POLICY BRIEF

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Assessing the climate pledges of China and India: how much do they bite?

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ABSTRACT

One of the most important outcomes of Copenhagen has been the pledge of China and India to reduce the carbon intensity of their economies. The former is especially relevant since China already generates 25% more emissions than the second world country emitter, the US. Recent statements of Chinese officials indicate that the commitment might already be included into the twelfth five year plan (2011-2015), to be approved early next year. If that was the case, China would have a domestic climate policy before more accountable nations such as the US do. However, given the elusive intensity metric, there is considerable speculation about what kind of climate leadership is entailed by the Copenhagen pledges. This policy brief tackles this issue by providing an assessment of the Asian giants' efforts required to meet their climate goals, and the implications beyond 2020. Historical evidence and results of integrated assessment models point to a mixed picture in which the accord can turn from business as usual to a serious climate policy.

Policy Challenge

Although perceived as a failure, the meeting of the conference of parties in Copenhagen has also provided some good news. One of the most important is the climate pledges set by major countries like China and India. Since they are expressed in terms of carbon intensity, it is not straightforward to evaluate what they mean in terms of emissions reductions. Are they consistent with a baseline as usual? Or do they entail a shift away from the way energy is produced and consumed now? Which way forward do they indicate, if any?

Introduction

A major factor in the reluctance of countries to make commitments to a low-carbon economy is fear that change will be costly and that others will hold back – the free rider problem. The little progress achieved in the past ten years on the front of international climate agreements is based on strategic considerations of this sort, predicted using applied game theory as long as 15 years ago (Carraro and Siniscalco 1993, Barrett 1994).

For these reasons, and given the absence of domestic legislation in the US -a fundamental condition for any meaningful step forward- experts and especially economists had little expectations that Copenhagen could mark a turning point in international negotiations. The public perception of the U.N. meeting was far direr, mostly out of the frustration of yet another negotiating stall, and of the high expectations that accompanied the election of a new US administration.

The meeting has shown many weak spots and not achieved dramatic results, also due the now apparent poor management of the Danish hosts, and the confusion of a system that is too big and diverse to be efficient. What is worse, it has undermined the climate leadership that Europe had strived for so long. However, the Accord signed, or better "noted", by the U.N. assembly contains some elements that are positive and should not be downplayed (Carraro and Massetti, 2010). The agreement pledges US$ 30 billion to the developing world over the next three years, rising to US$100 billion per year by 2020, to help poor countries adapt to climate change. The Accord also favors developed countries' paying developing countries to reduce emissions from deforestation and degradation, known as "REDD".

Most importantly, the Accord contains a series of pledges from many countries, including two leading nations such as China and India. Both countries have announced reduction targets in terms of carbon emissions per unit of gross domestic product (GDP): 40-45% for China and 20-25% for India, in 2020 with respect to 2005 levels. This has marked a point of departure from the long standing reference to the UNFCCC principle of "common but differentiated responsibilities", which requires developed countries to take on the initial responsibility in reducing carbon emissions. The developing countries appeal to the historical responsibility of developed ones and their higher per capita emissions remain a important stand post. But their growing weight – China is the world largest emitter with 25% more emissions than the second one, the US – doesn't get unnoticed. Before and during COP 15, many countries have pressed emerging economies –and especially China- to take on action in controlling their very rapid emission growth.

Although China has resisted demands from American and European negotiators to adopt binding limits on its emissions, arguing that environmental concerns must be balanced with economic growth and that developed countries must first demonstrate a significant commitment to reducing their own emissions, its -40-45% proposal can be considered an important political statement. More importantly, senior Chinese officials recently recommended that China should set a target for reducing its carbon intensity in the upcoming Twelfth Five-Year Plan (2011-2015). If approved by the National People's Congress early next year, this would mean that China could have a domestic climate policy before the US does (if it will ever do).

However, the assessment of its implications in terms of emissions reductions has generated fewer consensuses, given that specific assumptions are needed to convert the somewhat elusive metric of carbon intensity into the conventional one of quota targets. In addition, there are fears that the measurement uncertainty about economic activity and greenhouse gases could allow for some verifiability problems. For example, the recent Chinese claims of their good progress towards the 2010 energy efficiency target has been

questioned[1] as inconsistent with the published statistics. Given the parallel between the 2010 energy intensity target and the 2020 carbon intensity one, this indicates that monitoring advances in terms of actual emission reduction against a counterfactual baseline won't be easy. As for India, the Copenhagen pledge includes all greenhouse gases, not only CO2, adding a considerable source of uncertainty due to the difficulty in measuring them accurately.

