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From burden-sharing to opportunity-sharing: unlocking the deadlock of climate change negotiation

Yongsheng Zhang
Development Research Centre of the State Council
People's Republic of China
(email: zys@drc.gov.cn).

and

He-ling Shi
Department of Economics, Monash University, Clayton, Australia
(email: he-ling.shi@monash.edu)

Abstract: Since traditional fossil fuel-based economic growth is coupled with carbon emissions, mitigation is regarded as a burden on economic growth in conventional thinking about climate change. The scarcity of global emission budget as well as the "global public goods" interpretation of climate changes has led climate change negotiations into a burden-sharing deadlock. However, some recent economics studies have shed some lights that mitigation could actually promote *local* economic growth opportunities; consequently increasing incentives for unilateral mitigation actions. The objective of this paper is to highlight the implications of these studies for the strategies of unlocking the climate negotiations deadlock. Following an explanation of how climate change negotiations have led to a burden-sharing game and have become a deadlock, we show that emerging literature on green growth has provided some new ways of thinking which suggest how mitigation could promote *local* economic growth. One policy implication of the emerging literature is that we need to change our mindset in global climate change negotiation - from burden sharing to opportunity sharing, in order to move forward on climate action. We should therefore put green growth at the heart of post 2020 climate change regime. A new *two-track* approach is discussed for achieving the transformation.

Key words: climate changes, green growth, post 2020 climate regime, climate change negotiations

JEL code: Q540, Q550, Q580

From burden-sharing to opportunity-sharing: unlocking the deadlock of climate change negotiation

Yongsheng Zhang and *He-ling Shi*[1]

1. Introduction

Since the Industrial Revolution, modern economic growth has ever been coupled with high carbon emissions. The accumulation of man-made emissions dating back to the Industrial Revolution in the atmosphere have impacted today's climate. To avoid catastrophic consequence of climate change, urgent actions are needed to reduce global carbon emissions to meet the 2°*C* or below target (relative to pre-industrial levels) - which has been adopted by more than 100 countries as a guiding principle for mitigation efforts. Nonetheless, in a fossil fuel-based growth mode, cutting emissions can lead to the reduction of output and the sacrifice of economic growth. Without a substantial transformation in growth modes to decouple economic growth from carbon emissions, it is impossible to sustain economic growth while meet the 2℃ target. The study by Meinshausen et al. (2009) estimated the future global greenhouse gas (GHG) budgets for 2000-2049 in relation to the probability of exceeding 2℃ target. With the probability of 25% to 50% of exceeding the target, respectively, only 1,000 -1,440 Gt CO_2 can be emitted in the 50 years' time. It implies that, according to WBGU Special Report (2009), to achieve the 2℃ target, the maximum GHG emission budget from 2010-2050 is only 750 Gt CO2. Assuming the world annual emissions continue to be at the 2008 level, the GHG emission will reach its maximum within 25 years.

The scarcity on budget for global carbon emissions raises serious conflicts about how to share the budget between Annex 1 and Non-Annex 1 countries. Given the global emission budget, increases in one country's emissions can only be achieved at the expense of emissions from other countries (i.e. a zero-sum game). Developed countries, with 20% of global population, have already completed the industrialization phase through a period of high fossil fuel and resources consumptions. For the remaining 80% of global population, going through the industrialization phase in the same way as the developed countries will certainly generate GHG well exceeding this budget.

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On the basis of ethics, developing countries' demand for carbon equity can be justified, since the historic over-occupation of the atmosphere (a global common) by Annex 1 countries has not only squeezed out the development assets of developing countries, but also imposed hazard on the developing countries[2]. However, the scarcity of global carbon budget makes carbon equity far from achievable, which in turn intensifies the conflict between the developed and developing worlds.

In addition to the scarcity of the global emissions budget, the "global public goods" characteristic is another key impediment for reaching global climate change agreement[3]. According to the conventional analysis of climate changes, since the cost of emissions reduction is mainly *local*, but the major benefits of mitigation efforts are shared *globally*, all individual countries have strong incentives to be free-riders, expecting other countries to act first and more – a case of the 'tragedy of commons' predicted by Hardin (1968).

Due to the above two factors, the prospect of making progress in international climate change negotiation is very dim. Nonetheless, the latest progress in the economics research on climate change and "green growth" shows that mitigation could actually have significant *local* benefits, and that unilateral mitigation could be incentive compatible. One conclusion of this research line is that mitigation could be a source rather than a constraint on growth. If that turns out to be the case, international negotiation is then no longer a game of burden-sharing among countries, but a process of opportunity-sharing.

The objective of this paper is to present how strategic thinking about green growth could contribute to solving the global climate change negotiation deadlock and to provide some policy recommendations on how to proceed from *status quo*. The rest of the paper is organised as follows. In section 2, we show that if we follow conventional economics analysis, mitigation is inevitably treated as a burden on growth and climate change negotiations are most likely to become a deadlocked burden-sharing game. In section 3, we compare and contrast a variety of new thinking along the line that mitigation could actually significantly benefit the local economy by driving the economy to a more competitive structure and could consequently represent an opportunity to promote growth. In section 4, we document several real world practices which seek to capture the opportunities of mitigation. In section 5, based on the previous analysis, we discuss a new two-track approach to transform the negotiation from burden-sharing to opportunity-sharing. Section 6 provides some thoughts on common concerns. The last section concludes the paper.

2. How global negotiation become a burden-sharing game

Economics treats climate change as a case of public goods and mitigation actions incur *local* costs but *global* benefits (see for example, Pindyck and Rubinfeld, 2012).

