

Carbon pricing: a key instrument to facilitate low carbon transition

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Main messages

- There is a strong synergy between carbon pricing and the Paris Agreement. The call for ambitious climate actions through carbon pricing by both heads of governments and CEOs of leading companies gave momentum to raise the level of ambition of the Paris Agreement, and the ambitious climate goals stipulated in the Paris Agreement build momentum to introduce carbon pricing as a key instrument to attain the climate goals.
- 40 countries and 20 cities/states /regions have introduced carbon pricing schemes which represent almost a quarter of global greenhouse gas (GHG) emissions, and China and Canada will introduce nationwide carbon pricing in the near future. The pricing levels significantly vary across countries/schemes from USD 1/t-CO₂ to USD 130/t-CO₂.
- In many countries, carbon intensive sectors strongly oppose carbon pricing that significantly increases production costs if other conditions are the same. On the other hand, carbon pricing is expected to induce economic and social transformation towards a low-carbon and decarbonised world, where 'other conditions' must be changed. It is important to establish common ground between the proponents and the opponents of carbon pricing to have constructive discussion.
- In the context of transformational change corresponding to the Paris Agreement, sufficiently high carbon prices will improve the competitiveness and profitability of low-carbon/carbon-free options, and will provide favourable conditions for companies to take ambitious mitigation actions.
- Green tax reform that combines the introduction of a carbon tax with a reduction of in other taxes, such as income and corporation taxes, could achieve both environmental benefits and economic/social benefits. On the other hand, there is a potential conflict between mitigation and revenue-generating functions of carbon pricing. Increasing the tax rate would be needed to compensate for a reduction of in the tax base. It is also worth considering policy options that specialises on in price signal function in order to increase flexibility in policy design.
- Special treatment should be introduced to enhance the political feasibility of carbon pricing. However, there should be limits on the sectors and period of special treatment that would cause the policy to be less efficient due to fewer price-signals on high emitters and non-uniform prices.
- Carbon pricing, especially the cap-and-trade mechanism, could increase demand for credit inasmuch as the credit can be utilised as external credit in the mechanism. It could provide additional demand for credit among private investors for accelerating credit-driven investment in an international off-set mechanism.

1. Introduction

1.1 The synergy between the Paris Agreement and carbon pricing

At COP21 in December 2015, the Carbon Pricing Leadership Coalition (CPLC) was officially launched. CPLC brings together more than 20 national and state governments along with more than 90 businesses and NGOs aimed at promoting carbon pricing towards the long-term objective of introducing carbon pricing all over the world (World Bank, 2016).

Obviously, it is not by chance that the launch of CPLC and the adoption of the Paris Agreement happened simultaneously at COP21. There is a strong synergy between these two events. The call for ambitious climate actions, through carbon pricing, by both heads of governments and CEOs of leading companies gave momentum to raise the level of ambition of the Paris Agreement, and ambitious climate goals stipulated in the Paris Agreement build momentum to introduce carbon pricing as a key instrument to attain the climate goals. Considering the fact that 74 countries and more than 1,000 companies expressed their support for carbon pricing at the UN Climate Summit in September 2014 (Carbon Pricing Leadership, 2016), this momentum could accelerate mainstreaming of carbon pricing in the world.

Carbon pricing is expected to attain the climate goals through several functions. Two key functions are price signalling and revenue collection functions. The price signalling function means that carbon pricing will improve economic efficiency by reflecting the cost of carbon emissions, i.e. the damage costs of climate change. Ideally carbon prices should be set at the true cost of carbon emissions, but in reality any level of carbon pricing will raise the relative prices of carbon intensive commodities and can contribute to mitigation. This function is common across all forms of carbon pricing, including both carbon tax and cap-and-trade (emission trading system).¹ The revenue collection function means that revenues from the carbon pricing schemes can be utilised to fund climate actions. This function is limited to carbon taxes or cap-and-trade mechanisms with auction of emission allowances. In addition, a carbon tax with a clear price schedule may serve to inform the general public, by announcing the strong commitment of governments to achieve climate goals through a schedule of carbon tax rates. Through these functions, carbon pricing is expected to make low-carbon products relatively cheaper than carbon-intensive alternatives, thereby steering consumers to make low-carbon choices, as well as making low-carbon business profitable and creating business opportunities.

