



# **Can the steel industry pass through carbon costs without losing market shares?**

*Literature review and qualitative analysis –  
Executive summary and synthesis*

**For EUROFER**

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## Executive Summary

The existing EU ETS Directive states that the indicator for the risk of carbon leakage is assessed by “the extent to which it is possible for the sector or subsector concerned, at the relevant level of disaggregation, to pass on the direct cost of the required allowances and the indirect costs from higher electricity prices resulting from the implementation of this Directive into product prices without significant loss of market share to less carbon efficient installations outside the Community”.<sup>1</sup>

The issue of cost pass-through is thus a critical component of a proper understanding of exposure to the risk of carbon leakage, although it is at best an imperfect indicator. Bearing this in mind, the European Commission (“EC”) released in July 2015 an Impact Assessment, which draws on existing literature, to assess the ability of several sectors to pass through costs, in the context of its Proposal to amend the EU ETS Directive to enhance cost-effective emission reductions and low carbon investments. The EC also commissioned a study by CE Delft / Oeko Institut, which was released in November 2015 and assesses the ability of several sectors to pass through costs.

In this context, EUROFER has asked NERA Economic Consulting to investigate, for the European steel industry, what conclusions can be drawn from the existing literature and the latest study commissioned by the EC, and how this relates to the conclusions of the EC in its Impact Assessment.

Where free allocation is used to protect sectors at risk of carbon leakage, there is a legitimate public interest in limiting the extent of any “windfall profit” from the allowances. However, in order to assess the risk of potential windfall profits, the ability to pass-through costs must be assessed *in conjunction with estimates of the impact on market share*. In contrast, our review of the existing literature shows that for the most part it does not address cost pass-through *in conjunction in market share* or that, when it does (Vivid 2014), it is misinterpreted in the Impact Assessment.

Furthermore, the (very limited) existing literature shows the pitfalls of trying to measure ex-post cost pass-through – even when ignoring potential impacts on market share. One should highlight that since CO<sub>2</sub> costs as a share of product prices are low, small changes in key assumptions can drastically change the results. A good illustration is the sensitivity of the estimates from the CE Delft/Oeko-Institut 2015 study, which can range from 26 to 419% by changing one single parameter value. In addition, we have identified major flaws in the data used in the study, which should lead to dismiss the results as inaccurate: the benchmark cost structure used by the authors to convert the results of their study into a cost pass-through corresponds to “*a notional producer - a typical size integrated BOF plant, 3m t/yr, at a Japanese coastal site*” in March 2015, which means that neither the geographical location nor the time period are coherent with the rest of the data (Europe, 2008-2014), and a further bias is introduced by the use of a cost to proxy a price, despite the availability of the latter. It would also be imprudent to assume that any cost pass-through relationship measured during an unprecedented economic crisis and its aftermath could reasonably be applied to the decade after 2020. Even if the modelling were sound it *should not* be used for policy purposes without an analysis of the robustness of the assumptions and the corresponding results.

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<sup>1</sup> Source: COMMISSION DECISION of 24 December 2009 determining, pursuant to Directive 2003/87/EC of the European Parliament and of the Council, a list of sectors and subsectors which are deemed to be exposed to a significant risk of carbon leakage

A qualitative analysis using the criteria identified by the EC's impact assessment (trade exposure, market structure, elasticities) suggests that high cost pass-through would likely result in loss of market share and would likely be detrimental to the European steel industry (which already suffers from low margins, dumping behavior, most notably from Chinese steel producers, and fierce competition from other less environmentally stringent producers). Reducing carbon leakage protection based on poorly justified estimates of ability to pass through costs will also be contrary to the objective pursued by the ETS Directive of limiting CO<sub>2</sub> emissions, which would merely be relocated and not reduce

## Synthesis

The European Commission published in July 2015 an Impact Assessment accompanying the Proposal for a Directive to amend the EU ETS Directive (Impact Assessment). Among other topics considered, the Impact Assessment (IA) presents information about the ability of different industries to pass through carbon costs, including the steel industry. The existing EU ETS Directive states that the indicator for the risk of carbon leakage is assessed by “*the extent to which it is possible for the sector or subsector concerned, at the relevant level of disaggregation, to pass on the direct cost of the required allowances and the indirect costs from higher electricity prices resulting from the implementation of this Directive into product prices without significant loss of market share to less carbon efficient installations outside the Community*”.<sup>2</sup> In this context, the IA assesses options for using free allocation of allowances to protect exposed sectors against the risk of carbon leakage, taking into account their ability to pass-through costs.