Whether the Copenhagen pledges are real good news, a game changer, or just BaU, is thus an entirely open question. In what follows we'll provide some figures about what we can expect from the commitment, though no definitive answer is secured.

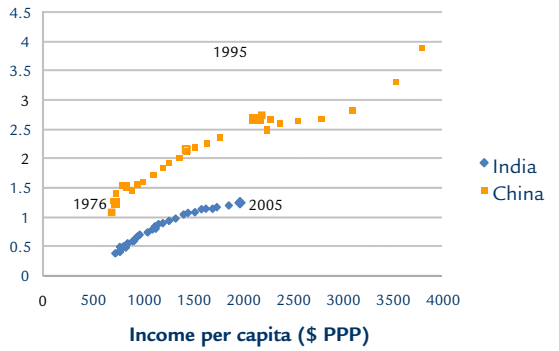
A tale of two (different) countries

China and India are often put side by side given their immense population and growing role in the global economy. With 2.5 Billion people, the two Asian giants jointly represent almost 40% of the world population. Their fast growing economies and domestic endowments of coal mean that the rising energy demand is likely to be met with fossil fuel sources. Given their scale, if uncontrolled their emission growth would soon make up all the mitigation that could be carried out in the industrialized countries.

However, the two nations are profoundly different, economically and even more so from a climate stand point. As shown in Figure 1, as for wellbeing India is lagging behind China by at least a decade: its income per capita in 2005 was that of China in 1995, and since then -despite the financial turmoil- the GDP has actually grown faster in China. As for climate, the gap is even bigger, with an average Indian emitting like an average Chinese used to do in the early 80s. This is due to a lower carbon intensity of the Indian economy, due to differences in economic structure as well as climate and geographical factors.

This simple illustration (Figure 1) shows how different the two countries are in terms of responsibility to climate change. Including China from the start is vital for any effective emission reduction plan, whereas India involvement could be more gradual, as their per capita emission would hardly exceed those of industrialized countries even in a climate mitigation scenario. The difference between these two countries is reflected in the different objectives contained in the Copenhagen pledges, with the India one almost half as stringent as that of their Chinese counterpart.

Figure 1: A tale of two countries: income and CO2 per capita in China and India over time.



An historical view

Given the difficulty in achieving real progress in international climate agreements, the priority of economic development in developing countries, the proximity of the commitment year (only ten years away), it is tempting to dismiss the pledges of Accord as nothing more than business as usual. According to this view, China and India were going to reduce their carbon intensity by 40-45% and 20-25% anyway.

Economic and emissions projections can be used to provide some intuition of how demanding is the intensity proposal. According to the Energy Information Agency of the US Department of Energy (EIA-IEO09), in 2020 China and India will have an economy of 16.9 and 6.4 Trillions USD (measured in 2005$, PPP) and energy related emissions equal to 9.4 and 1.8 GtCO2. Thus, the carbon intensity of the two countries are projected at 0.56 and 0.28 tCO2/'000$; with an intensity in 2005 just around 1 and 0.5 respectively, both countries are assumed to achieve more than 40% reduction target in the so called Business as Usual scenario, without any additional effort.

Another well known energy outlook, provided by the International Energy Agency (IEA-WEO09), foresees quite close carbon intensity figures: 0.55

[1] See for example http://www.eastasiaforum.org/2010/03/31/chinas-energy-intensity-target-on-track-or-off/ . The target envisions a reduction of energy intensity by 20% between 2005 and 2010.

for China and 0.32 for India, reinforcing the argument that the pledges would not entail measures that are additional to the ones considered as baseline. In the case of India, they would even go well further, though one should remember that India includes all the main greenhouse gases and not only the CO2 ones project by the international agencies.

This interpretation is at odds with declarations that suggest that significant action will be required to achieve a de-carbonization of the economy of this sort, released for example by the same IEA. Chinese commentators have suggested that the objective will require significant investments and increased taxes on energy or emissions. Yet, looking at Chinese own forecasts doesn't provide a different picture from the ones of foreign agencies: in the report that forecasts energy and emissions to 2050, produced by China's Energy Resource Institute, the carbon intensity in the baseline is expected to fall within the 40-45% band. In a comprehensive study employing five models[2], India is also shown to continue its decarbonization at a rate of about 2% a year, in line with the Accord commitments.

