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Some observations on EITE Industries, NAMAs, and Competitive Effects

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OVERVIEW

International negotiations regarding a post-2012 framework have developed the idea of Nationally Appropriate Mitigation Actions (NAMAs), using concepts borrowed from previous work on sectoral approaches. Much of these discussions concern energy-intensive industries in developing countries that can undertake actions to improve energy intensity and reduce GHG emissions. Such approaches, it is thought, offer some of the more cost-effective and readily-implementable ways in which developing countries can contribute toward global GHG improvement.

At the same time, some of these energy-intensive industries are trade-exposed ("EITE industries"), where international competition is sensitive to cost variations that GHG mitigation and carbon pricing could bring. Such trade concerns have been an obstacle for some developed countries contemplating national programs, and have also figured into policy deliberations on financial support to the developing countries.

These trade concerns also pose potential environmental implications. If an unlevel carbon playing field exists, it is argued, trade shifts can lead to economic and job losses, and that the environmental gains in one country may be nullified as a result of carbon leakage.

In this paper, we present some notes and thoughts on EITE industries, NAMAs, and potential competitive effects. For a developed country, the overarching question being addressed here – at its bluntest – is "Why should we help a competitor country if it results in our own economic harm?"

In exploring these topics, our starting point is the "status quo", defined here as a Kyoto-type framework under which developed country parties have emission reduction targets and carbon price signals. In contrast, developing countries do not have reduction obligations but have opportunities under the Clean Development Mechanism (CDM) to earn market prices for GHG reductions. We compare different approaches to this status quo to examine whether trade imbalances are made better or worse.

Under this status quo, we see two forms of potential competitive differences. For industries in countries with CO_2 market prices, there are costs incurred for in-system actions taken, as well as potential costs for emissions remaining after in-system actions are taken. And for industries in countries without such requirements, the CDM system presents opportunities to gain revenues in excess of their project costs.

The net effect on trade from NAMAs hinges upon whether the assistance is more than or less than the incremental costs of mitigation. When assistance is limited to no more than the incremental costs, such as with supported NAMAs, it should not worsen a trade imbalance caused by unequal carbon prices. However, when assistance is rewarded on a market price basis, such as in traditional offset markets, and the incremental costs are less than market prices, there is potentially a competitive effect. However, when credit-generating NAMAs are used in a tiered architecture after first undertaking unilateral actions and supported NAMAs, the potential producer surplus and associated trade impacts are much less than under the current status quo.

SUMMARY OF OBSERVATIONS

- Environmental comparability does not necessarily equate to trade comparability. In addition to costs incurred for GHG reduction activities, there may be costs to a producer for the allowances needed to cover remaining emissions. Where not covered by allowance allocation or similar mechanisms, the allowance costs to the producer are likely to be significantly greater than the costs for reductions.

- When some producers need allowances for their remaining emissions, but others do not, a cost difference is created even at equal carbon prices. For most industries, energy costs are not the dominant factor. But for some EITE industries, carbon pricing can potentially cause competitive shifts and GHG leakage.

- To the extent that trade flows are affected, production can potentially shift from a country with CO_2 prices to a country without (or with lower) CO_2 prices. Unless various policy tools are used to mitigate such shifts, this can also cause shifts in production and employment away from capped countries.

- If trade flows are affected, there are two types of potential GHG leakage effects: efficiency-related and regulatory-related. *Efficiency-related leakage* effects refer to the GHG changes due to the relative differences in energy & transport efficiency and the net change in GHG emissions may be either positive or negative. There is also a *regulatory-related leakage* that results when the trade moves away from a country subject to emission caps, and toward a country without caps; this effect is generally negative, resulting in overall greater GHG emissions.

- Absent globally-harmonized carbon price signals, the question then becomes one of identifying strategies and potential policies to mitigate the trade impacts and GHG leakage from these carbon pricing differences. There are a few tools available, though none are perfect. These include grandfathered allowances, output-based rebates, border tax adjustments, and creation of carbon price signals.

- The prospect of providing assistance to developing countries, particularly for energy-intensive trade-exposed industries, has raised tension in domestic industries worried about a loss of competitiveness. This concern is largely separate from the effect of domestic GHG reduction costs and domestic carbon prices. In general, paying for a portion or even all of the incremental costs should not result in an improvement in the competitive position of the recipient.