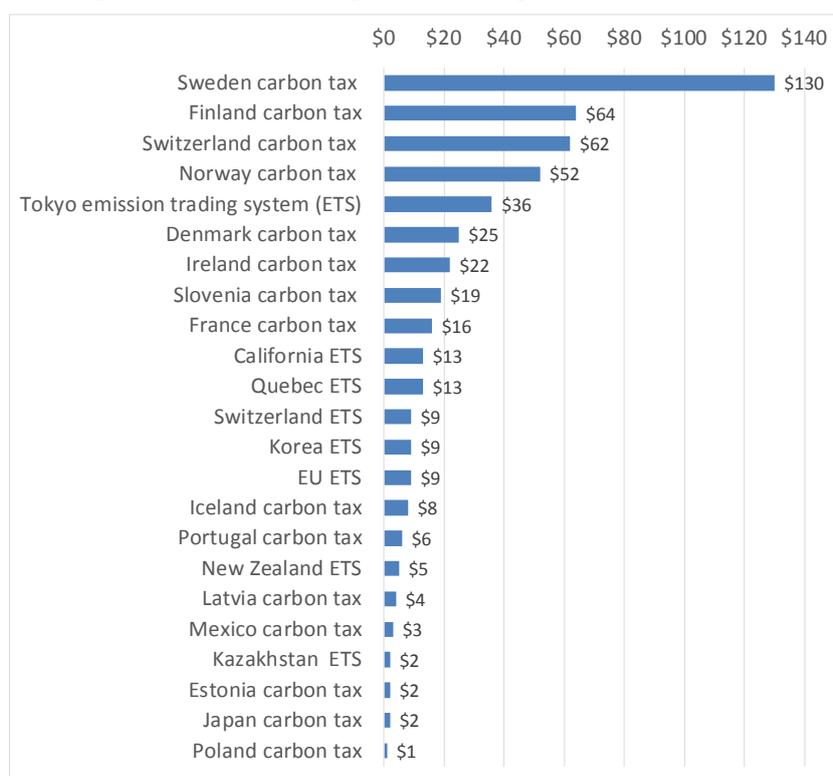
¹ Emission trading systems (ETS) in general include both the schemes with and without a cap on emission. This paper deals with ETS with cap (i.e. cap-and-trade) only.

1.2 Current situation of carbon pricing

As of September 2015, 40 countries and 20 cities/states /regions have introduced carbon pricing schemes which represent almost a quarter of global greenhouse gas (GHG) emissions, according to the “State and Trends of Carbon Pricing 2015” (World Bank, 2015). In addition, China will start national cap-and-trade in 2017, and the Canadian Prime Minister agreed, in March 2016, to introduce carbon pricing as a part of national climate strategy (National Post, 2016).

The pricing levels vary significantly across countries/schemes. Currently three Nordic countries and Switzerland set high carbon prices above USD 50/t-CO₂, with Sweden implementing the highest carbon price of USD 130/t-CO₂, while many schemes employ low carbon prices less than USD 10/t-CO₂ (see Figure 1). For example, Japan’s carbon tax (global warming countermeasure tax) is USD 2/t-CO₂, which is one of the lowest carbon prices.

Figure 1: Prices of existing carbon pricing schemes (USD/t-CO₂)



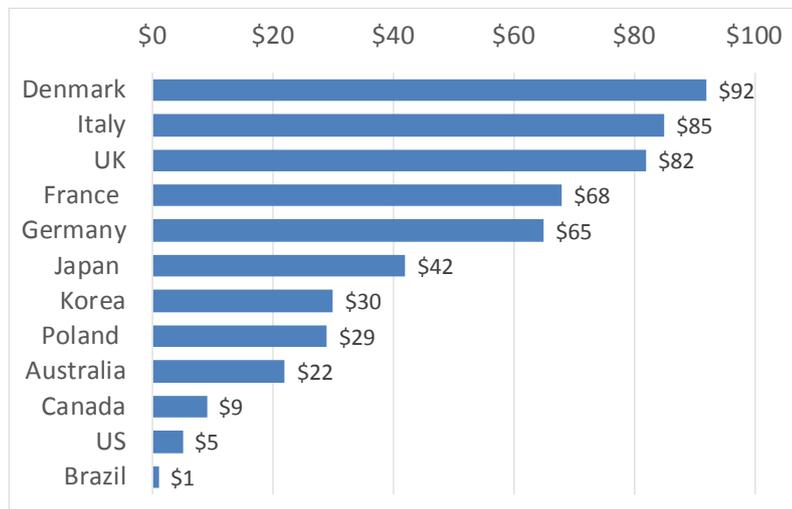
Source: World Bank (2015) Carbon Pricing Watch (processed by the author)

It is arguable how high the carbon price should be in terms of exploiting the full range of expected benefits mentioned above, but it is very likely that a low carbon price such as the Japanese carbon tax would have very limited mitigation effects. In order to encourage ambitious climate actions, it is crucial to utilise the abovementioned momentum not only to extend the geographical coverage of carbon pricing schemes but also to raise their price levels.