In its Impact Assessment, the EC relies on three studies (McKinsey 2006, CE Delft 2010, Vivid 2014). Later on, the EC commissioned an “ex-post investigation of the cost-pass through in the EU ETS”, analyzing six sectors among which the steel industry. This study was only published in November 2015, and does not appear in the bibliography of the EC’s IA.

After analyzing the relevance and robustness of the existing literature, including the recent CE Delft / Oeko Institut study, this report considers market characteristics to comment on the steel sector’s ability to pass-through costs without loss of market share.

An important feature of the EU ETS is that it imposes (opportunity) costs on EU producers, but not on foreign competitors. In this context, estimates of cost pass-through rates, and the analysis of cost pass-through, must refer to a situation in which the cost “shock” or cost increase is *asymmetric*.

All of the analysis we have performed in this report thus considers the specific situation of an asymmetric cost increase and its impact on EU steel producers’ market share. Indeed, focusing only on general ability to pass-through cost, without taking into account the additional requirement set out in the Directive that market share be retained, may result in erroneous conclusions, as ability to pass through cost without loss of market share varies significantly depending on whether the cost increase affects all market players or not. Economic theory suggests that ignoring potential impacts on market share makes it impossible to assess accurately the effectiveness of policy instruments designed to limit the risk of carbon leakage.

As we discuss below, the analysis presented in the Impact Assessment failed to acknowledge that the level of cost pass-through alone is an imperfect indicator of exposure to carbon leakage. Only when impacts on market share (and resulting impacts on profitability) are taken into account can an accurate assessment of carbon leakage risk be made. The Impact Assessment, has completely ignored potential market share impacts when assessing literature estimates of cost pass-through and when applying these to its analysis. Its approach to calculating policy impacts and the potential for “windfall profits” from free allocation therefore does not accurately reflect the likely impacts on the sectors analyzed.

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<sup>2</sup> Source: COMMISSION DECISION of 24 December 2009 determining, pursuant to Directive 2003/87/EC of the European Parliament and of the Council, a list of sectors and subsectors which are deemed to be exposed to a significant risk of carbon leakage

Similarly, the 2015 CE Delft / Oeko-Institut study does not address the issue of cost pass-through in conjunction with market share, rendering the analysis largely irrelevant from a policy perspective. Furthermore, the study suffers from serious shortcomings and is as such not robust enough to conclude on historical pass-through, even without taking market share impact under consideration.

### **The literature quoted or commissioned by the EC is either irrelevant to the current debate or misinterpreted: no evidence of cost pass-through without loss of market share is documented**

The European Commission relies on the results of three studies in its Impact Assessment to assess the ability to pass through costs. While it recognizes that the results from the studies it quotes are not robust enough to draw definitive conclusion<sup>3</sup>, it uses a weighted average of cost pass-through figures in these studies to calculate the net costs of compliance for a selection of energy intensive industries, and thus the risk of carbon leakage. Some of these studies suffer from serious methodological flaws, which we address in the next section. But even setting aside these concerns, none of the cost pass-through rates reported in the studies cited by the Commission are relevant to the question implied by the Directive, which is how much cost pass-through is possible **without** loss of market share.

One study, performed in 2006 by McKinsey, suggests that the steel industry can pass through costs at rates ranging from just 6% (for basic oxygen furnaces) to 66% (for electric arc furnaces), based on expert opinion. The study does not provide any details of the underlying data and hypothesis, so we are unable to comment on the validity of the methodology. **The report does not specifically address the issue of loss of market share associated with cost pass-through.**

The CE Delft study from 2010 reports cost pass-through values of up to 120% for the steel industry based on an ex-post econometric model. We believe there are very significant flaws in the methodology of this study, which we discuss below. Setting these aside, however, even by its own admission, the CE Delft (2010) study does not provide the type of evidence that is required by the Commission in its Impact Assessment. The CE Delft (2010) report notes that: *“the higher prices on the EU markets may have stimulated imports from non-EU producers but this was not quantitatively assessed in this study”*. **As such, this study omits a critical aspect of the analysis of cost pass-through as it is relevant to the question of carbon leakage, and therefore its results are not relevant for the purpose of the impact assessment, which should identify the share of costs than the industry can pass through without loss of market share**

