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Performance Measurement under Rational International Overpromising Regimes

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Abstract

Overpromising remains ingrained in international agreements, clouding their expected aggregate outcomes and how to assess the Parties' performance. This paper provides a theory-based explanation and evaluation of this regime and its consequences, with an empirical application to the Kyoto Protocol. It shows (1) overpromising to be part of a sustainable strategy for electoral success, and (2) there are common determinants of the countries' overpromising values that characterize the group regime. (3) Targets need to be adjusted for regression-predicted overpromising to yield rationally-expected outcomes. (4) Individual countries' performance is best identified by deviations of outcomes from their adjusted, not the agreed, targets.

Key words: Overpromising, international agreements, treaty compliance, performance measurement, politics and environment, Kyoto Protocol

JEL codes: F53, Q54, D72

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I. Introduction

When countries make commitments to each other as parties to international treaties, conventions, or looser agreements and joint declarations,¹ such agreements often involve considerable overpromising that is evident as ante.² Examples of this continuing practice range from undertakings promised under the Nuclear Non-Proliferation Treaty to G7 Economic-Summit undertakings³ and adoption of the millennium development goals in the Millennium Declaration. Commitments made under the Kyoto Protocol are another case in point:⁴ If nothing is changed drastically, overpromising of emissions reductions will continue in future rounds.

The national Greenhouse Gas (GHG) Inventory data first reported in October 2007 for 1990-2005 (UNFCCC 2007b) shows how far 21 of the most advanced countries fell short of the targets they had negotiated for rates of change in CO₂-equivalent (CO₂e) emissions. A total of 20 other “Annex I” (UNFCCC, 1992, p. 23) and “Annex B” (UNFCCC 2007a) countries -- transition economies and specialized countries like Iceland and Luxembourg that also had targets -- are not considered. The 21 countries overpromised by 10.7% on average when all countries are weighted equally. Thus instead of reducing emissions by 2005 1.4 percent below the 1990 baseline on simple average as implied in the Kyoto targets, the 21 countries increased such emissions by 9.3%. All countries together emitted a total amount of GHG that is even farther, or 16%, above their implied 2005 target levels combined. The reason is that large countries tended to overpromise more than small countries, and their performance dominates the aggregate.

By 2005 about three-quarters of the time had elapsed from the 1990 baseline to the 2008-2012 first commitment period during which the target is to be met. Hence it is

reasonable to assume that the Parties to the Kyoto Protocol should have used the time to move proportionately toward their target that is to be reached over the 5-year average centered at 2010. Such targets were agreed well before the Protocol was adopted in 1997 though it did not enter into force until 2005. So if a country promised to achieve a 20% reduction of annual emissions relative to the 1990 baseline in the first commitment period centered at 2010, its implied commitment for 2005 is taken to be a 15% reduction.⁵

For the 21 advanced countries, target rates of change in emissions to be achieved by the first commitment period, 2008-2012, range from a reduction by 8% (i.e., -8%) for Switzerland and the then 15-country European Union (EU-15) to an 8% increase for Australia over its 1990 emissions level. Within this range, the United States agreed to -7% and Canada and Japan both to -6%. The -8% negotiated by the EU-15 was redistributed within it over a far wider range extending from -21% for Denmark and Germany to 27% for Portugal (see EEA, 2007). For the US, Canada, Japan, and the EU-15, agreed rates of emission change to be achieved by 2008-2012 thus were confined to the -6% to -8%, a range much too compressed to accommodate vast differences in forcing variables between them. Targets that include, generally substantial, degrees of overpromising are not best forecasts or good-faith predictions of actual outcomes.

There is a wider, methodological issue also to be considered: How to evaluate performance in the presence of systematic overpromising. Measures of performance – showing which countries did better or worse than expected by the standards of the group – should be derived by comparing the rates of deviation of actual 2005 outcomes from the implied 2005 Kyoto target value with the like rates of deviation predicted from the pattern set by the 21 countries, and not with the unrealistic Kyoto targets that contained

these predictable degrees of overpromising. Nevertheless, overpromising up to a point appears to be a politically gratifying process that is deeply rooted.