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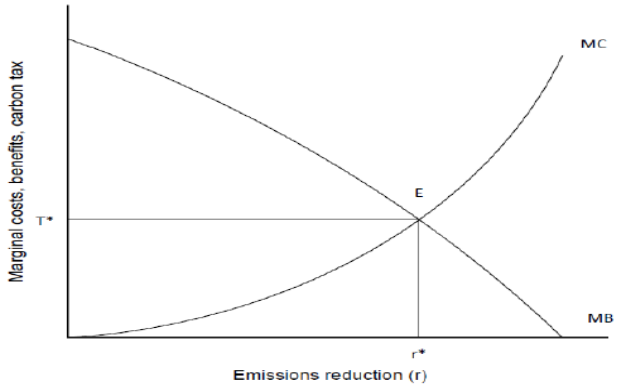
[2] The Annex 1 countries with 20 % of population, but produced 79% of accumulative emissions from 1875-2000 - see, for example, Brazil (2007), BASIC expert group (2011), and DRC (2009).

[3] See for example, Barrett (2007)

Works by Nordhaus (1993), Stern (2007), and Garnaut (2008) provided comprehensive reviews of the benefits and costs of mitigation.

The typical economic analysis of climate change goes this way: global climate change is harmful and the catastrophic consequence should be avoided by reducing global emissions. Nonetheless, since it is not costless to mitigate, we need to find the most economically-efficient global mitigation level. The optimal global emissions reduction is the point at which marginal cost equals marginal benefit of mitigation (Nordhaus, 1993, see Figure 1).

Figure 1 Marginal Costs and Benefits of Greenhouse-Gas Emissions Controls



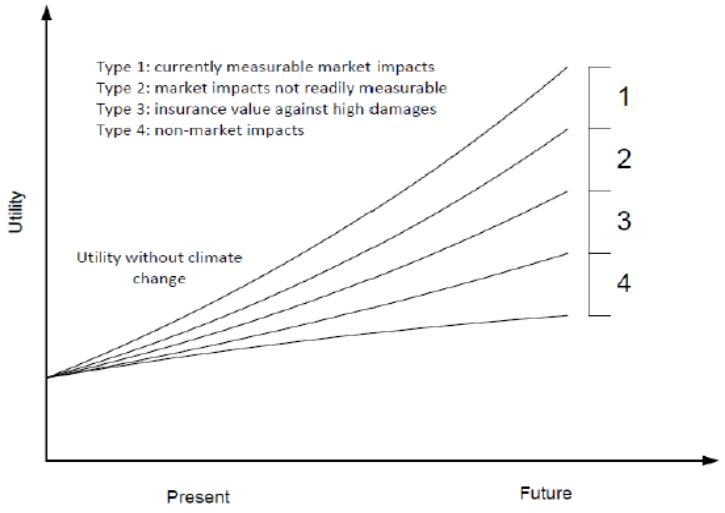
Efficient policy comes at point E, where marginal cost of further emission reduction (MC) equals marginal benefit of emissions reductions in slowing climate change (MB). T* is the efficient carbon tax while r* is the efficient reduction rates.

Sources: Nordhaus, 1993

Garnaut (2008) made efforts to specify the benefits and costs of mitigation. The benefits from mitigation are defined as the damages of climate change avoided. There are four types of benefits. (i) Type 1: currently measurable. These effects are typically measured as an impact of climate change on GDP or consumption. (ii) Type 2: market impacts not readily measurable. This is similar to type 1, but not amenable to measurement in the current state of knowledge. (iii) Type 3: insurance value against high damage. Since the damage of climate change is uncertain, it is like to make large financial commitments for insurance against low-probability but high-impact events. (iv) Type 4: non-market impacts. This type of benefit is more difficult to conceptualize and quantify, and it is related to the concept of welfare. For instance, valuation of environmental amenity, long-established communities and social structures built around particular patterns of climate, and etc.

The benefits can be illustrated in Figure 2. The curve on the top represents the ‘utility without climate change’, but because of the impacts of climate change, the utility would be decreased to the curve at the bottom, if no mitigation is taken. Mitigation would increase the utility, moving the utility curve up.

Figure 2 Four types of climate impacts

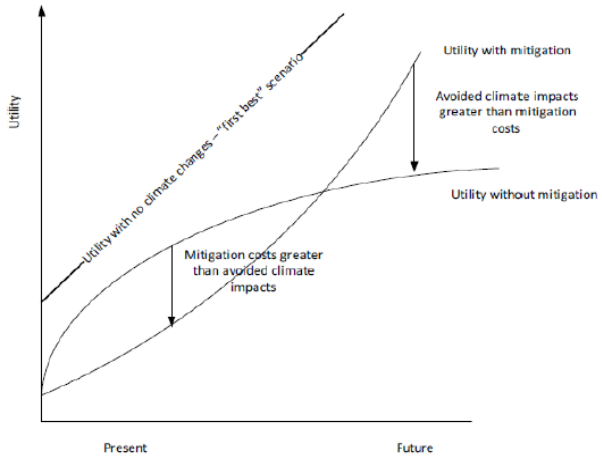


Sources: Garnaut (2008), p.10.

But mitigation is also costly. There are two types of costs: (i) increase of inputs to mitigation, including inputs of new equipment, technology, labour, and etc. (ii) possible decrease of outputs. Since the existing economic growth mode is heavily based on the burning of fossil fuel which generates emissions, the reduction of emissions is likely to reduce output. The costs of mitigation can be calculated for various levels and rates of reductions in emissions.

Garnaut (2008) provides a graphical representation of benefits and costs. As shown in Figure 3, the utility curve without mitigation is above the utility curve with mitigation in the early years. Mitigation has a net cost. However, mitigation utility curve may rise above the utility curve in the absence of mitigation in the later year – and generating a net benefit.