In addition to explicit carbon pricing policies mentioned above, OECD (2013) estimated

effective carbon prices that are defined as a change in the output price as a result of low-carbon efforts including not only carbon tax and cap-and-trade but also energy tax and other mitigation measures such as energy saving standards (see Figure 2).

Figure 2: Effective Carbon Prices (USD/t-CO₂)



Source: OECD Data compiled by Alter (2015) Reframing the Response to Climate Change

Effective carbon prices enable us to compare how much a commodity price increase would be associated with climate efforts as a whole, which provides useful information about the cost side of climate efforts. For example, the Japanese effective carbon price is significantly higher than its carbon tax rate because of an energy tax and other measures such as a feed-in-tariff for renewable energy and energy efficiency standards. However, there must be a clear distinction between explicit carbon pricing (such as carbon tax and cap-and-trade) that can send a price signal for stakeholders to make climate efforts, and effective carbon prices that measure the costs of ongoing climate efforts.

1.3 How carbon pricing can promote the transition towards a low-carbon/decarbonised society?

In many countries carbon intensive sectors such as the fossil fuel industry, the iron and steel industry and the paper industry strongly oppose carbon pricing that significantly increases production costs if other conditions remain the same. Actually, the business community strongly opposed introducing the carbon tax in Japan (officially proposed from 2004 and introduced in 2012), and it is one of the factors explaining why the realised tax rate (JPY 289/t-CO₂) was much lower than the originally proposed rates (JPY 655/t-CO₂ in the proposals during 2004-2008, and JPY 1,064/t-CO₂ in the 2009 proposal).

On the other hand, the major reason why carbon pricing is gaining momentum is its potential to induce economic and social transformation towards a low-carbon and decarbonised world, where 'other conditions' must be changed. In order to exploit the

potential of carbon pricing to implement the Paris Agreement, it is important to bridge the gaps between the proponents and the opponents of carbon pricing.

Against this background this paper discusses how carbon pricing can contribute to economic and social transformation towards a low-carbon and decarbonised world. It discusses how to address the abovementioned diverging views on carbon pricing, and also discusses policy design issues such as the potential conflict between the mitigation function and revenue generation function of carbon pricing, and special treatment for mitigating negative shocks to carbon-intensive sectors. In addition, the issue of utilising carbon pricing to facilitate climate actions in developing countries is discussed.

2. Need for a common ground to address controversy over carbon pricing

One of the important controversies between the proponents and the opponents of carbon pricing is whether carbon pricing is the most efficient mitigation measure or not.

Economic theory tells us that carbon pricing can achieve the most efficient outcome when the carbon price is set at the same rate as the social cost of carbon emissions, i.e. the damage caused by carbon emissions (Arrow, 1970).² In reality, however, the social cost of carbon emissions cannot be precisely measured and carbon prices are determined by various factors including political feasibility.

Another argument against carbon pricing is that voluntary mitigation efforts by business is more efficient than carbon pricing. For companies that reduce emissions by voluntary investment in low-carbon technologies, for example, carbon pricing would merely be an additional cost.

These arguments are theoretically valid, but they may miss the point in the context of transformational change corresponding to the Paris Agreement. It is unlikely that companies' voluntary efforts alone can achieve the large reduction in emissions required by the abovementioned ambitious mitigation goals such as an 80% reduction by 2050. Introduction of sufficiently high carbon prices, whether they are set to fully offset the social costs of carbon or not, will improve competitiveness and profitability of low-carbon or carbon-free options, and companies can take ambitious mitigation actions in the course of profit maximisation. There is a wide agreement that carbon pricing can be the most efficient mitigation measure in this context. Unless carbon pricing reduces carbon emissions 'too much', which means the carbon price is higher than social cost of carbon, carbon pricing will always work to rectify market distortions, and it is more efficient than measures that increase market distortions such as subsidies and feed-in-tariffs. Once a common ground of debate is reached in terms of commitment to implement the Paris Agreement, it is expected that the debate on carbon pricing will focus on design to achieve expected outcomes, rather than on whether carbon pricing should be introduced or not.