A few researchers have claimed that the Kyoto Protocol has failed entirely in that “[i]t has produced no demonstrable reduction in emissions or even in anticipated emissions growth” (Prins and Rayner, 2007a, p. 973). Some have asserted that it would have no cost-effective consequences, indeed essential no effect at all, “postpon[ing] the rise in global temperature a bit less than 7 days in 2100” (Lomborg, 2007, p. 23), even if faithfully implemented but without any extension. Others argue that it is failing because implementation was anything but faithful and because it became a “political sedative” (Prins and Rayner, 2007b, p. 12), lowering political demand for more effective measures. In either case, whether due to design, country-coverage, or implementation failure, overpromising would have been entirely unproductive. In general, however, overpromising is not so easily dismissed: To explain its persistence in international agreements requires overpromising to be somewhat productive.

A. Outline by Section

While overpromising is widespread, the commitments made in international agreements are almost always worth more than the paper they are written on. But how much more are they worth than if these commitments had not been agreed to? In other words, what is the net change produced by international cooperation in this form?

Because answering this important question involves first configuring the counterfactual against which the net change is to be measured, it would require historical-contextual analysis. That analysis would have to determine (1) by how much reaching international agreement had changed the promised, and then the expected, outcomes

relative to proceeding without such an agreement (the counterfactual⁶). After the end of the commitment period, an evaluation could then be conducted to determine to what extent actual outcomes deviated from (2) promised and (3) initially expected outcomes.

This paper does not provide an empirical answer to the important bottom-line question (1) which is, what difference an international agreement has made to an outcome “we,” and our representatives, really care about. It does not regard pro forma compliance scores (2) as informative for the evaluation of countries’ relative performance if these scores are derived for undertakings that were adopted under an overpromising regime. It focuses instead on the logically prior questions of how to infer rationally expected outcomes (3) from international commitments concluded under that regime. For without knowing what promises “really mean” it is impossible to determine how they have modified the outcome expected without them and whether the actual outcome is better or worse than expected.

Section II focuses on how to extract operational meaning from promises with a model in which overpromising is employed to maximize the utility of the (median) voter. In that model, performance gets increasingly risky the more ambitious the promises, and expected outcomes rise at first at a decreasing rate with promises and then actually begin to decline as promises become outlandish, betraying a lack of competence and judgment.

The sustainable equilibrium rate of overpromising thus deduced for a particular type of undertaking does not require asymmetric information, or deviations from rationality, by any party. Given that such a conceptual equilibrium rate can exist for each country, Section III looks for common determinants of these rates of overpromising among them. The regression analysis for the 21 countries is designed to identify the group regime of

overpromising against which their actual individual behavior can be measured. At this point gross and net overpromising are distinguished for clarity: Gross overpromising is the sum of the expected outcome plus the excess of the promise over the outcome expected with the promise in question; net overpromising refers solely to this excess.

As laid out in Section IV, using the estimated values of the regression-predicted net overpromising by country to adjust the different targets agreed to by each serves two functions. First it allows rational expectations to be formed about what may be achieved by the 21 countries operating under the overpromising regime for their group. Secondly it allows the actual performance of individual countries to be contrasted with the performance predicted if they followed the group pattern of net overpromising. This makes it possible to measure performance relative to the adjusted targets, rather than the treaty commitments, where the adjustment is for the group pattern of net overpromising. That pattern is identified by a cross-section regression analysis with explanatory variables that refer either to the beginning of the period (1990) referenced by the commitment or can be anticipated with a high degree of accuracy from its start. Section V reflects on alternatives to the over-promising regime and concludes.

B. Overpromising, and its Motivation and Productivity, under Rational Expectations

Whether practiced by snake-oil peddlers, pitchmen, sundry campaigners, or Hickey, the salesman and son of a preacher who appears as a messiah⁷, overpromising is common in social relations but frequently put down in literature and popular culture. The durability of the practice poses a puzzle. Under the rational-expectations paradigm here embraced, there is no recourse to chronic gullibility or slow learning about the true type of agent and the truth of the matter, save for random disturbances, that could help solve

this puzzle. Yet promising by means of express commitments short of enforceable contracts -- just like New Year's resolutions, Government Reform Plans, and mobilizing a spirit that is willing -- is often somewhat productive. With the bar often set high to push performance for a collective good, there is a tendency to wonder whether it was set high enough if more than relatively few agents, even governments, manage to clear it.