The Vivid study (2014), in contrast, *does* consider market share impacts, and concludes that a high rate of cost pass-through (assumed at a rate of 75-80%) for the steel industry would result in significant loss of market share (the Vivid case study, published at the same time as the Vivid study quoted by the EC, based on the same data, concludes on a loss of market share of 21-22% for a CO<sub>2</sub> cost of 30€/ton in 2020). The results of this study therefore cannot be applied directly to estimates of the ability to pass costs through *without* loss of market share. It appears that the authors of the Impact Assessment have misinterpreted the Vivid study and used these figures as though they were

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<sup>3</sup> *“The values from this table must be interpreted with caution. They provide a range of average expected cost pass rates through based on a review of the literature. In this literature both ex-ante and ex-post estimates have been treated as a single observation from which an average has been calculated. No attempt has been made to correct for the number of regression estimates in the literature.”* Impact Assessment, page 202

estimates of the ability to pass through costs without loss of market share. Overall, our assessment that full cost pass-through of carbon costs by the steel sector could result in significant loss of market share is consistent with the correct interpretation of the Vivid study.

Furthermore, the EC commissioned a study by CE Delft and Oeko Institut, which was published in 2015<sup>4</sup>, after the Impact Assessment, and which finds evidence of cost pass-through for the steel industry ranging from 55% to more than 100%. Like the earlier (2010) CE Delft study, the latest study does not address the issue of cost pass-through in conjunction with market share. The authors are very transparent about this, stating that they “*have not further investigated the extent to which cost pass-through has resulted in a loss in market share or has (negatively or positively) impacted on the profitability of firms*”<sup>5</sup>.

As pointed out by the CE Delft/ Oeko Institut study, “**if costs are passed through there is potential leakage through the trade channel**, and if costs are not passed through there is potential leakage through the investment channel”<sup>6</sup>. It identifies, correctly, that a high cost pass-through rate can in fact be associated with a high risk of carbon leakage, especially if there is available spare capacity in foreign countries and if the product is easily substitutable by foreign ones, both of which are true for the steel industry.

So from the very literature that it has quoted (or commissioned), the EC should come to the conclusion that

- there is no consensus surrounding the ability of the steel sector to pass through carbon costs (6% to 120%) and
- the rates reported in this literature are not directly related to carbon leakage except if studied in conjunction with the impact on market share.

As stated by the 2015 CE Delft/ Oeko-Institut study commissioned by the EC: “*it is important to note that evidence of carbon cost pass-through is not in itself an indicator of carbon leakage risk*”<sup>7</sup>. This is also the position adopted by Vivid Economics: “**Consequently, while the cost pass-through rate is certainly of interest, it should not be the focus of attention for policy makers: it represents an intermediate step to the calculation of the variables that actually reflect the impact on the sector, such as the proportional change in production**”<sup>8</sup>

## Literature on cost pass-through suffers from insufficient robustness

The McKinsey (2006) report does not detail the methodology used, beyond the fact that it seems to be an ex-ante model (which thus didn't measure historical cost pass-through) and the numbers published are thus the result of a “black box” model on which we cannot reasonably comment.

As for the Vivid (2014) study, which is based on ex-ante modelling, it should be noted that data sources are also not provided, but that it relies on strong assumptions, for which no justification

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<sup>4</sup> Ex-post investigation of cost pass-through in the EU ETS, CE Delft – Oeko-Institut 2015

<sup>5</sup> Ex-post investigation of cost pass-through in the EU ETS, CE Delft 2015, page 10

<sup>6</sup> Page 33 of the 2015 “ex-post investigation of cost pass-through in the EU ETS” by CE Delft

<sup>7</sup> Page 10 of the 2015 “ex-post investigation of cost pass-through in the EU ETS” by CE Delft

<sup>8</sup> Vivid Economics: carbon leakage prospects under phase III EU ETS and beyond, page 70

seems to be brought forward. For instance, one key assumption in the Vivid model is the value of the price elasticity of demand, which has a strong influence on cost pass-through rate: Vivid Economics has assumed it to be identical to the one of cement (-0.3) **based on a single non peer-reviewed study<sup>9</sup> by a student at Duke University<sup>10</sup>**, and which was actually **not dealing with the price elasticity of steel but with the price elasticity of iron ore**. This is illustrative of the weakness of the data used to determine key parameters, and strongly suggests that the results as they stand cannot be taken at face value.