Figure 3 Utility with, or without mitigation, or without climate change



Sources: made by the authors based on Figure 1.3 in Garnaut (2008), p.10.

By comparing benefits and costs of mitigation, Stern (2007) reached the similar

conclusion that "the benefits of strong, early action on climate change outweigh the costs".

While their pioneer works have greatly enhanced the academic exploration and public understanding of climate change; yet, the limitation of its analytical framework impedes our better understanding of the natural and consequence of mitigation.

First, at the theoretical level, the benefits of mitigation are defined as the avoided damage of climate change. Theoretically, this definition excludes the possibility that mitigation might drive the economy into a more competitive structure characterized by lower carbon emissions with a utility level even higher than 'utility without climate change' scenario. Consequently, mitigation has become a kind of action undertaken to avoid damage, rather than to explore new opportunity. The utility with mitigation - no matter how decisive the action to be taken - could never be greater than the assumed 'utility without the damage of climate change' (see Figure 3).

Second, in the policy arena, since the predicted benefits of collective actions are primarily global while the cost is local[4], all countries have strong incentives to be free-riders, leading to a large mitigation coordination problem[5]. Consequently, global mitigation has become a burden-sharing game among all parties. Every country is concerned with its 'fair share' in the global burden. Since different countries have different interpretations about 'fairness' - which hinders progress in international negotiations. Nonetheless, if local benefits (such as local economic growth) of mitigation could be properly predicted, then the mitigation of individual countries would become a self-interested behaviour.

3. Advances in economics of climate change with new implications

As argued in the previous section, the limitations of the conventional approach are rooted in the "global public goods" interpretation of climate changes – that is, benefits are primarily global, hard to be measured, only accruing in the long term; while the economic costs are local, tangible, and have to be paid in the short term. This asymmetry in benefits and costs leads to the reluctance of individual country to take a lead in implementing mitigation policies.

The key question here is: Will mitigation lead to local, easy to be measured, and short term benefits, not just a co-benefit, but new economic growth opportunities? [6].

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[4] Some authors (see a survey paper by Bollen, 2009) indeed discussed the local co-benefits, but the so-called "co-benefits" is not sufficiently big to substantially change the conventional benefit-cost story.

[5] As Garnaut (2008) pointed out the net benefit heavily depends on global multiple action. In other words, the net benefit is impossible in unilateral mitigation scenario.

[6] Garnaut (2008), implicitly, raised an important idea on thethe substantial benefit from structure change: "the models used for assessing the costs of mitigation and climate change depend critically on the assumptions that are fed into them about structural relationships in the economy……" (see Garnaut, 2008, page. xxiii). Unfortunately, the insight on structural changes resulting from mitigation cannot be properly dealt with conventional economic tools. Therefore, the typical conclusion of

In recent years, a new line of thinking has been emerging - showing that mitigation could have benefits well beyond amenities, and unilateral mitigation could promote *local* economic growth[7]. Consequently, it has a promising policy implication for addressing the current stalemate in international climate negotiations.

At the theoretic frontier, at least three research agendas have emerged including: the modified macroeconomic growth model represented by Hallegatte et al. (2012); the directed technical change model by Acemoglu et al. (2012); and models based on Adam Smith's notion of evolution of the division of labour and economic structure (see Shi and Zhang 2012).

The common feature of these three approaches is to argue that mitigation will benefit local economy in a measurable way in the short term. They differ in their respective mechanism which channels mitigation to economic growth opportunities.

The first research trajectory is represented by the work of Hallegatte et al. (2012). Based on a Solow-type macroeconomic growth model, they developed a conceptual framework to show that green growth is about making growth processes resources-efficient, cleaner and more resilient without necessarily slowing them. Their argument is that a better natural environment will positively affect economic growth in five channels. These five channels include increasing the quality of production factors; shifting the production frontier by correcting market failure in innovation and diffusion of knowledge; making the economy more efficient by correcting market failures to get closer to the production frontier with existing technology; increasing resilience to environmental shocks; and increasing the job content and poverty alleviation characteristics of growth. In their model, natural environment is itself a production factor; and natural environment is also a factor which enhances physical, human capital, and technological progress. Moreover, environment policy can help to correct market failure and move the actual output close to the production frontier. Needless to say, more research is needed to identify the *transmission mechanism* and the *magnitude* of these five channels to make this model useful for policy analysis.

The second, more microeconomics-oriented research line is represented by the directed technical change model of Acemoglu et al. (2012). By employing an endogenous innovation growth model, they show that government interventions (a combination of carbon taxes/research subsidy) could redirect private investments toward green technologies. They posit that, providing that "clean" and "dirty" inputs are sufficiently substitutable, a *temporary* government intervention could result in

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computable general equilibrium (CGE) model on mitigation and economic growth is somehow like this: mitigation would, more or less, negatively impact economic growth for some percentage points, but the cost is still affordable (see example, Frontier Economics, 2008)

[7] For instance, the updated Garnaut Review concluded that "the growth rate for Australian national income in the second half of the 21st century would be higher at the end of the century with mitigation than without. …Strong mitigation was clearly in the national interest" (see Garnaut, 2011, page x).

permanent shifting from "dirty" inputs to "clean" inputs. The dynamic story is that government intervention will have a short-term cost, but the long term 'green growth' rates could catch up the 'non-green growth' rates – the overall growth will be unaffected, consequently. Regarding timing, if immediate action is taken, then the catch-up period will be shorter. On the other hand, if action is delayed, the costs of intervention will be greater, and the catch-up period will be longer.