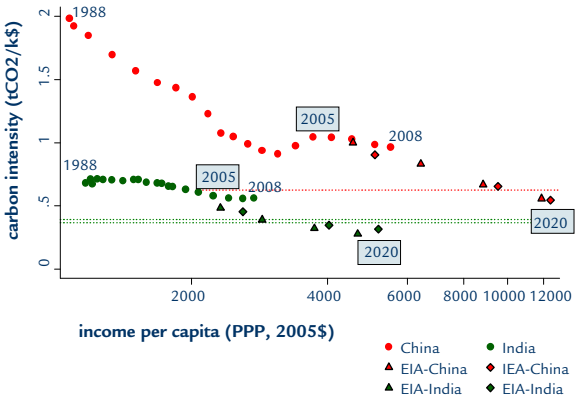
It should be noted that Business as Usual scenarios incorporate significant investments in low carbon technologies: for example, according to the IEA, China will have 114 GW of wind and nuclear in place in 2020, as compared to today's 14. As mentioned above, China has also committed to a significant energy efficiency improvement before 2010. India is also expected to increase its contribution of renewables and nuclear. Yet, coal is expected to continue to dominate the energy mix, with the astonishing installed capacity in 2020 of almost 1000GW and 200 GW in China and India, twice as much as today. It thus remains unclear whether the proposed climate policy will achieve more than the already demanding "natural" evolution of baseline.

History provides some, though partial, guidance over the future. As reported in Figure 2, in the 15 years before 2005, China's carbon intensity has decreased by roughly 44%, the same number that is forecasted from 2005 to 2020, either as baseline or policy. On the contrary, India carbon intensity has declined at a lower speed, of about 16% between 1990 and 2005. At this rate, the climate pledge would be actually binding.

[2] Available at http://moef.nic.in/downloads/home/GHG-report.pdf

In addition to this country differences, the picture shows significant variations over time. China achieved a remarkable drop from its initially extremely high carbon intensity, but then experienced a sudden reverse of this trend in the early 2000's, that has ceased only after 2004. Though this well known fact can be imputed to a swift reallocation of the economic activity towards energy intensive sectors such as cement and aluminum, and to potential misreporting of emission inventories around the turn of the century, it also serves as a reminder that steady intensity improvements should not be given for granted. As for India, a more linear pattern emerges, with an increase in decarbonization since the inception of the new century, though not confirmed in the provisional data for the most recent years.

Figure 2: The past and the future: carbon intensity versus income per capita historically and as projected by international agencies. The dashed lines indicate the Copenhagen pledges.



This mixed picture is not altered when looking at a sufficiently large panel of countries, which doesn't provide an unequivocal relation between economic development and carbon intensity. Carbon efficiency gains are observed in many circumstances, but in widely varying relation to the economy.

Therefore, the historical evidence provides us with only limited confidence to believe that naturally, as China and India economies roughly double in per capita terms, the carbon intensity will be driven down by a growing role of the service sector and of technology. That is, the projections reported in Figure 2 indicating a baseline straightly approaching the climate target might well be correct, but it is also

plausible that deviations from the historical rates of de-carbonization would result in a much more demanding job.

As an example, we estimate the income elasticity of carbon intensity for different time spans for the case of China. Looking at the past 20 years (1988-2008), China's elasticity is about -0.5, meaning that every 1% increase in per capita income has been accompanied by 0.5% decrease in carbon intensity. Using this value for projecting forward, would result – as noted above - in a carbon intensity reduction in line with the climate proposal, of about 41% with respect to 2005. Indeed, despite using a much richer modeling approach, this is what international and national scenarios are projecting.

Looking at a different time frame would alter the picture. For example, since 2004 (and according to provisional emission estimates to 2008) China's elasticity has been around -0.3. In Table 1 we show what would happen if China follows such rates of de-carbonization. It would result in higher emissions, or equivalently in roughly 25% of abatement needed to comply with Copenhagen pledge.

Table 1: Implications of different elasticities on carbon intensity and emissions in China in 2020.

	Income elasticity of carbon intensity	Carbon intensity reduction (2020 w.r.t. 2005)	Emission reductions needed to achieve a 42.5% objective)
1988-2008	-0.5	41%	2%
2004-2008	-0.3	27%	26%

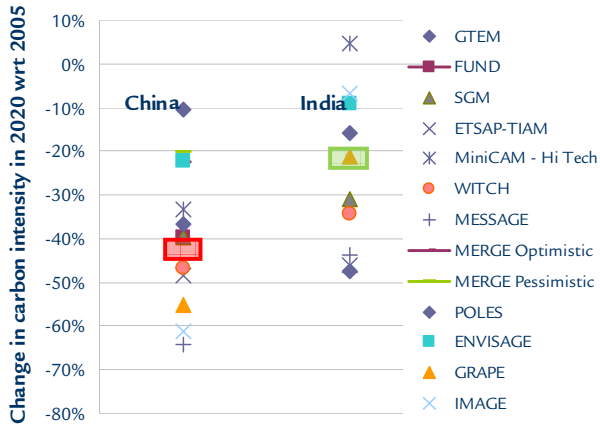
A modelling view

In addition to the historical perspective, and with the hope of getting a clearer picture, it is interesting to investigate the scenarios generated by integrated assessment models. These numerical models are extensively used to assess the economic, technological and environmental implications of international climate and energy policies, and are the backbone of the IPCC working group III effort to assess the solution side of climate change.