It is also worthwhile to note that the Vivid study focuses only on the UK market, and then extrapolates to draw conclusions for the EU28, thereby ignoring the specificities of the UK market. It also focuses only on a subset of products, from which one cannot draw conclusions for a sector as a whole (which the EC also does). Critically, according to Vivid, ***“the model does not take into account the production of semi-finished steel, owing to difficulties in correctly accounting for intra-company transfers. However, two plants in the UK produce only semi-finished steel, and semi-finished steel is observed to be more highly trade exposed than finished steel products (British Steel, 2013). This analysis may thus be understating the trade exposure of the steel sector”<sup>11</sup>***.

Regarding the CE Delft 2010 study, its economic approach had been reviewed by NERA, which had identified a number of concerns. Among others, NERA had uncovered an important omitted variable bias: many relevant variables in the determination of steel prices, such as the price of iron ore or of scrap metal, were excluded in the modelling, seriously biasing the cost pass-through estimates (as these variables were shown to be correlated with CO2 prices). Furthermore, the authors failed to recognize data limitations that seriously undermined the strength of the estimates, for example by failing to find a significant long-term relationship (“cointegration”) between European and US prices for half of the products analyzed, even though the existence of such a relationship is the authors’ main reason for following their approach. Some concerns appear to have been taken on board, as the more recent study by CE Delft and Oeko Institute (2015) for instance incorporated variables for other input prices (iron ore, scrap, coke).

However, the more recent CE Delft / Oeko-Institut study, which also does not address impact on market share, also suffers from significant methodological issues.

As a result of the modelling, the authors of the study conclude that “[...] indicative CO2 cost pass-through rates in North Europe range from 75% for hot rolled coil to 85% for cold rolled coil. In Southern Europe a larger differential can be found where the cost pass-through of hot rolled coil would surpass 100% and for cold rolled coil would equate to 55%”.<sup>12</sup> The actual figure for hot rolled coil in Southern Europe, which the authors refer to as surpassing 100%, is in fact 155%.<sup>13</sup> These results are very counterintuitive given that, during the period of observation (2008-2014), margins of steel makers have declined to a historical low, even reaching negative territory, which is an indication that they are in fact struggling to pass through their costs. It is even more surprising given that the

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<sup>9</sup> Vivid Economics, 2014, case studies, page 91

<sup>10</sup> ZHU, 2012 (graduate thesis), Identifying Supply and Demand Elasticities of Iron Ore

<sup>11</sup> Vivid Economics, 2014, case studies, page 94

<sup>12</sup> Ex-post investigation of cost pass-through in the EU ETS, CE Delft – Oeko-Institut 2015, page 92

<sup>13</sup> This has been obtained by applying the methodology described in the study. Small differences can arise due to rounding, whether published (rounded) numbers or calculated (raw) numbers are used. By using non-rounded figures, the pass-through amounts 152%, while by using published numbers it equals 155%.



sector has suffered (and is suffering) from dumping behavior<sup>14</sup> from producers located in several countries<sup>15</sup> for different steel products, and unfair competition by foreign competitors in the steel sector in general. If foreign competitors are selling at prices below their costs, it is difficult to see how domestic producers would be able to pass through costs that the foreign competitors do not even face themselves. In consequence, a 155% pass-through for an asymmetric opportunity cost (i.e., one that has not been incurred in cash flow or accounting terms) seems implausible in this context.