Overpromising thus often implies underdelivering on the promise while still exceeding the result that would be expected without the promise. Few promises, and none that are sustainable, are entirely empty and without consequences. Promising to break the status quo and to get 10% more done, while achieving only about 7% more not just in a particular instance but even on average, could be an example of a promise made in good faith. Credibility is not lost automatically and deception or incompetence is not manifest when programs that aimed high fail to be fully implemented and adopted targets are missed after a "mighty effort," or at least a "good try."

Overpromising, as here conceived, may involve the display of optimism as a public-relations posture, but it is free of self-delusion, and does not delude others. Unlike overconfidence, it is not based on miscalculation. Overconfident agents will tend to give, as their subjectively unbiased best estimate, more than they can realistically expect to achieve, though they will, at times, get lucky. They will also tend to underestimate the degree of downside risk associated with their promise, believe in rosy scenarios, and make insufficient allowance for uncontrollable events.⁸ Yet overconfidence by the agent is not a necessary condition for chronic overpromising, and no such perception bias or any information asymmetry between agent and voting public is used in this paper. For overpromising to "work" politically, it has to be associated with a successful projection

of dynamism, willingness to take risks, and energy to get great things done, even if outcomes generally turn out to be not quite as good and complete as promised.

Of course, habitual tolerance of overpromising could be based simply on the premise that such predictable behavior does neither harm nor good; rational recipients of such promises will know how to scale them back to their rationally expected outcomes. However, those adjusted outcomes are still not independent of the degree of overpromising if overpromising had consequences that helped generate them. Indeed, the ubiquity of overpromising in international agreements involving global public goods or widely shared aspirations suggests that there is some efficacy to the practice.

If clarion calls of overpromising are not worthless but productive of increased resolve, political focus, and some desired results, overpromising is potentially sustainable indefinitely. Leaders who promise to get much done and appear hopeful, inspired, and energetic may thrive politically by pushing goals that are so ambitious that they fall into the upper tail of outcomes likely to be achieved even with promises. They may thus overpromise and underdeliver on average and yet be credited with achieving more than rivals evincing less ambition. Hence, up to a point, promising more may lead to actions that raise the rationally expected outcome without too much risk. Overshooting that point by promising too much can have the opposite effect when the marginal risk/return ratio becomes excessive and promises begin to strain credulity. Then the forgiving Null hypothesis, that these commitments are indeed serious, starts to be rejected by the public.

C. Overpromising due to Time-Inconsistency or Other Coordination Failures

In contrast to the theory of rational and sustainable overpromising developed in this paper, some other theories are based on intragovernmental disequilibrium or international

coordination failures. Internally there may be pressure at the commitment level that does not extend equally to implementation. For instance, when a government is made up of competing groups that prevent it from being unitary and time-consistent, what a Ministry of External Affairs agrees to at the commitment stage may not be what other departments, such as a Ministry of Trade and Industry, are happy to see implemented.⁹

For lack of sufficient international cooperation, countries may sometimes choose to agree to targets to set an example for others, even though there may be little point in sticking with the targets if the example fails to draw others in (Le Boucher, 2004). National decisions on environmental treaty ratification have also been depicted as best explained with “globally legitimated” models of environmental protection rather than as solely reflecting a calculated choice of self-interested rational sovereigns (Frank, 1999).

If a high degree of overpromising is suspected but its distribution over countries is uncertain, overpromising increases uncertainty over the net benefits of cooperation. In addition, non-cooperative countries raise costs for all cooperators. “The result can be a reduction in the aggregate expected net treaty benefits and, therefore, an increased likelihood that the treaty will end in failure” (Bial, Houser, and Libecap, 2002, Section III).¹⁰ Hence overpromising may have diverse causes and consequences. The challenge set for this paper is to explain this phenomenon in international agreements parsimoniously as the outcome of a sustainable and transparent vote-maximizing strategy adopted by internally unified and time-consistent national governments.

II. Overpromising for the Median Voter: The Micro-Model

According to the scenario just outlined, the adoption of programs that involve overpromising with regard to objectively verifiable outcomes or targets may in fact be

energizing up to a point, even if compliance remains partial. Hence the ratio of a promised (program) result (PR) to a baseline (BL) alternative construed without that program, $x = PR/BL \geq 1$, will be viewed as the controlled policy input variable that drives the expected result, ER again related to BL, $y = ER/BL$, where $x \geq y \geq 1$ and there is uncertainty about the effect of x on y .