We avail of a recently completed model comparison exercise (EMF22) that brought together ten models to analyze a set of concerted scenarios of international climate policies. Here we focus only on the reference scenarios, to see whether this data set foresees the climate pledges of India and China as binding or not. The suite of models is calibrated on historical data, but incorporates technological progress and can thus provide a more accurate representation of the near term future than a straightforward reference to the past trend. In addition, most models feature all the main greenhouse gases, an important characteristic since India's target goes beyond energy related CO2.

Figure 3 shows the forecasted change in carbon intensity for the two countries in 2020 with respect of 2005. A mixed picture is once again reported, with roughly half models predicting that the carbon intensity objectives of the Accord would be binding, and the remaining half that it would be consistent with business as usual.

Figure 3: Carbon intensity reductions for India and China as predicted in the reference scenarios of the EMF22 participating models.



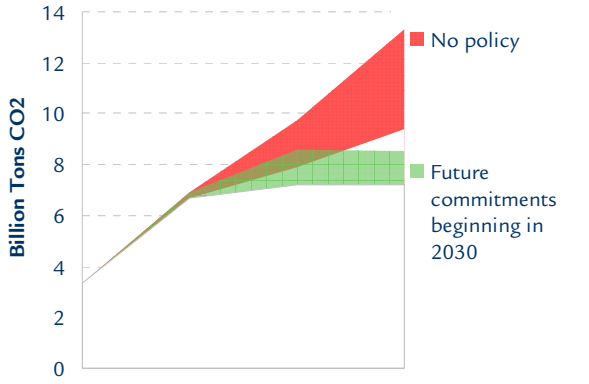
Looking beyond

The real question, though, is whether the announced targets have implications for the longer term. Investment decisions in long lasting capital such as power plants are taken looking beyond 2020, normally as far as 2030. Also, it is reasonable that developing countries expect

industrialized ones, most notably the US, to initially take a more decisive action than their own.

Two papers in the same modeling exercise (Bosetti et. al. 2009, Richels et. al 2009) have specifically looked at the issue of timing and policy anticipation. The key insight in their analysis is that a commitment now on behalf of China and other key developing countries to accept pre-specified future targets on emission reductions (not intensity) could effectively make a contribution. The studies show that anticipation of a credible future policy target induces a smooth transition, leading to reductions from baseline emissions well before the policy actually begins (Figure 4).

Figure 4: Energy-related CO2 emissions in China under a no-policy reference case and a future commitment scenario, as indicated by the two models.



The primary driver for this result is the long lifetime of capital in the energy system, in particular of conventional coal-fired electric generation, the main source of emissions in the developing world (now and in an expected "no policy" future). The most attractive abatement options involve investing instead in low- or zero-carbon generation capacity, including renewables, nuclear, advanced coal with carbon capture and storage (CCS), and improvements in end-use efficiency. This strategy would optimize the replacement of carbon-intensive capital, whose costs are sunk once the capacity is installed. Equally important, many low-carbon options will require a sustained research and development (R&D) effort to bring them to market. Thus if a country is eventually to undertake emissions reductions, the sooner its firms and households know about it, the better will be their investments in both capital and technology.

Concluding remarks

This policy brief has assessed the climate pledges that China and India included in the Accord of Copenhagen. Historical evidence and results of integrated assessment models have shown a mixed picture in which the accord can turn from business as usual to a serious climate policy. These results indicate that assessing the challenge of the carbon intensity target proposed by China and India is not an easy task. For example, if China were to continue on its long term historical trend, then the objective would essentially yield nothing more than the baseline. No leadership to fight climate change. The Copenhagen Accords would be even emptier than what is now perceived.

Yet, the significant variations over time and across countries suggest that the proposal could turn into a serious mitigation policy, even for somewhat lower rates of de-carbonization of the economy. More importantly, the pledges might be consistent with a longer term view in which binding emission targets are adopted later than 2020.

After all, developed nations have postponed their obligations by at least a decade since the start of climate negotiations. A commitment to commit to future emission obligation would allow fast growing economies like China and India to configure their energy capital stock accordingly in advance. And it is in this spirit that the climate pledges might be best interpreted.

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