Upon further examination, the CE Delft / Oeko Institut study suffers from three critical flaws, which should lead to dismiss its results:

- The authors determine the cost pass-through rate by comparing the production costs of a Japanese plant in March 2015 (which is used as a proxy of European product prices) with the average carbon price in the period 2008-2014. Firstly, using Japanese production costs as a proxy of European product prices is not appropriate. Secondly, the time-line of the comparison is not consistent, as two different periods are considered (2008-2014 vs. 2015). Thirdly, the average carbon price of the period 2008-2014 is considered as constant, which does not take into account the significant variations over the period (from 3.5 to 23.5 EUR/ton CO<sub>2</sub>). Finally, a crude estimate of the emission factor is used, to which the model is very sensitive. A simple sensitivity analysis of the choice of parameter values for carbon intensity, the price of carbon emissions and the price of output using available data or data suggested by CE Delft / Oeko-Institut results in values for carbon cost pass-through ranging from **26% to 419% by simply changing one parameter within the range suggested by the authors, and up to 570% when combining different values**. When correcting the input data, the CO<sub>2</sub> cost as a share of total cost falls at a critical level, which according to the authors should have led to a different approach given that the results would be too sensitive to be considered robust. **The use of poor data for this stage of the approach leads to imprecise estimates and is in itself sufficient to dismiss the conclusions for the steel industry.**
- The final sample period chosen by the authors (August 2008 – December 2014) is a very particular period as it includes a 50% drop in output prices due to an unprecedented economic crisis, but omits a significant increase in prices that immediately preceded the sharp decline. In addition to reducing the number of observations to a critical level, **this calls into question the appropriateness of applying the resulting ex-post cost pass-through relationship to subsequent (non-crisis) periods, and thus seriously weakens the case for generalizing the results to subsequent ETS phases**. Furthermore, the theoretical model estimated in the study assumes that input cost shares are constant, which is simply untrue for steel when the sample period includes an

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<sup>14</sup> The economic definition of dumping refers to a situation where foreign producers are selling below their production costs in a given market. As production costs in foreign countries could be unobservable, the definition from the EC rather uses product prices (i.e. not production costs), as the EC specifies that: “A product is considered as being dumped if its export price to the EU is less than its normal value. The normal value is usually the market price for the product in the exporting country.” (EC Anti-dumping measures conditions – URL: [http://trade.ec.europa.eu/doclib/docs/2013/april/tradoc\\_151016.pdf](http://trade.ec.europa.eu/doclib/docs/2013/april/tradoc_151016.pdf)) . In order to receive compensation, producers should also demonstrate material injury (Condition 2), a causal link (Condition 3) and the Community interest (Condition 4).

<sup>15</sup> Countries under antidumping measures and investigation as of December 2015 are: China, Japan, Russia, South Korea, Taiwan and the United States.

economic crisis with a corresponding drop in capacity utilization with major shifts in input cost shares.

- The choice of variables in the estimated equations for each product category is inconsistent. As an illustration, the price of iron ore for EU producers is measured by iron ore **from Brazil to the Netherlands** for 3 out of 4 product categories, but the authors appear to have used the **import price of ore to a port in China** for cold-rolled coil in Northern Europe (see Tables 15 and 16 of the report). The appropriateness of using a Chinese import price as a proxy for the EU import price requires justification, particularly given the use of another ore price for the three other regressions. Similarly, the timing of the effect of the price of scrap and of carbon emissions is allowed to differ across product categories: the results kept by the authors consider that the impact of an exogenous shock of scrap prices on the price of steel is felt with zero delay except in the case of hot rolled coil in Southern Europe. Similarly, a change in the price of CO<sub>2</sub> is assumed to affect the price of steel with a one-period lag for cold rolled coil in Southern Europe, a two-period lag for cold rolled coil in Northern Europe, and a three-period lag for hot rolled coil in Northern and Southern Europe. Given that most of the steps in the BOF production process are identical between cold and hot rolled coil (up to the latter), it is hard to imagine any real-world specificities or idiosyncrasies that would justify such a different time span. The authors do not comment on this. **This highlights that the final specification across product categories is inconsistent and ad-hoc, and is not justified by any theoretical/factual argument.**
- The authors choose to simplify their model and to use only four dynamic variables to explain steel prices (price of iron ore, of scrap, of CO<sub>2</sub> and of coke) by arbitrarily dismissing labour, and ignore the sector-specific nature of capital costs by using market-wide interest rates as proxy, which is (at best) very imperfect. **The model thus suffers from omitted variable bias as long as the correlation of the absent input prices with CO<sub>2</sub> prices has not been ruled out.**

On top of these issues, the study neither presents key statistical tests of robustness nor any sensitivity analysis, so it is not possible to check the robustness of the analysis.