A simple quadratic outcome function may convey the basic idea that y falls increasingly, and with growing uncertainty, short of x as the relative size of the promised rate of change, $x-1$, increases:

$$y = x - a(x-1)^2 + \varepsilon, \quad \varepsilon \sim H(0, x S_\varepsilon^2|_{x=1}) \quad . \quad (1)$$

The error term, ε , is symmetric but heteroskedastic (H) because, as explained below, it is subject to a diffusion process in x . Its variance is rising linearly with x times the level of the prospective baseline ($x=1$) outcome variance, $S_\varepsilon^2|_{x=1}$. This baseline variance level may be written $\text{var}(0)$ as in Figure 1, so that

$$S_\varepsilon^2 = x [\text{var}(0)]. \quad (2)$$

If the baseline, BL, is to serve as useful reference for the performance expected under a program that may take years to materialize, it must itself be brought forward to the promised delivery date for a time-matched comparison. BL therefore is an uncertain forecast or projection made on the assumption that $x = 1$, or that there is no overpromising and hence no (special) program. The uncertainties of such a business-as-usual scenario, itemized by class of emissions in Part III of the HM Treasury (2006) Stern Review, Annex 7.b through 7.g, involve climate-science and other outcome risks relating to such a dynamic baseline. A diffusion process starting from that baseline may represent the growing apprehensions of the voting public about the increasing risks associated with

ever more ambitious promises. The public could, for instance, be concerned about the risk of rapidly increasing costs and growing uncertainty of outcomes as the program moves into unfamiliar terrain with x rising well above 1.

Without addressing the political aggregation of “issue” voters and others, such as partisan voters, “personality” voters, and government followers, and who may participate in the calculus below, the vote-maximizing program or policy can be represented as:

$$\text{Max } \{UV = u(y, \text{Risk}) = g(x)\}. \quad (3)$$

Required signs of the partial derivatives of the (median) voter’s utility function, UV , are $u_1 > 0$, $u_2 < 0$, $u_{11} < 0$. Hence obtaining more of the expected outcome, y , is treated as a political desideratum, or public “good,” but at a decreasing rate and at the cost of greater, and unwelcome, risk. As equations (1) and (2) already suggest, Risk rises with x , as does y in the relevant range, so that there is an optimal level of x .

To illustrate this system of constrained choice, Figure 1 creates a space in which y and Risk are represented along the left-vertical and top-horizontal axes as functions of x which is shown on the bottom horizontal. The independent variable x also shares the y -axis to let the upward-sloping diagonal, whose equation is $x=x$, serve as a line of reference for net overpromising, $x-y$, where $y = f(x)$. The figure then shows that the highest vote-outcome indifference curve, which is given by equation $IV = g'(x) = 0$, is reached at the value $x = A$. At this optimal value of x the “product” of promising is shown by the distance BA and the net rate of overpromising by CB . Hence the optimal performance-on-the-promise rate, $(y-1)/(x-1) = BA/CA$, which looks to be a little over one-half in Figure 1, is preferred by the electorate and its representatives to the business-as-usual position reached, at $x = 1$, when overpromising is zero and $y/x = 1$.

A. Functional Representation

To round out the functional representation of the relations depicted above, the utility of the (median) voter under a constant degree of relative risk aversion (ρ) is first expressed as a function of y , which is the ratio of expected-results relative to the updated baseline,

$$UV = (1-\rho)^{-1} y^{1-\rho} . \quad (4)$$

Substituting from equation (1) for y in equation (4), using a second-order Taylor-series approximation¹¹ evaluated at x for deviations in this ratio variable from 1, choosing a value of $\rho=2$,¹² and approximating $(1+\varepsilon)^{-1}$ by $(1-\varepsilon)$ yields the corresponding form of the voter utility function:

$$UV(x) = -(1-\varepsilon) + (1-\varepsilon)^2(x-1) - [(1-\varepsilon)^3 + a(1-\varepsilon)^2](x-1)^2 . \quad (5)$$

Taking expectations of equation (5), using equation (2), and treating x as a controlled policy variable while retaining the idea that outcome risk is a rising function of x , the expected value of this function is:

$$E(UV) = -1 + [1 + x \text{ var}(0)](x-1) - [1+a+(3+a)x \text{ var}(0)](x-1)^2 . \quad (6)$$

The optimal level is found from the first-order condition that turns out to be a quadratic with only one positive root. With the parameter values $a = 1$ and $\text{var}(0) = 0.1$, the solution of this quadratic function,

$$d[E(UV)]/dx = 4.5 - 2.2x - 1.2x^2 = 0, \quad (7)$$

is $x^* = 1.225827$, yielding $y^* = 1.174829$ from equation (1). Hence the optimal net rate of overpromising, defined like the dependent variable in the next section as $\ln(x^*/y^*)$, equals 0.0425 in this example, or 4.25% continuously compounded.