- Unilateral actions and supported NAMAs, by providing forms of assistance that do not exceed incremental costs, should not adversely affect competitive balance and GHG leakage. However, a credit-generating NAMA, by compensating at a market price for GHG reductions that might exceed incremental costs, potentially could have competitive effects, giving an advantage to the recipient.

- The evolving analyses of Nationally Appropriate Mitigation Actions, together with the knowledge that mitigation abatement costs span a range from the negative cost to the higher cost, suggest an architecture that can leverage public financing, achieve greater GHG reductions, and minimize potential trade impacts. *Unilateral Actions* would be directed toward negative cost actions, while *Supported NAMAs* would be directed toward other lower-cost mitigation actions. *Credit-generating NAMAs* would be directed toward the higher-cost actions, and would follow the formulation of unilateral actions and supported NAMAs.
- Even though assistance with incremental costs should not worsen a trade imbalance, we can identify forms of assistance that are inherently more benign, even to the EITE industries. These include vintage and size preferences, locational preferences, technology development such as CCS, and NAMA structures that encourage the developing country to pay a higher portion of the incremental costs.
- NAMAs and other forms of assistance can also be designed to *improve* trade imbalances resulting from unequal carbon prices. By incentivizing the producer to see and take into account a carbon price signal for production at the margin, the carbon playing field becomes more level. A NAMA that creates a cap-and-trade system is one means to this end. Similarly, a developing country's adoption of carbon taxes or export tariffs for the industry could achieve similar effects, as could some forms of credit-generating NAMAs. Additionally, by creating carbon price signals, these actions are supportive of the longer-term objective of global carbon prices.

I. How Can the Status Quo Create Competitive Differences?

Under a Kyoto-type framework, developed country parties have emission reduction targets, and these create costs for carbon emissions. Developing countries do not have those responsibilities under Kyoto, and do not face comparable costs. Further, developing countries have opportunities under the Clean Development Mechanism (CDM) to undertake GHG reductions and earn revenues in excess of costs. Both the costs of the developed country obligations and the potential developing country benefits under CDM can be a source of competitive difference for energy-intensive, trade-exposed (EITE) industries. Let us examine both of these components of the status quo.

To illustrate this difference, consider Figure 1(a). This figure depicts an "emissions reduction supply curve" for a company (or an entire industry), and is also known as a "marginal abatement cost" (MAC) curve. In this figure, the X-axis denotes the percent of the facility's CO_2 reductions (ranging from 0 to 100 percent), while the Y-axis denotes the marginal cost per ton for these reductions. The sloped line, or MAC curve, is the cost of in-system GHG reductions. The MAC curve does not include potential reductions from offsets, and the shape is specific to each facility and industry.

Figure 1
Effects of CO_2 Pricing

A. Illustrative MAC Curve

B. Cost for Industries in Developed Countries: (1) in-system costs (2) costs for CO_2 remaining emissions

"Costs" for remaining CO_2 emissions are those seen by a firm or an industry. On a national basis, such costs would be seen as transfer payments

C. Costs and Potential Producer Surplus for Industries with CDM Projects

Figure 1(b) describes the situation for a company (or an entire industry) in a developed country that has adopted a GHG reduction requirement, such as a carbon tax or cap-and-trade program. For this example, we assume the GHG reduction program results in a market price of $20 per ton for CO_2 emissions, and that 30% of the emissions could be reduced for under $20/ton. As shown in Figure 1(b), the company or industry will see two types of costs:

1. ***In-System Costs.*** In a CO_2 market system, it'd make sense for the facility to undertake in-system CO_2 reductions actions up to the $20 price. By taking in-system actions, CO_2 reductions are achieved at a cost less than the market price. The facility's cost for undertaking in-system actions is shown as the shaded triangle under the MAC curve. (The actual shape, of course, depends on the shape of the specific MAC curve.)

2. ***Costs for Remaining Emissions.*** When there is a market price on CO_2, emissions remaining after the in-system actions have been taken also have a cost. We saw that in reading left to right, the X-axis shows the percent of CO_2 reductions, ranging from 0 to 100%. But, as shown in Figure 1(b), that same X-axis, when read right to left, also describes the CO_2 emissions remaining after reductions have been made. In this example, a 30% reduction leaves 70% of emissions remaining. (At any point along the x-axis, the % reduced + % remaining = 100%.)