As a result, the CE Delft / Oeko Institut study cannot reasonably be used to frame the debate on cost pass-through as the results presented are unlikely to be an accurate reflection of actual cost pass-through of the steel industry in any way.

## **Factors identified by the Impact Assessment**

The European Commission in its 2015 Impact Assessment (IA) identifies three main factors affecting how much a sector “may” pass through its costs: market structure, demand and supply elasticity and trade intensity.

Given that the existing literature does not provide robust and relevant conclusions regarding the steel sector’s ability to pass-through carbon costs, we have reviewed the steel sector’s ability to pass through costs in light of the three factors identified by the EC in its Impact Assessment (trade intensity, market structure, demand and supply elasticity), taking into account the specific features of steel markets.

While the analysis is based on the three broad criteria identified by the EC, it expands on these to include points missing from the Impact Assessment: for instance, when analyzing elasticities, we have

also included Armington elasticities in addition to supply and demand elasticities. We have also tried to move beyond the sometimes simplified micro-economic framework used in the EC's reasoning to make it more relevant to the steel industry. Furthermore, our analysis systematically addresses pass-through ability of an *asymmetric* cost increase, in conjunction with the impact on market share.

## Trade exposure

The steel sector has significant exposure to trade, which is recognized by the European Commission's analysis. Trade intensity for the manufacture of basic iron and steel and of ferro-alloys (NACE 24.10) reached 24% in 2014.

Exposure to international trade means that European steel producers compete directly with non-European producers, which operate outside the EU ETS and therefore do not bear the costs that it imposes. If a cost increase does not affect *all* suppliers in the market, those affected by the cost increase (i.e., the European producers) will pass through less of it than if the cost increase was common to all suppliers – and they may pass through none at all in competitive markets without capacity constraints. In fact, international trade flows in the steel industry seem particularly sensitive to environmental regulation. In a research working paper published by the World Bank in 2004, steel production was found to be the only industry in which the stringency of environmental regulation had a statistically significant, negative impact on net exports.<sup>16</sup>

Exposure to foreign competition is also likely to persist or even expand in the near future, since despite a glut of worldwide capacity, capacity is still being expanded in all markets (except the EU28).

This exposure to foreign imports has been recently aggravated by global overcapacities in the steel sector, resulting in fierce competition and often dumped imports, most notably from China. The European Commission has recognized the harm of this behavior on European producers.<sup>17</sup> In a context in which some producers are selling at below their variable cost, it is difficult to justify the conclusion from the Impact Assessment that steel producers are able to pass through costs without loss of market share, especially at a time when maritime shipping costs have reached an all-time low.

Given the high exposure to trade of the steel industry, passing-through costs would likely result in loss of market shares.

## Market structure

The ability to pass through cost with no significant loss of market share is related to the nature of competition at hand in the market, which impacts pricing strategies. In addition to relative bargaining power, analyzed through the concentration level of the steel industry and its upstream and downstream markets, industry characteristics are key to understand the ability to pass through costs without loss of market share: for instance economic theory indicates that fierce competition, which is associated with low margins, can be expected to lead to higher cost pass-through where all producers face the cost increase, as producers cannot afford to decrease their margins. However, the opposite is true, i.e. low pass-through levels, if the cost increase affects only some producers – as is the case with carbon costs – because fierce competition is associated with a high degree of contestability by

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<sup>16</sup> Busse, M. (2004), "Trade, Environmental Regulations and the World Trade Organization, New empirical evidence", World Bank Policy Research Working Paper 3361

<sup>17</sup> Anti-dumping and anti-subsidy measures list of EC Trade as of 31 October 2015

producers who do not face the cost increase. Also, an analysis of the market structure at a given point in time is not sufficient to assess the ability to pass through costs without loss of market share: to be relevant, such an analysis must take into account future trends, as market structure can change rapidly over time.