Hence promising to do 22.6% better than business-as-usual, in this derivation of the optimal solution that is represented by point B in Figure 1, actually achieves an expected improvement of 17.5% relative to the updated baseline. Hence the degree of promise-keeping, $BA/CA = (y^*-1)/(x^*-1)$, is 77.4% in this optimal policy program, and the degree of net overpromising in the promise, CB/CA , is 22.6%. Equation (6) suggests that the (median) voter utility is raised from -1 when $x=1$ to -0.8735 when $x = x^*$, while substituting y^* for y in equation (4) yields -0.8512. The closeness of the last two values shows that the approximations leading from equation (4) to equation (6) work adequately.

The mathematical model would have to account more fully than through the risk factor alone for the costs of implementing the program before policy conclusions could be drawn. Yet it does show that a constrained-optimization structure can be given to the scenario sketched in Figure 1 that attempts to explain why overpromising may be sustainable and desirable in certain situations up to a point. That optimal point is reached at values of x^* closer to 1 the higher the parameters a and $\text{var}(0)$ because $\text{var}(0)$ is the rate at which risk grows with increases in x while a indicates how quickly promises of additional output wear thin as x is raised progressively above 1.

III. Regression Estimates of the Country-Group Pattern of Overpromising

In the international context, promises are exchanged between sovereigns of varying power, rather than between agents and principals, or government representatives and voters. The extent to which countries choose to stretch their promises beyond the business-as-usual trajectory then could depend also on the penalties to which they are exposed for treaty violations. As Lawrence (2003, pp. 82-84) has well explained in

another context, in a voluntary contributions mechanism less will be promised the tougher the prospective penalties for incomplete fulfillment of any promises given.

The only types of penalties in the application chosen for this paper are due to the dependence arising from one country's decisions changing the (re)optimization conditions for others: One country's flouting of its international commitments makes it politically easier and economically more attractive for other countries to do likewise, lest they shoulder a disproportionate burden for the common good.¹³ For overpromising to be stable thus requires an *overpromising regime* that attempts to balance these externalities among participants and is well understood by all Parties. If the shared pattern of overpromising can be identified convincingly, it may be possible to estimate predicted outcomes for each country, given its economic and demographic forcing conditions. This will allow adjusting the targets it officially agreed to for the net rate of overpromising expected on account of its membership in the group's overpromising regime. Then, because a country's performance normally differs from even this adjusted target, it may be possible to evaluate how each country performed relative to the group pattern.

In the regression analysis that follows, the argument in brackets is the dependent variable, defined as the logarithm of a country's actual CO₂e emissions in 2005, $y_{i,t+s}$, minus the logarithm of the Kyoto target value or implied 2005 "assigned amount," $x_{i,t+s}$. Because dividing by baseline (BH) values to express x and y in Section II and Figure 1 as ratio variables would make no difference here, these variables are identified for ease of reference just by their numerator in this section where the difference in their logarithms is analyzed. The amount $x_{i,t+s}$ is brought back from the first commitment period, 2008-2012, to 2005 for country i where $i = 1, \dots, 21$ and $s = 15$ when the baseline year is $t = 1990$ and

the evaluation is for year $t+s = 2005$. This is the most recent year for which, still preliminary, emissions data were included in the Greenhouse Gas Inventory for 1990-2005 released in October 2007 (UNFCCC, 2007b).