The third line follows Adam Smith's notion of specialisation and division of labour (Smith, 1776; Young, 1928) and its modern incarnation of inframarginal analysis (see Yang, 2001). Different from the marginal analysis focusing on resource allocation in a given structure, infra-marginal analysis focuses on optimal structure of specialisation and the division of labour to achieve organizational efficiency. From an infra-marginal perspective, the conventional marginal analysis only captures a specific case of many potential structures of division of labour and is incapable of modelling structural change to the division of labour resulting from mitigation policies; Consequently, conventional economic analysis fails to predict the evolution of economic structures following a reduction in emissions.

Based on Shi and Yang (1996), Shi and Zhang (2012) constructed an infra-marginal general equilibrium model to explore the evolution of economic structure following government policies on emissions mitigation and environment. They assumed two substitutable energies to produce an identical final product – one was a "dirty" energy which emitted carbon dioxide and one was a "clean" energy which did not. The "clean" energy was costly at the early stage as its roundabout production chain has not been developed yet. In a *laissez-faire* environment without stringent policies on emissions mitigation and environment, the external environment cost of "dirty" energy was not included in its price and dirty energy dominated the "clean" energy. Consequently, without government policies the "clean" energy did not appear in equilibrium. However, government policies (e.g. emission cap, carbon pricing, regulation, removal of fossil fuel subsidy, high environmental standard) acted like a catalyst which promotes the emergence of the "clean" energy by equalizing the after-policies costs of the "clean" energy and "dirty" energy – which is similar to the conventional analysis of climate changes. The unique feature of the model is in its evolutionary mechanism of the "clean" energy sector. With the market expansion and transaction efficiency improvement through institutional innovation, the market structure in the "clean" energy sector will automatically jump to a higher level of division of labour through further specialisation and therefore higher productivity. Putting that story in the context of global competitiveness suggests that economies that take tough emission reduction measures and establish sound systems will be forerunners in transforming to the more competitive low carbon economy. Jaeger et al (2011) also independently come to the similar conclusion with Shi and Zhang (2012). A research agenda on climate change and green growth along the infra-marginal approach is currently being undertaken[8]

Though coming from different perspectives, a common feature of these three research agendas is their similar conclusion that mitigations could bring in additional

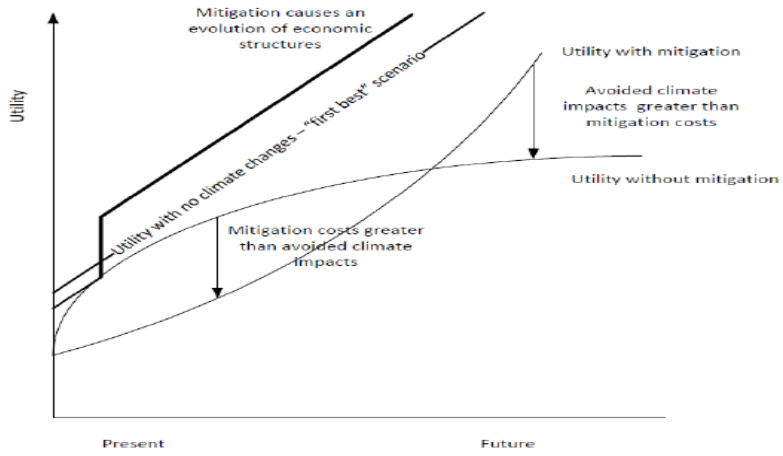
[8] See: http://www.drc.gov.cn/ccgg/en/

benefits for the *local* economy – either through incremental benefits on physical and human capital, technological progress, the use of mitigation policies in driving the economy closer to the production frontier, or its stimulus on the investment in "clean" technology, or its catalyst effects on the evolution of economic structure. Compared to the conventional approach, this research line challenges the "global public goods" interpretation of mitigation policies by arguing that the benefits of mitigation are internal to the participating countries in the form of promoting new economic growth opportunites.

Among these three approaches, the first two approaches are within the neoclassical framework in which mitigation is treated as the "second best" solution – that is, in terms of welfare, mitigation will be better than the case without mitigation but always worse than the "first best" case without climate change at all. On the other hand, Shi and Zhang's (2012) approach is more drastic in that it predicts that a different economic structure in terms of the division of labour might emerge following mitigation policies. This model is reminiscent of Schumpeter's 'creative destruction' concept in which interruptions or pivotal events drive the economy to a more competitive structure. Consequently, in terms of welfare, mitigation might represent an opportunity to move the economy to a better structure which exceeds the existing structure's "first best" case without climate changes. Another notable feature of this approach is that mitigation is the driver to promote the emergence of a new economic structure, rather than a co-benefit of reducing climate change costs in the long term. Jaeger et al (2011) also predicted the similar infra-marginal structural effect of mitigation from a different approach.

The difference of these approaches might be illustrated in a figure similar to Figure 3. In Figure 4the first two approaches predict a possible *temporary* decrease of utility due to mitigation costs. The incrementally better environment will then kick in to promote economic growth above the case with no mitigation but still below the "first best" case without climate changes. The third approach, however, predicts a possibility of drastic change which causes the evolution of economic structure and the utility to jump above existing structure's "first best" solution.

Figure 4 Utilities in different research



Source: made by the authors based on Figures 1.3 & 1.4 in Garnaut (2008)

An extension of Shi and Zhang (2012) adds an international trade story. The country first to *unilaterally* initiate an appropriate policy mix (e.g. emission cap, carbon pricing, regulation, high environment standard, removal of fossil fuel subsidy, and etc.) would drive the emergence of a "clean" energy sector. The evolution of the division of labour within the "clean" energy sector will ultimately improve the productivity of the whole economy, leading to a gain in international competitiveness for the whole country which forces its trading partners to catch up in transforming to a more competitive "clean" energy structure. That is, unilateral mitigation could lead to multilateral mitigation action (see, Zhang, Zhang and Shi, 2013). The story is similar to the historic events of free trade. About two hundred years ago, all countries, except the Great Britain, thought unilateral free trade was harmful to economy. But Great Britain greatly benefited from the unilateral free trade and the other countries then followed.