   Generally, it is the producers' cost of allowances for *remaining* emissions that creates the biggest potential cost. The likely extent of GHG reductions, coupled with geometry of the shapes (triangles vs. rectangles), make it probable that the allowance cost for the GHG emissions will exceed the in-system costs for making GHG reductions.

For this example, the CO_2 price was assumed to result from a cap-and-trade program or a carbon tax. It in turn drove the extent and cost of the facility's in-system reductions, where the remaining emissions could be more economically dealt with by purchasing allowances or paying the carbon tax.

If some of the emission allowances are allocated rather than purchased, the overall cost to the producer is lessened but the economic incentives remain the same. If the in-system actions produced more reductions than were needed, then the facility would have extra allowances for sale. Conversely, if those actions were not enough, then it would be cheaper to buy additional allowances on the market than to do so in-system.

If a developing country does not have reduction requirements or a CO_2 market price, producers in that country may not face the costs for in-system actions (depending upon other policies and requirements that may be in place), and will not face the costs for the remaining emissions. These differences in costs faced can create competitive differences for some EITE industries. As described later in this paper, there are a few policy tools available – such as grandfathered allowances and output-based rebates – that can help to reduce these potential competitive differences, though none are perfect.

There is a second source of competitive differences under a Kyoto-type framework, this one originating in other countries without reduction requirements. Specifically, CDM makes it possible for some EITE industries to undertake GHG reductions and earn revenues in excess of costs. This can be seen in Figure 1(c). Assuming that CDM projects are desirable up to the CO_2 market price, CDM developers will undertake in-system projects up to that price. Their cost for those projects is the area under the MAC curve, much as the in-system costs for companies in countries with CO_2 market prices. However, the revenue is equal to the market price times the tons reduced. Since some of the reductions are made at a cost less than the market price, there is a producer surplus, equal to the amount of revenue in excess of incremental costs. Potentially, this producer surplus could enhance their competitive position.[1]

Hence, under the status quo, we see two forms of potential competitive differences. For industries in countries with CO_2 market prices, there are costs for in-system actions taken, as well as potential costs for emissions remaining after in-system actions are taken. And for industries in countries without such requirements, the CDM system presents opportunities to gain revenues in excess of their project costs.

II. DO COMPARABLE GHG STANDARDS MEAN THE SAME THING AS "LEVELING THE CARBON PLAYING FIELD"?

It has sometimes been said that for EITE industries, GHG-related trade concerns could be addressed if comparable levels of GHG stringency were adopted by all. By having similar performance of energy intensity or GHG intensity, some have argued, no country would see a trade advantage resulting from GHG requirements.

But this view is incorrect, because it is incomplete. Environmental *performance* comparability is not the same as environmental *trade* comparability. When carbon emissions are priced, there are two potential types of direct costs, as was seen in Figure 1(b): (1) the cost of mitigation actions taken to reduce emissions, and (2) the cost of allowances to cover the remaining emissions.

For facilities with CO_2 prices on emissions, both of these costs are potentially applicable. Unless offset by free allowances or other policy tools, the cost of allowances is likely the bigger of these two cost components.

What would be the effect for a facility in a country not subject to CO_2 pricing, but participating in a comparably stringent GHG reduction program? For example, instead of price-driven mitigation actions, what if specific technologies or performance standards were imposed? In that situation, the in-system reductions would be comparable, and we

[1] The CDM market has both developers of projects and financial intermediaries who broker transactions. The potential producer surplus is shared between them in varying proportions depending upon market conditions and bargaining power. It does not necessarily follow that the developers receive the producer surplus, and accordingly we say that their competitive position is "potentially" enhanced.

would expect the same environmental benefits. Similarly, there would be comparable costs for these in-system reductions.