The resulting net rate of overpromising, that will be called the *Kyoto Deviation Rate* for short; is shown by the vertical difference between the diagonal $x=x$ and the outcome curve $y = f(x)$ in Figure 1. That figure treats x and y as referring to something of value, like emission reductions, so that $x-y$ is positive. If promised emissions *reductions* are greater than those expected to be achieved, then promised emission *levels* are lower than those expected. Hence to preserve a positive sign when there is overpromising requires subtracting promised from expected levels below rather than the other way around.

$$y_{i,t+s} - x_{i,t+s} \equiv \text{Kyoto Deviation Rate} = h[z_{i,t}, \beta(s) - \gamma(s)] + v_{i,t+s} \quad (8)$$

The function $h(\cdot)$ may explain the cross-sectional pattern of deviations of countries' promises from their Kyoto target implied for 2005. The vector of explanatory variables specific to country i and essentially known at time t is $z_{i,t}$. Their coefficients, $\beta(s) - \gamma(s)$, apply to the time s that has elapsed under the commitment before its due date. If the expected degree of overpromising were about equal for all 21 countries in this cross-sectional study, the coefficients $(\beta - \gamma)$ would be close to zero, leaving only a constant. That would make adjustment for predicted overpromising easy, but such is not the case.

Although $v_{i,t+s}$ appears as a random error term with zero mean in equation (8), it contains little true randomness because the observations are for countries accustomed to the Kyoto Protocol for years. Instead $v_{i,t+s}$ indicates mostly a country's idiosyncratic and purposeful individual performance relative to the pattern set by the group as a whole. It is useful to view the performance score, $v_{i,t+s}$, as the log difference between the actual

emissions outcome, $y_{i,t+s}$, and the target adjusted for the regression-predicted rate of overpromising, $x_{i,t+s} - h[z_{i,t}, \beta(s) - \gamma(s)]$. The performance measure thus seeks to identify which countries have achieved lower or higher emission levels than conforming to the group pattern, rather than their unrealistic treaty obligation, would imply.

An example may help. Assume it has been established empirically that, as far as emission reductions are concerned, countries overpromise more the higher their rate of population growth. Specifically, let a regression coefficient and the intercept estimated for the group of countries imply that, *ceteris paribus*, a country A with 1% population growth per annum will overpromise by 15 percentage points more than a country B with 0% population growth. Furthermore, the regression-predicted level of overpromising for country B is 5 percentage points, meaning that emissions are expected to end up 5% higher than promised by that country. If country B now promises to reduce emissions by 30% by a certain date, while country A, the one with the growing population, promises to reduce them by 15%, correcting for regression-predicted overpromising would make the expected outcomes for emission levels -25% for country B and +5% for country A. If the two countries have equal weights, the expected emission reduction would be 10% for the two of them combined. If country B actually achieves a 20% reduction (-20%) by the target date, while country A ends up with a 0% change, country B's performance would be scored 5% above (+) its target adjusted for overpromising, which is bad, while country A's performance would be 5% below (-) its adjusted target, which is good.

To compare this with the pro-forma performance scoring method often used: According to that method, country A had promised a 15% reduction while achieving none, so that its performance score would be zero. By contrast, country B delivered two-

thirds of the 30% reduction promised so that its performance score would be 66.7%. Failure to adjust for predictable degrees of overpromising thus would prevent (1) expected outcomes to be estimated at the commitment stage and (2) the subsequent performance of individual countries to be assessed relative to realistic targets represented by these expected outcomes, which are targets that are met on average by the Parties.

A. *The Regression Model for the Pattern of Overpromising*

The estimating equation used to predict the pattern of overpromising can be obtained by recalling that the persistence of overpromising may be explained in part by the positive signals associated with it, such as energy, ambition, and willingness to take risks for a good cause. If this perception is grounded in reality to some degree, and not just a bonus bestowed by partisan credulity, the actual amount of CO₂e emissions, y , is still generally above the promised amount of emissions, x , because emissions reductions tend to fall short of what was promised. Hence $(y/x) \geq 1$ holds for the measured gross rate of overpromising, $e^\pi \sim (1+\pi)$, and the *planned* net rate of overpromising is $\pi = E[\ln(y/x)] \geq 0$.

