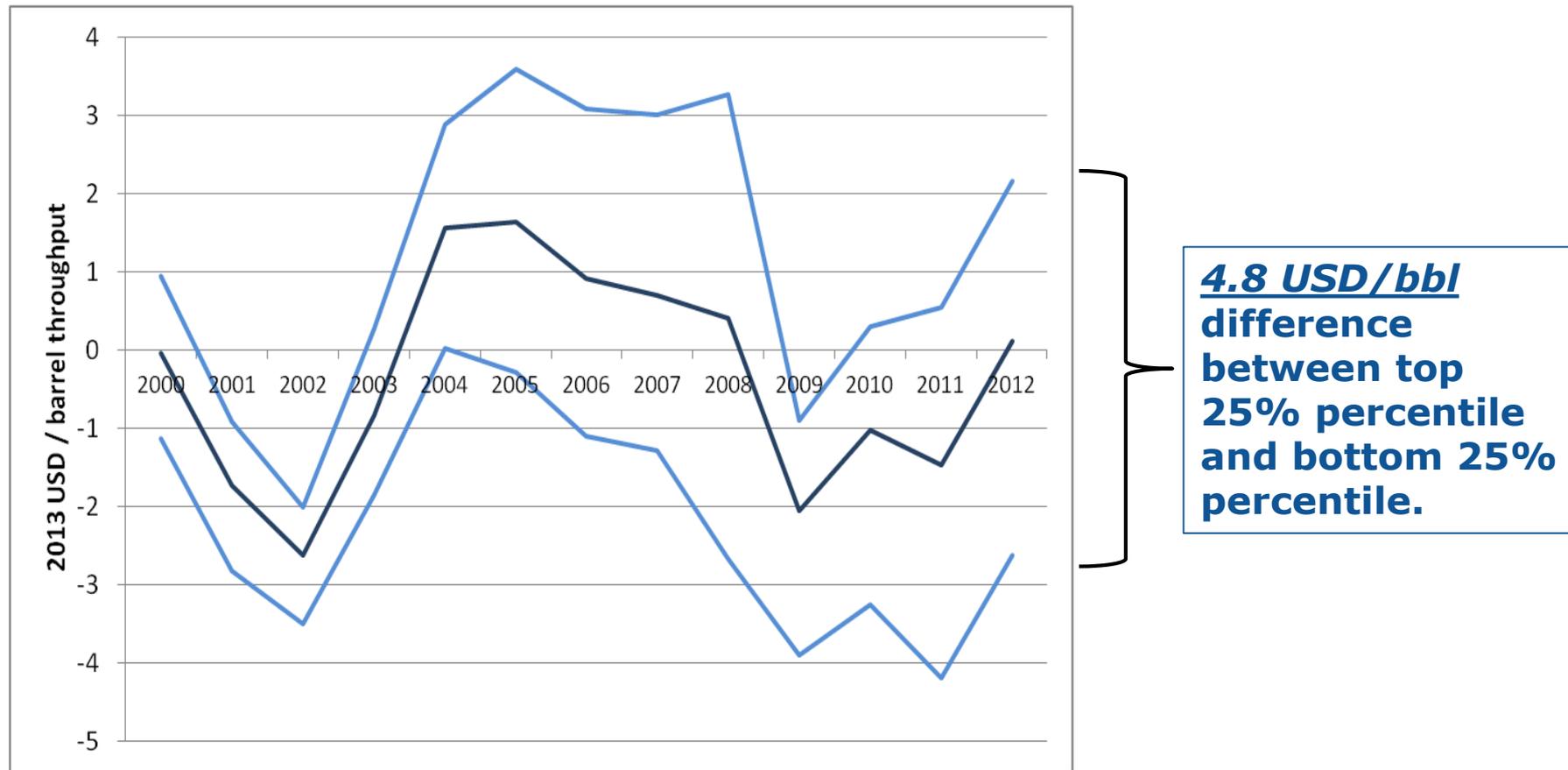
Explaining deterioration of EU energy cost position

Energy costs in Europe may have increased because:

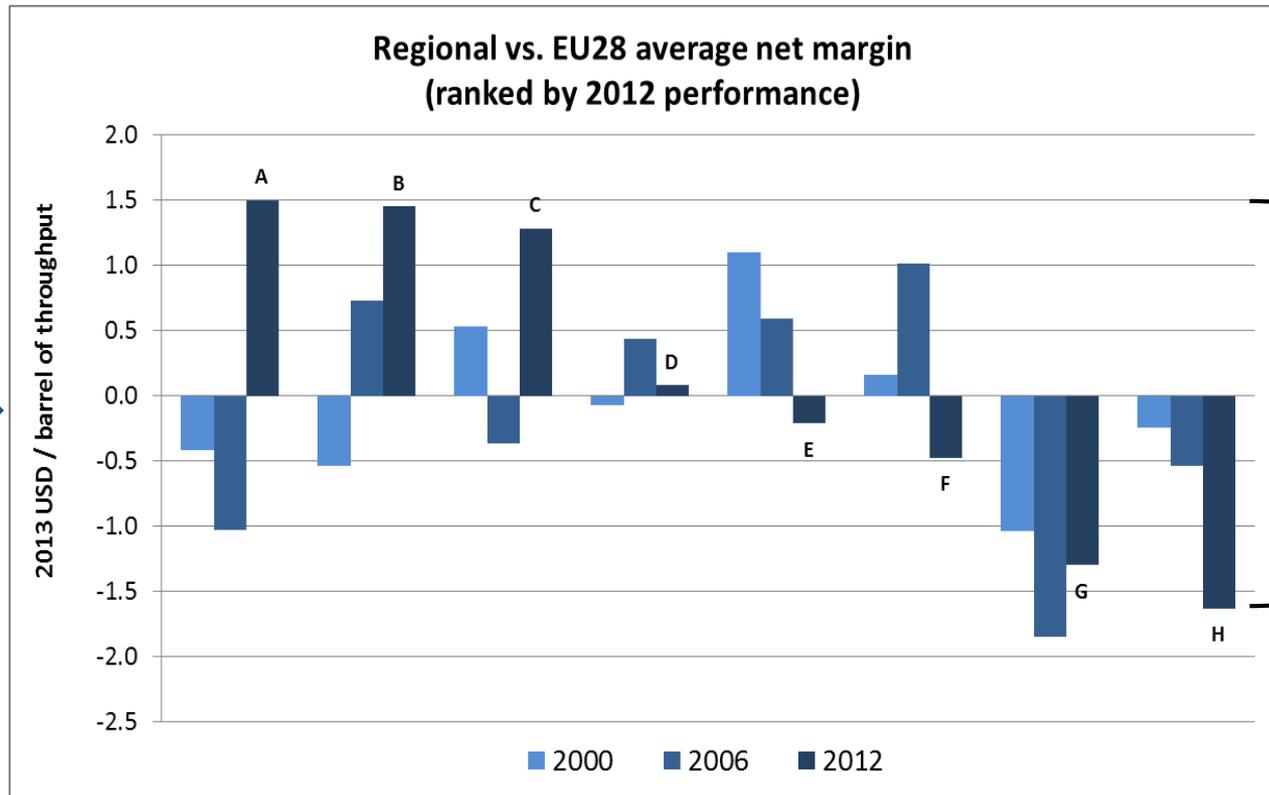
- ~~1) Decreasing relative to competitors energy efficiency (= use of energy per throughput)~~
- 2) Cost increase in Europe – relative to the competitor regions – of 1 unit of energy
 - i. due to price increases
 - ~~ii. due to composition effect, i.e. switch towards more costly forms of energy~~

Variation within EU28 refining sector

EU Performance in terms of net margins has become more variable



EU28 regional refining margins (2012)



Summary of Conclusions

Observed developments in EU28 international competitiveness vis-à-vis US PADD 1 & 3, Middle East, Russia, S.Korea & Singapore.

- Loss of competitiveness: EU margin decrease of 2.1 USD/bbl against competitor regions over 2000-2012;
- The data shows that this loss is due to relative increase in energy costs in EU. In absolute terms, energy costs per barrel have increased almost 4-fold over 2000-2012, while on average less than 2-fold in competitor regions;
- International competitiveness of bottom 50% of EU refineries has suffered more than that of top 50%;
- The performance gap between EU28 refineries has widened: spread between 25% percentile and 75% percentile has more than doubled from about 2.1 to 4.8 USD/bbl;
- Visible performance differences between EU regions: 3.1 USD/bbl.

Summary of Conclusions

Impact of EU legislation on investments in EU refining industry.