This new line of thinking has significant policy implications.

First, the new research line suggests that if we take into account the evolution of economic structures, the benefits of mitigation could accrue to the implementing countries in the form of generating economic growth opportunities. Mitigation is no longer a practice of benefiting other countries but compatible with self-interest; and consequently, unilateral mitigation could bring benefits for individual countries.

Second, in all three approaches, government policies on mitigation and environment are *necessary* to trigger the transformation from a high carbon structure to a low carbon structure. After the emergence of "clean inputs/energy", market will evolve by itself along the low carbon trajectory. From this perspective, government intervention serves as a catalyst to promote the emergency of new technology and/or the transformation of economic structure.

These two implications are the theoretical foundations of our policy initiative of a new two track framework presented in Section 5 below.

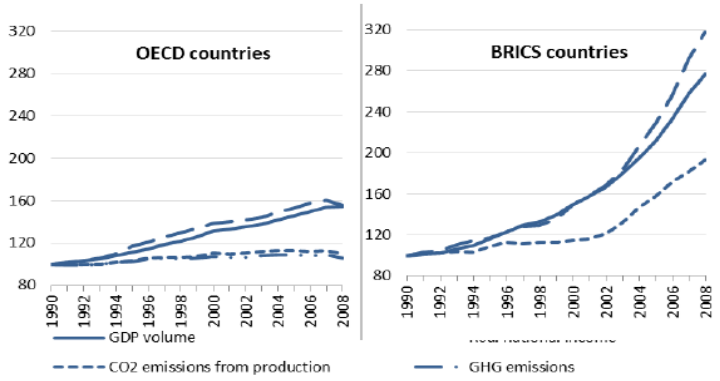
4. Real world practices to partially decouple economic growth from carbon emissions

Compared to the slowly progressing economics of climate change, policy-makers and the business community have taken swift actions to seize the opportunity represented by emission reductions. More and more evidence that emission reductions could have concrete benefits for growth is amounting.

The potential benefits of mitigation to economic growth – collectively called Green Growth, have been foreseen by more and more multilateral agencies. For example, in 2009, the OECD issued a *Declaration on Green Growth* in which its member countries set forth a comprehensive green growth strategy; under the EU's "Europe 2020" initiative, innovation and green growth form the core of a strategy to increase the competitiveness of European countries; and for "Rio+20," the United Nations Conference on Sustainable Development issued the *The Future We Want* to promote green growth.

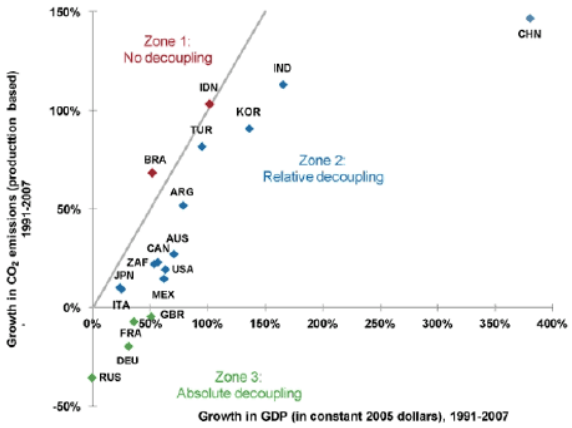
Meanwhile, some evidences of green growth are emerging. The World Bank and China's Development Research Centre of the State Council (2012) showed that economic growth and carbon emissions and pollution have already begun to partially decouple. According to UNEP, the carbon intensity of the world economy (CO_2 emissions per unit of GDP) has dropped 23% since 1992. Since 1990, economic growth has increased faster than carbon emissions for both the developed countries and developing countries, as represented by the 5 BRICS countries, though that decoupling is much more complete in OECD countries (see Figure 5). Raworth (2013) compared the growth in GDP and the growth in CO2 emissions in G20 countries during 1991-2007 and concluded that with the exception of Brazil and India, all other countries had experience of either "relative decoupling" or "absolute decoupling" (see Figure 6).

Figure 5: Decoupling economic growth from carbon emissions worldwide (index, 1990=1)



Source: OECD 2011

Figure 6: The G20's record on GDP and CO2 emissions growth, 1991-2007



Source: http://policy-practice.oxfam.org.uk/blog/2012/01/hunting-for-green-growth-in-the-g20

These global trends are also seen in evidence emerging from the two biggest emitters, U.S. and China. In both countries it has been demonstrated that economic growth can be partially decoupled from emissions, and that mitigation could potentially be a driver of technological progress and growth.

For instance, during the period of China's 12th *Five Year Plan* (2006-2010), China's GDP grew by 11.2%, while its energy consumption increased by only 6.6%, about half of its economic growth rate. Energy intensity decreased by 19.1%. Some relevant pollutants dropped absolutely. For instance, SO_2 decreased by 3.64 million Tons (-14.29%); CO_2: -1.76 million Tons (-12.45%). More importantly, Chinese decision makers have recognized that fighting climate change represents a 'great opportunity' and made a call for the country to seize the opportunity of green growth in its official document (NDRC, 2011).