But as seen in Figure 1(b), this environmental comparability is only a portion of the economic dynamics. What's *not* comparable is the treatment of the GHG emissions remaining after the in-system actions have been taken. For a facility with a CO_2 price on emissions, the remaining emissions (70% in this example) require allowances at a market-clearing price, or carbon tax rate. (While these allowance costs are viewed as financial transfers within the country and not costs for the economy as a whole, they are marginal costs to the producers.) However, facilities not facing a CO_2 price on emissions would not be burdened with this extra cost.

Even with comparable environmental rigor, it is the producers' cost of allowances for *remaining* emissions that poses a potential cost disparity. Unless policy tools such as free allowances are applied, environmental costs for producers in one country could be higher than in another. Hence, environmental comparability does not necessarily mean economic and trade comparability.

III. CAN DIFFERENT CARBON PRICES AFFECT TRADE?

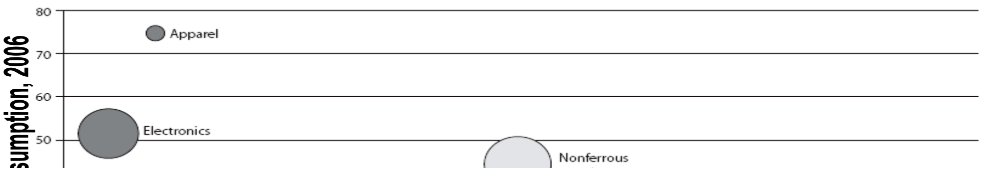
As described above, the cost of allowances for the remaining GHG emissions can create a competitive difference, even more so than the cost of in-system reductions. That is, facilities subject to CO_2 pricing will see higher costs, which are generally not present for facilities not facing CO_2 pricing.

Can this affect trade? Maybe. The extent to which trade may be affected depends upon several factors, including the product's GHG intensity, the cost of CO_2 allowances, the CO_2 costs relative to product value and transport costs, and other policies & measures.

For most industries, energy costs are not the dominant factor. But in some energy & carbon-intensive industries, carbon pricing could potentially lead to competitive shifts and GHG leakage. These so-called energy-intensive, trade-exposed (EITE) industries generally have a high energy cost (or associated carbon costs) and a high percentage of traded products in international markets. While different metrics have been applied in analyses of U.S. and European markets, the results show that only a relative handful of industries appear to be particularly exposed. These industries include iron and steel, cement, aluminum, refineries, certain chemicals, and others. Figure 2 shows the results for one analysis of U.S. industries potentially at risk.

To the extent that trade flows are affected, production can potentially shift from a country with CO_2 prices to a country without (or with lower) CO_2 prices. When this happens, emissions and employment likewise shift away from capped countries. As described later, there are various policy tools available to mitigate such shifts, though none are perfect.

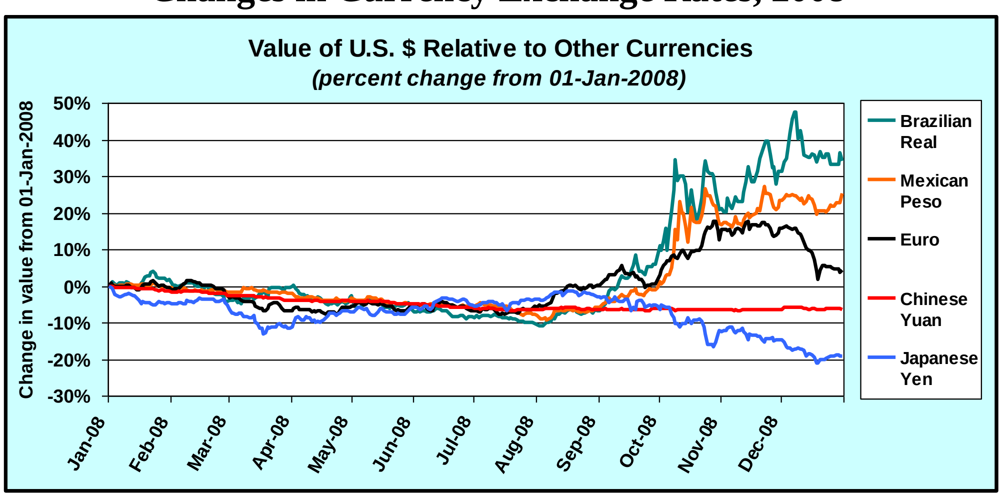
Figure 2
U.S. industry energy intensity and imports as a share of consumption



Source: Peterson Institute and WRI, *Leveling the Carbon Playing Field*, May 2008, p. 9.