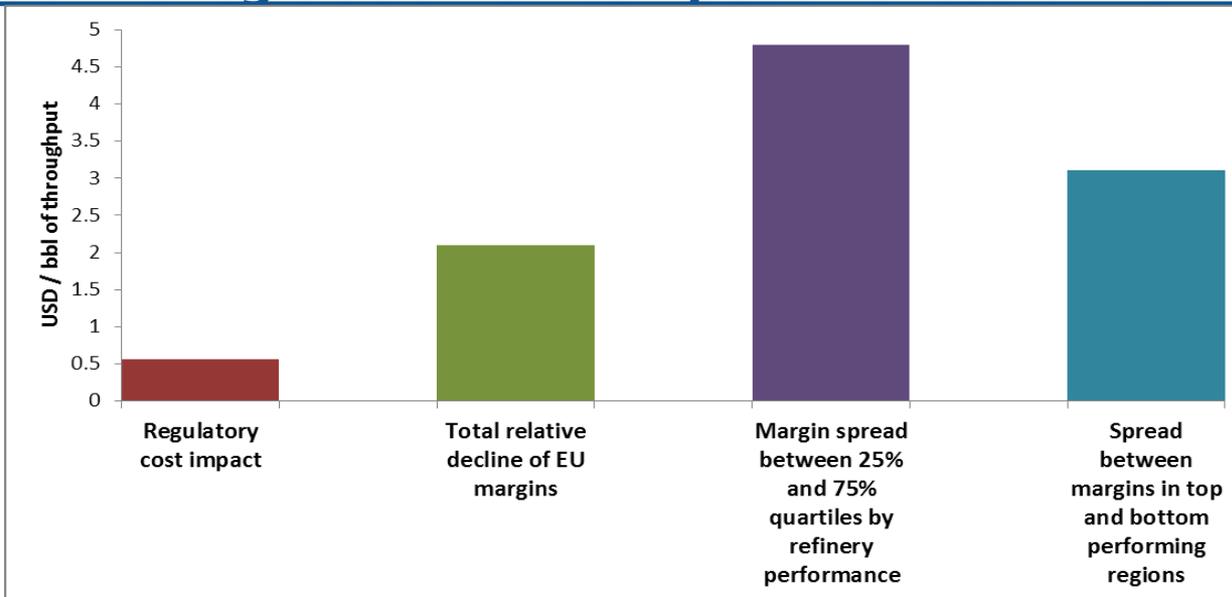
- FQL and IED/LCPD/IPPCD lead to sizable additional investments by refineries in desulphurisation and emission abatement capacities;
- Refineries invested in additional logistic and blending capacities related to compliance with RED;

Has EU legislation contributed to increased refining energy costs?

- Increased energy consumption due to FQL;
- Switch to low-sulphur (generally more expensive) fuel oil for refinery energy due to pollution legislation (IED/LCPD/IPPCD);
- Demand impacts (RED, ETD, IED) contribute to reducing utilization rate (as indicated by OURSE modelling), which lead to foregone revenues and can negatively affect refineries' energy and operating efficiency;
- EU ETS can increase costs of purchased electricity, although its share in average refineries' energy costs is very low.

Summary of Conclusions

The impact of EU legislation on competitiveness of EU refineries.



- Cost impact from regulation is significant, increasing from 2000 to 2008 and appears to stabilise afterwards;
- This impact implies diversion of revenues towards regulatory compliance rather than making other investments that improve the competitiveness. But it corresponds to at most 20% of EU margin decline;
- Other factors seem to have much larger impact on refining margins than regulation, e.g. size, configuration or location.

Summary of Conclusions

Has EU legislation affected EU refineries in a coherent manner?

- The effects of more horizontal pieces of legislation (such as AQD and EED) are likely to be implicitly covered within the impact of more focused regulation with tangible norms and limits;
- The efforts of refineries to meet the requirements of FQL, IED/LCPD/IPPCD and RED directives also contributed to objectives of AQD and EED, which do not address the refining sector specifically;
- The contribution of requirements imposed by EU legislation to increased refining energy use creates the tensions between the objectives towards higher fuel quality and lower industrial emissions on one side and the objectives of decreasing the GHG emissions on the other;
- At the same time the increasing energy costs creates additional incentives for refineries to make efforts towards improving energy efficiency, which is the main objective of EED.

Thank you!