In the U.S., as the special envoy on climate change indicated, "since 2006, according to the International Energy Agency, U.S. CO_2 emissions have fallen 7.7%...Meanwhile, the latest figures from the Energy Information Agency, for the four months ending in March (*2012, authors added*), show that U.S. emissions are 14% lower than in 2005. "

5. A new two track policy initiative

In the previous two sections, we have highlighted that the new progress in economics thinking of climate change (green growth) has made a case that decisive governmental actions on climate change and environment could actually promote *local* economic growth and therefore internalize the externality caused by greenhouse gas emissions; and in practices, we have already seen some emerging evidences of partially decoupling economic growth from carbon emissions. This gives us confidence to unlock the deadlock in climate change negotiation.

However, there is one more catch-22 dilemma: the kick-off of green growth requires catalytic action of the government on mitigation, while a risk-averse government needs convincing evidences of green growth to take the first step of mitigation[9]. Apparently, at the early stage, green growth still largely exists in vision and has not become common reality with sufficient evidences. For that reason, governments might be reluctant to take firm emission reduction action. In turn, without initiatives from the government, evidences on the benefits of green growth are slow to accumulate.

To solve this dilemma, the "loss aversion" theory of Kahneman and Tversky (1984) suggests that we might need to set a lower mitigation target to start with – say, a 3°C target, rather than the desirable 2°C target, so that the majority of risk-averse individual country is willing to take mitigation action. Meanwhile, to address the "emissions gap" to avoid the catastrophic consequence of the 3°C target, we need to build up consensus and confidence on green growth – which requires serious and complex policy coordination. Study by Victor (2011) suggests that such complex coordinating requires initially working in small groups (for example, in the form of a club) rather than a global UN framework. Weischer et al. (2012) also suggests

[9] One challenge in implementation is that green growth is beneficial particularly over a longer period to time and therefore it is important for government to consider longer timeframes in decision making. This could be a particular challenge in countries where planning is more explicitly linked to short political cycles.

establishing “transformational clubs” to complement UNFCCC. In this section, we discuss a new policy initiative – namely, new two-track approach to achieve this objective.

The basic idea of the new two-track approach is to guarantee early action and introduce green growth mechanisms in the post 2020 regime by taking the advantages of both top-down and bottom-up approaches. The legally-binding UNFCCC (the first component) mitigation would start from a relatively lower but politically-realistic emission reduction target, while the green growth Club (the second component) aims at higher voluntary global ambition. The two interactive systems are mutually-reinforcing in promoting green growth and eventually evolve toward the 2°C target.

Different from the old two-track system in which Annex I and non-Annex I countries take different obligations[10], the new two-track approach is applicable to all countries, but the ‘common but differentiated responsibilities’ (CBDR) principle is kept in a different form and becomes operational with a clearly-defined emission reduction obligation for each country. Each country commits two types of pledges, a legally-binding low pledge in the UNFCCC, and a voluntary high pledge in the green growth Club. It is optional for a country to decide whether or not to join the Club. Nonetheless, those countries not joining the club would not be eligible to the exclusive benefits and rights of the Club member countries.

The new two track approach is an open-and-inclusive system. It can incorporate the merits of a variety of existing proposals and all issues in the old two-track can continue to be discussed and negotiated, including finance, technology transfer, international climate change fund, and etc.

Specifically, in order to make this approach adequately respond to the challenges of climate negotiations, it consists of three pillars:

<u>Pillar 1</u>: set a relatively low UNFCCC legally-binding global target and disaggregate the global target among parties, so that CBDR of each country could be clearly defined.

The objective of the UNFCCC pillar is to guarantee early action and introduce institutional arrangements needed for green growth. For this purpose, the top-down element in UNFCCC is essential to guarantee all countries take serious actions. Otherwise, no individual country would have realistic pressure to take action on emissions reduction which is a prerequisite for green growth.

Two questions remains: First, how to set the global target within the UNFCCC?

We propose to set a lower global target (i.e. larger global emission budget) to start with in order to lower conflicts between the parties and make the essential early action politically acceptable to all countries, especially to the major emitters. We will

[10] The authors are not suggesting that the old two-track is unfair to any particular countries or countries group, but the new two-track approach is relatively easier to be implemented.

discuss why it is the best way to start with a higher degree target to achieve the 2 °C target in the next section (Section 6).

The second question is how to disaggregate the global legally-binding target. It should be an open question to be addressed through negotiation. In addition to the widely-accepted *per capita* principle, some specific factors can also be taken into account to make the allocation more acceptable[11]

Once each country's pledge has become legally-binding within the UNFCCC, then an *Emissions Account* can be introduced as a tool for measurement and international collaboration. Each country's account consists of three concepts: (i) an emissions entitlement (equivalent of how much a country should reduce based on its real emission); (ii) real emissions; and (iii) acquired emission permits from international cooperation, including emission trading, joint implementation, clean development mechanism, and etc. The account can then be established in the formula:

Emission Account Balance = (i) emissions entitlement –(ii) real emissions +(iii) acquired emission permits

The benefit of this strategy is that a country has various avenues in which to meet its legally-binding pledge, as it can balance this through adjusting (ii) real emissions or/and (iii) acquired emission permits. This provides an effective mechanism for global optimal allocation of resources. The formula suggests that real emission is no longer the single criteria to measure a country's efforts and its contribution to global emission reduction. A country with high real emissions could acquire more emission permits to maintain its emission reduction obligations.

<u>Pillar 2</u>: Setting the 'Green Growth Club' rule.

The objectives of green growth club are twofold: (i) to provide incentives for countries to reduce their emissions and activate green growth through international cooperation, and (ii) to address concerns about the 'consensus rule of procedure' in negotiations. The advantage of consensus rule is to provide a protection to small countries to avoid the manipulation by a few powerful countries over negotiation. Nonetheless, its disadvantage is that it can be ineffective. As complained by Stern (2012), "negotiations are governed by a consensus rule of procedure, which, in effect, enables any small handful of determined countries to block progress".