It bears noting that these potential trade effects due to carbon pricing are but one of many factors affecting trends in global trade. The potential trade risks are greater when the energy intensity is high relative to the value of the product, and also when transportation costs are a relatively low part of total delivered costs. There are many other factors at play in energy-intensive industries, including global variations in resource endowment, labor costs, transport logistics, taxes, currency exchange rates, and other factors. As an example, Figure 3 graphs the swings in currency exchange rates over 2008, showing changes of 20 percent or more in the value of the U.S. dollar against several other currencies. For most products, these other cost factors dwarf carbon costs. Importantly, trade shifts to date have largely been the result of factors other than carbon pricing, and CO_2 goals should not be a basis for redressing other trade and competitiveness concerns.

Figure 3
Changes in Currency Exchange Rates, 2008



Source: *FXHistory®: historical currency exchange rates*, Oanda.com, http://www.oanda.com/convert/fxhistory.

IV. CAN CARBON PRICE DIFFERENCES AFFECT GHG EMISSIONS?

If trade flows are affected, what are the GHG consequences if production shifts from a country with CO_2 prices to a country without (or with lower) CO_2 prices? There are two types of potential leakage effects*: efficiency-related* and *regulatory-related*.

Efficiency-related leakage effects refer to the GHG changes due to the relative differences in energy & transport efficiency. In the facility losing production, emissions will generally decline as energy consumption and process emissions are reduced to meet this lower level of demand. But the facility to which this demand has been shifted will generally need to increase its energy consumption and processes emissions. The facility increasing production may be either more or less efficient than the facility losing production. Additionally, the trade shifts will often require longer shipping distances between producers and consumers, usually resulting in more transportation energy and emissions. The net change in GHG emissions for the two facilities may be either positive or negative, depending upon the relative production efficiencies and transport emissions.

However, there is also a *regulatory-related leakage*, and this effect is usually negative, resulting in overall greater GHG emissions. This form of leakage results when the trade moves away from a country subject to emission caps, and toward a country without caps. In the country with the emission caps, the emissions decline at an individual facility does not flow through into overall lower country-wide emissions, since the cap does not correspondingly adjust downward. Rather, the lower facility production eases pressures for other reductions within the country's cap, leading to slightly lower carbon prices but similar total national emissions. In contrast, in the uncapped country increasing its production, overall GHG emissions would be expected to increase, unlike a situation where a national cap induces offsetting reductions. Collectively, with the capped country emissions remaining the same while the uncapped country emissions grow, the net effect is for a global emissions increase stemming from this regulatory-related leakage.

V. HOW CAN EMISSIONS LEAKAGE BE MITIGATED?

As described above, differences in carbon prices can potentially drive shifts in trade for EITE industries. In addition to the economic impacts, these shifts can lead to carbon leakage, particularly when production shifts from a capped to an uncapped country.

The differences in carbon prices can best be understood from the perspective of a producer's marginal costs. If a producer in a capped country needs to purchase allowances for each additional ton of emissions, then the market price for that ton represents an additional cost of production. However, in an uncapped country that might not "see" a carbon price, the producer would not face that additional marginal cost of production. If this difference in marginal carbon costs is sufficiently large – taking into account global variations in resource endowment, transport logistics, labor costs, taxes, currency exchange rates, and other factors – it becomes economic to shift production to avoid the marginal carbon cost.

Of course, in theory the simplest way to avoid these trade dislocations is to have a global carbon price seen by all producers. If carbon costs are globally uniform to all producers, the carbon playing field is level and there is no gain to be made by shifting production, other than the usual market costs and forces. But that is not the political or regulatory reality we currently face, making different carbon pricing a factor of future markets.