² More precisely, when carbon price is set at the marginal social cost of carbon emission that is the additional damage induced by marginal increase of carbon emission.

3. Policy design issues to implement effective carbon pricing

3.1 Choice of carbon pricing options

Carbon pricing can be broadly categorised into two approaches: one is a carbon tax that regulates the price of carbon; and the other is cap-and-trade that regulates the quantity of emissions (Morotomi, 2004). The former can send a predetermined price signal but cannot strictly control emissions, while the latter can achieve predetermined emission levels but cannot strictly control carbon price. The relative advantages and disadvantages of these two approaches have been discussed and an economic theory of the determinants of their relative advantages was proposed. In practice the important decision factors include transaction costs (lower for carbon tax) and preferences of the business sector (for example, the Japanese business sector tends to prefer a carbon tax because it is expected to provide greater price stability, while US businesses prefer a cap-and-trade system that allows flexible emission trading). It must be noted that these two approaches have a different policy scope. A carbon tax targets all the stakeholders, not only businesses but also other important stakeholders such as the transport sector and households.

It is possible to combine these two approaches. As a matter of fact, many countries including some members of the EU have implemented both carbon taxes and cap-and-trade systems (EU ETS) simultaneously. With careful policy design to avoid double taxation of the business sector the two types of policies could be mixed. It would be reasonable to implement cap-and-trade in the business sector in order to limit emissions, and at the same time, introduce a carbon tax in order to encourage low-carbon efforts from other stakeholders such as households and the transport sector. This policy mix also could provide additional flexibility for the business sector to choose either cap-and-trade or a carbon tax.

3.2 Conflict between mitigation and revenue generation functions

In the case of carbon tax and cap-and-trade with allowance auctions, it has been argued that these instruments could serve a dual purpose, that is, to reduce carbon emissions through price signalling effects and to generate revenues. The revenues from these instruments can be used for various purposes, not only to implement other climate actions such as R&D in low-carbon/carbon-free technologies but also to pursue other policy objectives such as social security and job creation. In many European countries including Nordic countries and Germany, a carbon tax (or energy tax that plays a similar role as a carbon tax) was introduced as a part of green tax reform that combines the introduction of carbon tax and reductions of other taxes such as income and corporation taxes or of companies' payments for social security. It is reported that green tax reform in these countries may have generated so called 'double dividends', that is, environmental benefits

(emissions reduction) and economic/social benefits (industrial competitiveness, job creation etc.) (Ecologic/DIW, 2005).

On the other hand, it has been pointed out that there is a potential conflict between the mitigation and revenue generating functions of carbon pricing (Morotomi, 2000). This concern is particularly important when carbon pricing is introduced in order to achieve major emissions reduction. For example, if Japan could achieve an 80% emissions reduction by 2050 with carbon tax as one of key policy instruments for this purpose, the tax base of the carbon tax would fall by 80%. Some may argue that no tax can escape revenue fluctuations, but the point here is not just revenue fluctuations but also implications for policy design. If, for example, a carbon tax is intended to generate stable revenue, either a low tax rate should be chosen or an higher tax rate would be needed to compensate for the reduction in the tax base. In the former case, the mitigation effect is sacrificed. The latter case, starting with a lower rate initially may be reasonable as in any case, the sudden introduction of a very high rate of carbon tax would be politically infeasible so the tax rate could be gradually raised later.

In addition, it may be worth considering carbon pricing specialised for the price signal function, which would take the form of something like a carbon tax without the tax revenue by returning the collected carbon prices to citizens based on some rule such as lump-sum transfer. Once we separate the price signal function of the carbon price from the revenue generation function, we can design carbon pricing to separately attain both goals of mitigation and utilisation of tax revenue.

3.3 Consideration for potential losers

It has been pointed out that carbon intensive and/or trade-exposed industries are negatively affected by carbon pricing while some sectors are unaffected or even benefit from carbon pricing. The sectors vulnerable to the negative impacts of carbon pricing vary among countries, and it is common practice to arrange special treatment such as tax exemptions or carbon price reductions to such sectors through consultation with stakeholders. For example, Climate Change Levy (CCL) in the UK excludes households and transport, and in the Ecological Tax Reform in Germany, coal is subject to a lower energy tax in order to avoid an intolerable burden to those sectors and increase the feasibility of the policy implementation. Also in Nordic countries imposing high carbon tax rates, special treatment for especially vulnerable industrial sectors is commonly accepted.