One strategy to maximize incentives, and address concerns about consensus rule of procedure would be to design green growth club using a normal club rule with rights and obligations. In this case the rights of membership would be designed to promote benefits of those joining – which include, but not be limited to, free trade and

[11] See for example, BASIC experts (2012), DRC (2009). Klinsky and Dowlatabadi (2009) used an applied ethics approach to categorise various proposals on international climate policies and their respective implications for distributive justice.

investment, technology transfer, the establishment and the use of international climate change fund, the use of established standards, and etc[12].

However, countries joining the club would also have to accept the obligation of introducing mechanisms of green growth at home country. Such obligations might include making high voluntary emission reduction pledges, introducing stringent reduction policy and law, reducing/removing fossil fuel subsidies, consolidating competitive market system, and etc. In order to encourage countries to join, and to ensure compliance, every member country needs to publicly announce its emission reduction pledge which is subject to public scrutiny, and membership would be subject to periodical review. For those countries failing to meet their voluntary pledges, penalties, such as suspension of their membership, would apply.

Our Pillar 2 is very similar to the idea of "transformational clubs" presented in Weischer et al. (2012). We share the same position of (i) they should have an ambitious vision consistent with the latest scientific evidences on climate change, (ii) there should be clear conditions for membership, (iii) they should provide significant benefits to members, and (iv) there should be a pathway to start now and expand over time. We defers in the proposed relationship with UNFCCC. We recommend a tighter connection with UNFCCC through Pillar 2 – which, in our view, provides an addition incentive for emitters to join the club.

Pillar 3: Connection of the two pillars.

Although the pledges in the two systems have different legal status, the two systems could be connected and mutually-reinforcing.

According to the emission account balance formula above, for a country, the less it emits the more emission entitlements it can sell or the less it needs to buy. The emission reduction resulting from the Club incentive (a reduction in real emissions; and consequently a positive emission balance) can be sold through a trading scheme in UNFCCC pillar (for example, establishing an emission trade scheme within UNFCCC framework) for a profit. Therefore, the new two-track approach provides an

[12] Research and policy initiatives are emerging to support the green growth club initiatives. For example, The International Centre for Trade and Sustainable Development (ICTSD), Global Green Growth Institute (GGGI), and the Peterson Institute for International Economics (PIEE) launched a project in 2012 designed to analyze the feasibility of a Sustainable Energy Trade Agreement (SETA) and develop the concept into a detailed set of policy options that could serve as the basis for such an agreement. On 7 September 2012, before attending the APEC summit at Vladivostok, Russia, the deputy U.S. trade representative Demetrios Marantis revealed that a 21-nation cluster would soon implement a mandate on cutting down import duties on "green" technologies.
Moreover, overcoming some of the policy and market failures that prevent the opportunity club being formed are being addressed at the "sub-multilateral" level, such as through the Global Green Growth Forum (Danish/Korean-led, China as participant) and the Clean Energy Ministerial (US-led, China as participant).

effective mechanism for low carbon technological innovation and management improvement towards green growth.

6. Further discussions of broader policy issues

In the previous section, a new two track approach was proposed to address the current stalemate in climate negotiations - based both on the economics literature that highlights the potential advantages of green growth, and on awareness of the challenges of triggering green growth to start. In this section, we highlight three controversial policy issues and discuss the ways the proposed new two trackapproach tackles these issues.

1) To achieve 2°C target, why need to start from a high degree?

A high target is desirable, and 2°C target is endorsed in the *Copenhagen Accord*.Ironincally, one feasible way to achieve the 2°C target is to start from a high degree. 2°C (750 Gt CO_2) target means a very tight constraint of global emission budget and is well below all countries' business-as-usual (BAU) emissions.. Naturally, during international negotiations, each country's primary objective is to fight for bigger share of a given global emissions budget - inevitably lead to a deadlock which might lead to a higher degree outcome and a catastrophic result[13]. Instead, to start from a lower target means a relatively larger global emission budget to allocate among all countries. This larger budget would alleviate conflicts between the parties, and likely make the essential early action politically acceptable to all countries, especially to the major emitters, and make it easier to introduce institutional arrangement promoting green growth[14]. Ultimately, green growth will make the 2°C possible.

So, how high is high degree?

The literature highlights government policy is just a catalyst and green growth is a self-fulfilling process. Delay in actions could be costly and it is preferable to reach a global climate change agreement as early as possible, no matter what the specific temperature target is[15]. A target (rather than the slow progress in the negotiations of *the* target) would provide a certainty crucial for both investors and consumers. This

[13] According to the World Bank (2012), if not take immediate action to reduce emissions, then global temperature is likely to rise 4°C

[14] Young (2011) surveyed the literature on the effectiveness of international environment regimes. One finding is that success in the implementation of international regimes, UNFCCC is likely to require the establishment and maintenance of maximum winning coalitions rather than minimum winning coalitions. A low-start is such an effective regime.

[15] This position is consistent with another interesting finding of Young (2011) in that multiple pathways can lead to success of many environment problems and environment regimes are dynamic in that they change continuously after their initial formation.

certainty is crucial for fostering green growth, and in turn crucial for solving climate change.

In this context, the proposed new two track approach can be effective because it addresses risk aversion and provides incentives for swift action. Since the legally-binding pledge is relatively low, the risk of action is low and essential early action can be guaranteed. Such no-regrets actions provide policy certainty which will raise the confidence for both investors and consumers to jointly expand the green sector and speed up the transformation of industrial structures[16]. Similarly, a self-interested mechanism is established in which emission reductions are rewarded in two ways: 1) the more a country reduces, the more it can sell or the less it needs to buy; and 2) deep emission reductions facilitate its green growth.