Absent globally-harmonized carbon price signals, the question then becomes one of identifying strategies and potential policies to mitigate the trade impacts and GHG leakage from these carbon pricing differences. There are a few tools available, though none are perfect:

- ***Grandfathered allowances***. Allowances can compensate for lost profits & declines in asset values. However, if they are based on historical levels, allowances provide a cash payment equivalent, and (unless the historical baseline is periodically updated) won't affect variable costs, so trade differences may remain.
- ***Output-based rebates.*** Payments to producers are based on production. This can help level the playing field with respect to carbon price, in that the domestic marginal cost of carbon is reduced by the free allowances. By basing the rebates on production and a historical emission intensity, it encourages domestic production and jobs, and consequently reduces carbon leakage. However, by taking much of the carbon cost out of production, the carbon price signal is reduced to the customers, potentially limiting their actions taken in response to carbon price signals. Additionally, there may be potential distortions among competing carbon-intensive products.
- ***Border tax adjustments.*** Importers could be required to acquire allowances for the embedded carbon emissions. By raising the marginal cost of production for importers, this can level the import playing field and maintain a carbon price signal through to the consumer. However, export disadvantages remain, in that exporting producers would still see marginal carbon costs that may not be seen in the developing countries. Additionally, border taxes can raise WTO & other trade concerns, and prove difficult and contentious to administer.
- ***Create carbon price signals*** through use of cap-and-trade programs for specific industries and/or export fees in the developing countries. Additionally, the availability of programs such as the CDM enable developers to undertake projects in response to a carbon price. All of these can potentially cause the producer in the country to see a marginal cost for additional carbon emissions.

VI. CAN NAMAS FOR EITE INDUSTRIES ADVERSELY AFFECT TRADE?

Under the new international framework now being negotiated, developing countries would adopt NAMAs, including mitigation actions in one or more industries, in return for finance and technology from developed countries. From a developing country perspective, the actions and financing are linked. However, energy-intensive and trade exposed industries in developed countries are wary of the notion of providing finance and technology to their competition. This concern about a loss of competitiveness has been expressed as “Why should we help our competitors?” If we are paying twice – once for our own reductions and once again for reductions in developing countries – are we in fact doubly hurting ourselves? And if we then end up losing jobs and economic activity, will there be fewer or no environmental gains because of GHG leakage?

We can explore this question in two parts. First, are we hurting ourselves through our own domestic program? Second, are we hurting ourselves by providing assistance to developing countries? To a large extent, these two questions are separable; either action can be taken independent of the other.

The first question – whether we are hurting ourselves through our own domestic program – was addressed earlier in this note. For a select number of energy-intensive trade-exposed industries, a domestic carbon price could create a competitive disadvantage relative to other countries with a lesser or no carbon price. The extent of this risk depends upon the GHG intensity of the product, the cost for CO_2 allowances, the CO_2 costs relative to product value and transport costs, and other policies & measures. There are various policies to mitigate the trade impacts and GHG leakage from these carbon pricing differences, though none are perfect.

The second question asks whether NAMAs that provide assistance to EITE industries in developing countries put us at a competitive disadvantage. Here, the answer depends upon whether or not we are limiting such assistance to incremental costs (or a portion thereof). In general, where assistance is limited to a portion (or even all) of the incremental costs, such assistance should not improve the competitive position of the recipient.

In economic and business analysis, the breakeven point is that point at which the proposed investment will just earn its required returns, including return of and on capital. Investments at the breakeven point represent actions that produce a different combination of labor, capital, and supplies, but are not expected to improve the firm’s value. Investments below the breakeven point are beneficial to the firm, while those above the breakeven point (if undertaken) decrease the firm’s value.

When carbon is not priced, those emissions are not factored into the breakeven analysis, and can be considered externalities. In such a non-priced environment, financial assistance with the incremental costs can be a low-cost way of achieving these environmental benefits. However, so long as the assistance is confined to the *incremental* cost portion only, the firm is only changing its mix of labor, capital, and supplies to achieve environmental benefits, but is not fundamentally improving its competitiveness. Consequently, trade dynamics should be similarly unaffected.

So if financial assistance with incremental costs does not affect trade competitiveness, the question then shifts to whether financial assistance is confined to incremental costs *only*, or whether economic rents are achieved by the recipient. To the extent that financial assistance to these industries in these countries may exceed the incremental costs, then the possibility grows that their competitive position could be enhanced. This situation can occur with some crediting approaches, such as the existing CDM program. By paying a market price for the emission reductions, when the incremental costs of making those reductions is less, the recipients may be made more profitable. This potential trade impact is explored in the next section.