Competition in the steel market is driven to a large extent by the search for economies of scale. This shared incentive to increase capacities has led to a lasting overcapacity situation worldwide: capacity utilization in Europe is on average 10 points lower over the past five years compared to the 2000-2008 period (given the economies of scale and competition based on capacity utilisation, it is rational for each producer to prefer volume over prices, resulting in overcapacity and limited pass-through). World overcapacity is estimated at 704 million tonnes of crude steel in 2014, which is more than four times the entire EU production estimated at 166 million tonnes. In fact, overcapacity in China itself, at 379 million tonnes in 2014, could substitute the entire EU28 production for the same year (169 million tonnes) as it is more than 2.2 times larger.

This glut of capacity has led producers to decrease prices since steel pricing strategies are driven to a large extent by the willingness to maintain capacity utilization sufficiently high to remain competitive: as in many high fixed costs production processes, high capacity utilization allows to spread these costs over a larger number of units, thereby decreasing unit costs. Furthermore, capacity doesn't adjust quickly to downturns because of high exit barriers (dismantlement costs, environmental clean-up, labor costs, etc.)<sup>18</sup> and because steel producers do not have the option of shutting down a plant and reactivating it a few months or years later to drive up utilization at other units, since blast furnaces cannot be shut down temporarily (i.e. any capacity taken out of the market results in very substantial loss of the sunk investment).

Competition in the steel industry is global, and the market for steel products shows a low level of market concentration (the top 10 producers in the world accounted for just 27% of production in 2014). This contrasts with the high concentration of upstream suppliers of the industry (4 companies account for 71% of the iron ore shipments in 2014).<sup>19</sup> The combination of fragmented steel producers, overcapacity resulting from a drive for economies of scale and very concentrated upstream suppliers has resulted in the steel industry globally seeing its share of profits within the steel value chain reduced significantly over the years, indicating a progressive but significant decrease in its bargaining power.<sup>20</sup> For European producers, this has been compounded by an inability to remain competitive on many markets relative to other steel producers: since 2000 the European steel industry has seen its share of worldwide production decrease from 23% to 10% in 2013: despite a growing global market, especially in traditional EU export markets, production of steel in the EU28 has decreased by 14% between 2000 and 2013 and while steelmaking capacity is still growing globally it is declining in the EU.<sup>21</sup>

Steel producers are in no position to enforce asymmetric cost pass-through in many of their markets as many clients have a worldwide sourcing organization, so the diverse uses of steel are faced with

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<sup>18</sup> OECD (2015), "Excess Capacity in the Global Steel Industry and the Implications of New Investment Projects", OECD Science, Technology and Industry Policy Papers, No. 18, OECD Publishing

<sup>19</sup> Mining Giants' Push for Iron Ore Tests Mettle of Smaller Miners, Wall Street Journal, July 22<sup>nd</sup> 2015

<sup>20</sup> Competitiveness and challenges in the steel industry, McKinsey for the OECD Steel committee, 74<sup>th</sup> session, July 2013

<sup>21</sup> OECD (2015), "Excess Capacity in the Global Steel Industry and the Implications of New Investment Projects", OECD Science, Technology and Industry Policy Papers, No. 18, OECD Publishing

highly contested markets. Furthermore, the increase of indirect steel imports, with indirect trade of steel multiplied by six over the last decade, is a sign that Europeans consume more finished products containing steel that are fully produced outside Europe, which means the industry also faces the risk of indirect carbon leakage: carbon leakage can be assessed not only by looking at flows of steel, but also at the flows of products containing steel.

The current low margins in the EU steel industry are evidence of a very limited ability to pass-through asymmetric costs: if the industry is not in a position to achieve sufficient profitability without being faced with significant carbon costs, it is likely to be unable to increase its prices to pass on significant carbon costs without losing market shares. And an inability to pass-through the full cost would be a further drag on margins, which is also associated with investment leakage: if margins are insufficient new capacity investments are realized outside of the EU, while plant closures affect EU producers. If this leads to EU exports being replaced by domestic production in third countries or results in more steel being imported in the EU, the consequence of low margins is carbon leakage. In fact, the OECD expects the EU to be the only market in which capacity decreases between 2013 and 2017, while it is increasing in nearly every other market. An asymmetric increase in prices for EU producers would thus only amplify the phenomenon.

Given these features of the steel market structure, high pass-through would likely be associated with loss of market share.