2) 'CBDR' principle and the dual-track negotiation system

Given the different contributions to global climate changes and respective capabilities of different countries, "Common but differentiated responsibilities"(CBDR) is a fair principal and is the foundation of UNFCCC. However, CBDR is subject to different interpretations in practices – which have become a deadlock in international negotiations. Under the Kyoto Protocol, The division between the Annex I and non-Annex I countries in mitigation obligations – commonly known as the firewall, has caused lots of controversies. The Bali Road Map tried to put the CBDR principle in practice by including a dual-track negotiation system, the Convention track, and the Kyoto Protocol track, respectively. Two *ad hoc* working groups (AWG-LCA and AWG-KP) were established to conduct negotiations on each track. It is fair to say the debates on the effectiveness of this dual-track negotiation system among the participating countries have not been settled yet.

In the new two track approach, CBDR principle can be operationalized by clearly-defining each country's legally-binding mitigation target at Pillar 1 and letting each country to voluntarily choose a high pledge at Pillar 2. For each country, the 'differentiated responsibilities' are clearly-defined by its legally-binding and disaggregated UNFCCC target. In this way, though the form of CBDR is changed, the substance of CBDR is kept.

3) Top-down or bottom-up?

The debate on top-down or bottom-up approaches is another deadlock in negotiations. For instance, as a matter of U.S. politics, any agreement that requires actions by the U.S. but not by the emerging economies would be a dead letter in the US Senate. In 1997, the Senate, by a vote of 95-0, passed the Byrd-Hagel resolution,

[16] Carruth, Dickerson, and Henley (2000) reviewed the literature investigating the relationship between investment flows and uncertainty. A general conclusion of their work was that increased uncertainty, at both aggregate and disaggregates levels, leads to lower investment rates.

declaring that the U.S. should not accept commitments to reduce greenhouse gases unless developing countries accepted such commitments as well (see Stern, 2012). Though the resolution is not seen as justified by other countries, it is a real political barrier for reaching global agreement in a traditional way.

Some then take an extreme way and propose a bottom-up approach to replace top-down approach within UNFCCC. For instance, Stern (2012) proposed a bottom-up flexible approach that starts with nationally derived policies, in which the pledges of individual country will be modified over time. Nonetheless, though the top-down UNFCCC has its problems, the solution is not to go from one end to another, but combine the advantages of two approaches.

First, top-down and bottom-up approaches are two sides of one coin. Since there is a 2°C global target, if all countries took a bottom-up approach, then the aggregate pledges of each country also need to be consistent to the global target of a top-down approach.

Second, the two approaches are interdependent. Without the pressure from the UNFCCC top-down approach, ambitious bottom-up pledges are impossible.

Thirdly, a complete bottom-up approach is politically not so realistic. For instance, to the U.S., though the pressure from domestic politics would be gone in bottom-up approach, the international political pressure to it will dramatically increase if it insists on dropping the UNFCCC. Therefore, bottom-up is not likely an 'art of the possible'.

Fourthly, bottom-up approach with modified pledges over time is not so realistic. If it is hard to ask the countries to raise the ambition under UNFCCC, then there seems no reasons to think it would be easier to modify a country's ambition by "a six-month period after countries submitted initial offers in which other governments, experts, and civil society could react and urge for modification" as Stern (2012) proposed – just recall how difficult it is to ask any countries to raise their pledges in Copenhagen Accord.

Lastly, a bottom-up approach is not so compatible with establishing global carbon market since the value of carbon permits is then determined by each country's reduction ambition. Some would argue that the world carbon market can still be established since in this case different country's carbon permits have different values and prices, and a carbon 'exchange rate' can be introduced. The risk of seeking to establish markets without a coordinated limit is that it would make things too complicated and transaction costs high.

The proposed new two track approach can effectively combine both top-down and bottom-up approaches. The UNFCCC Pillar 1 set a global target and each country's obligations in mitigation – a top-down approach; while the Club Pillar 2 allows each country to determine its own pledges – a bottom-up approach. Such a combination is both realistic and effective.

7. Conclusion

This paper is aimed at providing some policy recommendations to unlock the deadlock in the current rounds of international climate change negotiation. Our arguments are based on two grounds.

The first is the latest progress in the theoretic frontier of economics of climate change which show the possibility that mitigation could stimulate the emergence of new technology and/or new market structures which promote economic growth - rather than negatively impact economy. One exciting implication of this trajectory of research is that unilateral mitigation could bring substantial benefits to the local economy – which challenges the common mindset that mitigation necessarily has "global public good" characteristics in which "cost is local and benefit is global". Since mitigation is incentive compatible, the burden-sharing negotiations could become opportunity-sharing collaborations in the context of international negotiation in climate changes. Accordingly, we suggest that to establish an effective post 2020 climate change regime, the current negotiation needs a *strategic transformation* from burden-sharing to opportunities-sharing by putting green growth at the heart of the new regime.

The second is to provide a practical policy initiative - a new *two-track* approach to facilitate this *strategic transformation*. Starting from a less ambitious but legally binding UNFCCC emission target, plus a voluntary Green Growth Club approach, we have made a case that this new two-track approach could face far less resistance from individual countries in international negotiations and could establish a mechanism of triggering green growth. This could in turn encourage individual countries to take decisive early actions to mitigate. With sufficient local benefits emerging – and the theoretical research and amounting evidences have shown so, more and more counties will then voluntarily join the Green Growth Club. Ultimately, a relatively lower starting point with higher temperature will achieve the well acclaimed 2°C or below target.

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