VII. How Can NAMAs with EITE Industries be Made Trade-Neutral?

As described above, the net effect on trade from NAMAs hinges upon whether the assistance is more than or less than the incremental costs. When assistance is limited to no more than the incremental costs, such as with supported NAMAs, it should not worsen a trade imbalance caused by unequal carbon prices. However, when assistance is rewarded on a market price basis, such as in credit-generating NAMAs, and the incremental costs are less than market prices, there is potentially a competitive effect. How, then, can NAMAs be made more trade-neutral?

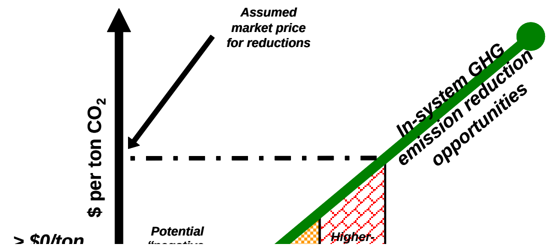
Figure 4 develops the framework for thinking about financial assistance vis-à-vis mitigation abatement costs. Figure 4(a) depicts a marginal abatement cost (MAC) curve, similar to what was presented in Figure 1. In this case, the curve has been redrawn to show that for some firms and/or industries, there may be "negative cost" actions that could be undertaken, where the total costs of the action (including financial costs) are less than the benefits, even if no value is assigned to the GHG reductions. Presumably, such actions have not already been undertaken because of various barriers in the form of regulatory, behavioral, financial, structural, and other impediments. Above these negative-cost mitigation actions are various actions that are only economic where there is a value to the GHG reductions. Some of these actions are available at a lower value per ton of reductions, while others would require higher values.

Figure 4(b) shows the effect of monetizing these reductions at a market price for GHG reductions, as might be the case in a CDM or other credit-generating program. The emissions reduced are compensated at a market price for GHG reductions. However, the cost to the producer for making those reductions is only the area under the MAC curve.

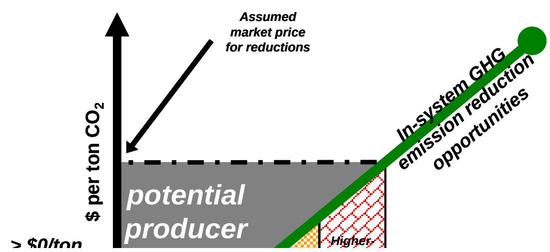
The evolving analyses of industrial approaches, together with the knowledge that mitigation abatement costs span a range from the negative cost to the higher cost, suggest an architecture that can leverage public financing, achieve greater GHG reductions, and minimize potential trade impacts. As depicted in Figure 4(c), three types of approaches could be applied to actions at different points on the MAC curve:

FIGURE 4
POTENTIAL PRODUCER SURPLUS IN NAMA FINANCING

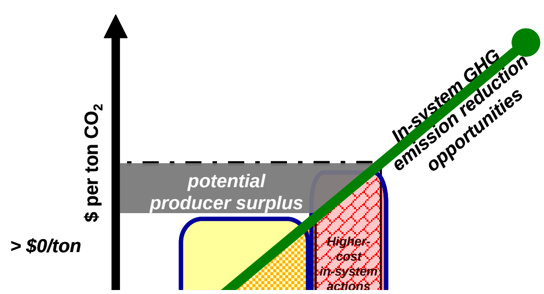
A. Illustrative MAC Curve, with Different Costs for GHG Reductions



B. Potential Producer Surplus



C. Possible Architecture for Limiting Competitive Impacts



1. ***Unilateral Actions*** would be directed toward the negative cost actions. Since the actions are estimated to be profitable even in the absence of a carbon price signal, the developing country could presumably undertake these actions without financial assistance, taking steps to overcome barriers that may have kept this from happening already. Developed country assistance, if needed, could come in the form of technical assistance, capacity building, and supply of technology, equipment, and financing at market rates.
2. ***Supported NAMAs*** would be directed toward mitigation actions that have a modest positive cost. By financing only the incremental costs (or a portion thereof) of these actions, competitive effects are avoided, and more reductions are achieved for the limited funds spent, by paying only for incremental costs rather than market values.
3. ***Credit-generating NAMAs*** would be directed toward the higher-cost actions, and would follow the adoption of unilateral actions and supported NAMAs. Because the lower-cost actions were covered by these other steps, the differences between market price and incremental costs will be much smaller, and accordingly the potential producer surplus is much less than under the status quo. Additionally, by having this approach be conditional upon unilateral actions and supported NAMAs, the developing country has an incentive to take these first two steps in order to partake in the financial benefits of the third, and thereby increase the overall contribution from developing countries.