However, this raises several issues including a less efficient policy due to lower price-signals on high emitters and non-uniform prices. In addition, it might represent a violation of constitutional principles in some countries. In France, the government's proposal on special treatment was declared unconstitutional because some low-energy consumers without special treatment were taxed more than some high energy consumers with special treatment (Conseil constitutionnel, 2000) and more than 90 % of CO₂ emissions from the

industry sector were not taxed due to such special treatment (Conseil constitutionnel, 2009). Therefore, special treatment for carbon pricing should be introduced for a limited duration, with gradual phasing-out, and designed carefully to reduce the impact of the above issues on policy efficiency as well as to stay within the principles of a fair tax system.

4. Carbon pricing to facilitate mitigation actions in developing countries

Under the Paris Agreement, developing countries commit to take mitigation actions. One of the major drivers for their mitigation actions is financial instruments, especially private finance for large-scale emissions reduction through market-based scaling-up and/or multiple application of low-carbon technologies in developing countries with lower marginal emissions reduction costs. However, the current speed of privately-driven dissemination of low-carbon technology is too slow to achieve that goal, even though a market for this type of low-carbon technology has been emerging and growing due to financial incentives, such as FIT (Feed-In-Tariff). Therefore, the Agreement needs policy instruments to provide additional financial incentives for investing in low-carbon technology in developing countries.

One of the promising additional financial incentive is a carbon off-set mechanism to provide emission credits from GHG reduction projects. The CDM (Clean Development Mechanism) and JI (Joint Implementation) are successful mechanisms provided by the Kyoto Protocol in terms of how to efficiently mobilise private investment into low-carbon technology. For the Agreement to be fully effective, it is crucial to provide additional demand for credit among private investors to accelerate credit-driven investment in off-set mechanisms. Carbon pricing, such as a cap-and-trade mechanism, could increase demand for credit inasmuch as the credit can be utilised as external credit in the mechanism.

5. Conclusion

This paper discusses how carbon pricing can facilitate a low-carbon transition, or a further net zero carbon transition, responding to the Paris Agreement. There is a strong synergy between carbon pricing and the Paris Agreement; the call for ambitious climate actions through carbon pricing by both heads of governments and CEOs of leading companies gave momentum to raise the level of ambition of the Paris Agreement, and ambitious climate goals stipulated in the Paris Agreement build momentum to introduce carbon pricing as a key instrument to attain the climate goals. As of September 2015, 40 countries and 20 cities/states /regions have introduced carbon pricing schemes which represent almost a quarter of global greenhouse gas (GHG) emissions. In addition, China and Canada will introduce nationwide carbon pricing in the near future.

The pricing levels significantly vary across countries/schemes from USD 1/t-CO₂ to 130/t-CO₂. Low carbon prices may have very limited mitigation effects, and it is crucial to utilise the abovementioned momentum not only to extend the geographical coverage of carbon pricing schemes but also to raise their price levels in order to encourage further ambitious climate actions. It must be recognised that sufficiently high carbon prices will improve competitiveness and profitability of low-carbon/carbon-free options, and will provide favourable conditions for companies to take ambitious mitigation actions, which is required to implement the Paris Agreement.

In addition to the expected benefits of carbon pricing, green tax reform that combines introduction of carbon tax and reduction of other taxes, such as income taxes, is expected to achieve both environmental benefits and economic/social benefits. There is a potential conflict between the mitigation and revenue generating functions of carbon pricing, and increasing tax rate would be needed to compensate for the reduction of the tax base. It is also worth considering policy options that specialise on the price signalling function in order to increase flexibility in policy design.

There is another expected benefit of carbon pricing, especially cap-and-trade mechanisms, in terms of facilitating climate efforts in developing countries. Carbon pricing such as cap-and-trade could increase demand for credit inasmuch as the credit can be utilised as external credit in the mechanism. It could generate additional demand for the credit among private investors for accelerating credit-driven-investment on international off-set mechanisms.

Despite these expected benefits of carbon pricing, in many countries carbon intensive sectors strongly oppose carbon pricing that significantly increases production costs if other conditions are the same. On the other hand, carbon pricing is expected to induce economic and social transformation towards low-carbon and decarbonised world, where 'other conditions' must be changed. It is important to establish common ground between the

proponents and the opponents of carbon pricing to facilitate constructive discussions. In addition, special treatment to address transitional shocks to potential losers should be introduced. However, there should be limits on the sectors and period of special treatment that would cause the policy to be less efficient due to fewer price-signals on high emitters and non-uniform prices.

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