## Supply and demand elasticities

The EC impact assessment takes for granted that inelastic demand is a good indicator of a high ability to pass through costs. The economic literature usually states that the steel industry exhibits relatively inelastic demand in the short-run, given its relatively low product substitutability in the short term, which is a common feature for many industrial materials<sup>22</sup>. However, in the context of concerns about carbon leakage, these observations about demand elasticity are largely irrelevant. Indeed, demand elasticity faced by EU producers cannot be assessed without taking into account *cross price* elasticity of competing products and producers. In the context of international trade, these elasticities are often referred to as “Armington elasticities”.<sup>23</sup>

Armington elasticities are a measure of the extent to which domestic production can be substituted by imports in case of a price increase. In both the short run and long run, Armington elasticities of steel products are relatively high (based on the studies we have reviewed, steel products have the highest elasticities compared to other products). This reflects the fact that steel is traded as a commodity complying with global standards, meaning demand can be served by either foreign or domestic producers.

On the supply side, the impact assessment is correct when stating that supply elasticity can affect rates of pass-through – but its impact depends on the nature of the market. The market structure discussed above, including the significant global overcapacity (Chinese overcapacity is superior to the entire EU production), implies that supply is very elastic as production can be increased by simply increasing capacity utilization instead of requiring significant new investments. Moreover, asymmetric

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<sup>22</sup> See for instance CEPS special Report: the steel industry in the European Union, N.80, December 2013: “Steel is an intermediate good, characterized by a derived demand which is inelastic in the short run, so that changes in price affect only marginally the overall amount of steel that can be sold worldwide”

<sup>23</sup> Armington, Paul, 1969, "A Theory of Demand for Products Distinguished by Place of Production", International Monetary Fund Staff Papers, XVI (1969), 159-78

cost increases can be expected to change the shape of the supply curve, so conclusions based on historical supply elasticity are unlikely to be accurate.

When these elements are taken in conjunction, the third criterion of the Impact Assessment suggests that passing through CO<sub>2</sub> costs would likely result in loss of market share.

## **Our assessment**

The literature used by the Commission for the most part does not address cost pass-through in conjunction with market share, or when it does (e.g. Vivid 2014), it is misinterpreted by the European Commission.

One must not lose sight of the fact that the relationship between carbon leakage (direct and indirect) and cost pass-through depends critically on output levels and market share. Where free allocation is used to protect sectors at risk of carbon leakage, there is a legitimate public interest in limiting the extent of any “windfall profit”. But the extent of any windfall profit depends not on prices and cost pass-through *on their own*, but on the combination of these with impacts on output and market share. Thus, in order to guard against potential windfall profits from the free allocation of allowances, the ability to pass-through costs must be assessed *in conjunction with estimates of the impact on market share*.

Furthermore, the (limited) existing literature shows the pitfalls of trying to measure ex-post cost pass-through – even when ignoring potential impacts on market share. One should highlight that since CO<sub>2</sub> costs as a share of product prices are low, small changes in key assumptions can drastically change the results. A good illustration is the sensitivity of the estimates from the CE Delft/ Oeko-Institut 2015 study, which can range from 26 to 419% by changing one single parameter value. In addition, we have identified major flaws in the data used in the study, which should lead to dismiss the results as inaccurate. For example, the benchmark cost structure corresponds to “*a notional producer - a typical size integrated BOF plant, 3m t/yr, at a Japanese coastal site*” in March 2015, i.e. neither the geographical location nor the time period corresponds to the producers covered in the study. It would also be imprudent to assume that any cost pass-through relationship measured during an unprecedented economic crisis and its aftermath could reasonably be applied to the decade after 2020. Even if the modelling were sound it *should not* be used for policy purposes without an analysis of the robustness of the assumptions and the corresponding results.

The qualitative analysis using the criteria identified by the EC (trade exposure, market structure, elasticities) carried out in this paper suggests that high cost pass-through would likely result in loss of market share and would likely be detrimental to the European steel industry (which already suffers from low margins, dumping from China and competition from other less environmentally stringent producers). Reducing carbon leakage protection based on poorly justified estimates of ability to pass through costs will also be contrary to the objective pursued by the ETS Directive of limiting CO<sub>2</sub> emissions, which would merely be relocated and not reduced.

## **Report qualifications/assumptions and limiting conditions**

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