Further, even though assistance with incremental costs should not worsen a trade imbalance, we can identify forms of Supported NAMAs that are inherently more benign, even to the EITE industries. These include:

- ***Vintage and size preferences.*** Not all facilities in a country perform at comparable levels of efficiency, GHG intensity, and cost. Typically, the newest plants are often the most efficient and most competitive, while older facilities are often less efficient, higher cost, and more GHG-intensive. These older facilities offer many of the opportunities for GHG reductions. However, even with financial assistance many of these older plants will never attain leading-edge efficiencies that would make them internationally competitive.
- ***Locational preferences***. Many of the internationally competitive facilities are located in coastal areas or other places with ready access to low-cost transport. Conversely, many of the inland facilities would be so burdened with higher shipping costs that they would likely never be internationally competitive. By targeting assistance to these inland and more remote facilities, environmental benefits are achieved in less trade-exposed areas.
- ***Technology preferences***. While some mitigation actions result in greater efficiency and potentially lower costs (e.g., boiler efficiency improvements), others do not. Carbon capture and storage (CCS), for example, is a promising technology for future GHG abatement but inherently worsens efficiency relative

to a facility not capturing the carbon. Providing financing for the incremental costs of CCS and other low-carbon projects that do not improve operating efficiency or lower operating costs should have little immediate competitive impact.

- ***NAMA preferences***. Under some visions of a post-2012 framework, developing countries would propose NAMAs, and developed countries would indicate their preferences for financial aid. In such a system, internal competition could be created. By creating a race to the top," we increase the likelihood that funds flow to NAMAs in which the developing country is encouraged to pay a higher portion of the incremental costs. Consequently, the risk of overpaying and creating a subsidy below breakeven costs is reduced.

VIII. CAN NAMAS WITH EITE INDUSTRIES HELP LEVEL THE CARBON PLAYING FIELD?

As described above, when the status quo has unequal carbon prices that can create a trade impact, those impacts are not made worse by assistance to the industry that does not exceed incremental costs. That is, for both unilateral actions and supported NAMAs where the assistance is at most the incremental cost of mitigation abatement, the recipient firms and industries are at best even in trade relative to the status quo. And, to the extent where the assistance is less than the full incremental costs, the recipients are incurring some of the incremental costs for the environmental benefits.

A credit-generating NAMA, like the CDM, carries the potential for assisting beyond the incremental costs, and as such potentially worsen the status quo trade imbalances. However, when credit-generating NAMAs are used in a tiered architecture after first undertaking unilateral actions and supported NAMAs, the potential producer surplus is much less than under the current status quo. Further, in the case where credit-generating NAMAs could potentially lead to competitive shifts and GHG leakage, we have identified some ways in which such impacts can be minimized.

However, it leaves open the question as to whether NAMAs and other forms of assistance can *improve* existing trade imbalances resulting from unequal carbon prices. Since it is the differences in carbon prices that produce most of the trade imbalance (apart from the aforementioned differences in resource endowment, labor costs, transport logistics, taxes, currency exchange rates, and other factors), actions that narrow the carbon price differences will help level the carbon playing field.

Here, as before, the objective is to incentivize the producer such that for production at the margin, a carbon price signal is seen and taken into account. A NAMA that creates a cap-and-trade system is one means to this end. Similarly, a developing country's adoption of carbon taxes or export tariffs for the industry could achieve similar effects, as could some forms of credit-generating NAMAs. Additionally, by creating carbon price signals, these actions are supportive of the longer-term objective of global carbon prices.

For a developed country interested in mitigating adverse trade impacts, assistance to industries, carefully targeted to NAMAs that create carbon price signals, can be a useful approach for encouraging developing country action in a trade-friendly manner.