Two functions, involving many of the same variables but loaded differently now are distinguished in the functions for x and y that follow. The first, $g(z, \pi) = g(z)/(1+\pi)$ is the overpromising function, with gross overpromised emissions lower (and the emissions reductions greater) the higher the net rate of overpromising, π . The second, $h(z)$, is technical function of the factors that would govern the emissions outcome under a business-as-usual scenario involving no net overpromising. As net overpromising occurs nonetheless, the expected outcome is raised by degree $\alpha < 1$ through productive efforts greater than those assumed in the business-as usual scenario. With $g(z)$ taken to be a log-

linear function of $j=1,..N$ variables in set z , $\Pi_j z_j^{\gamma_j}$, and $h(z)$ given by $\Pi_j z_j^{\beta_j}$, the functions for x and y can be represented as:

$$x = (1+\pi)^{-1} g(z) e^{\varepsilon} \quad (9)$$

$$y = A(1+\pi)^{-\alpha} h(z) e^{\eta}, \quad 0 < \alpha < 1, \quad (10)$$

where ε and η are i.i.d. error processes. If $\alpha = 0$, any planned overpromising is dysfunctional as it has no effect on the expected outcome. Such an ineffectiveness proposition is not adopted here. At the other extreme, a value of α as high as 1 would indicate that promising is completely effective at the margin, and not decreasingly effective, as required by the model of the previous section. Since neither extreme is of interest, strict inequalities are imposed on α in equation (10).

Using equations (9) and (10) to solve first for y/x , and then for $\ln(y/x)$, and taking the approximation $\ln(1+\pi) \sim \pi$, the degree of actual net overpromising is:

$$\ln(y/x) = \ln(A) + (1-\alpha)\pi + \sum_j (\beta_j - \gamma_j) \ln(z_j) + (\eta - \varepsilon), \quad (11)$$

and the corresponding planned net rate is:

$$\pi = \ln(A)/\alpha + \sum_j [(\beta_j - \gamma_j)/\alpha] \ln(z_j). \quad (12)$$

This equation indicates logically correctly that if promising were completely effective, as in the excluded case of $\alpha=1$, the planned net rate of overpromising, π , would have to be zero and $\ln(A) = \sum_j (\gamma_j - \beta_j) \ln(z_j)$.¹⁴ The opposite extreme case, $\alpha=0$, where overpromising does not matter to the outcome, would impose the same final constraint directly from equation (12) solved for $\alpha\pi$. For the intermediate values of α that concern us, substituting from equation (12) for π in equation (11) leads to the estimating equation:

$$\ln(y/x) = \ln A/\alpha + \sum_j [(\beta_j - \gamma_j)/\alpha] \ln(z_j) + \psi, \quad \psi \equiv (\eta - \varepsilon). \quad (13)$$

Apart from having a positive intercept if $A > 1$, equation (13) shows that the actual rate of overpromising is a function of the extent to which arguments linked to emissions have different weights, γ_j , in the promising function than the weights β_j in the function for the actual emissions outcomes. Hence the predicted overpromising rates of countries can differ greatly depending on the level of the variables $\ln(z_j)$ that characterize their (economic and demographic) conditions.

B. The Explanatory Variables and Regression Results

Four explanatory variables ($j = 1, \dots, 4$), whose full names appear in italics below, characterize the pattern in countries' *Kyoto Deviation Rate* which is the dependent variable in the regression analysis with 21 observations. This is the rate by which countries in 2005 are above (+) or below (-) the path of emissions that would lead to full compliance with that country's Kyoto target about five years later. Derivation and source for this dependent variable and of the four independent variables, as well as their values, are given in Appendix C to this paper that is available upon request (and later on the author's web site). The regression results discussed below are laid out in Table 1.

The net rate of overpromising, the Kyoto deviation rate, follows a predictable pattern: First the two components of economic growth -- at the intensive margin of *Per Capita Real Income Growth* and at the extensive margin of *Population Growth* -- both matter, but quite differently.¹⁵ Per capita income growth on annual average over the period 1990-2005, as well as the logarithm of the ratio of each country's *Per Capita Income Relative to U.S. Level* in PPP metric¹⁶ at the end of this period are weakly *negatively* related to overpromising. The latter finding may give a hint of some Parties starting to reach the downward sloping portion of the environmental Kuznets curve (see H.M. Treasury, 2006,

Part III, p. 191). This could happen if stricter compliance through less overpromising, leading to lower emissions per head, are being demanded in countries that have higher levels of per capita income than others. Per capita real income growth had no significant influence in the unweighted run and was negative significant, albeit barely, in the weighted regressions. (With 16 degrees of freedom, t-values have to exceed 2.12 to be statistically significant at the 5% level in a two-tailed test.) Thus there is mild support for the proposition that net overpromising of emissions reductions, at the current margin, may have become the political equivalent of an economically inferior good.

On the other hand, the association of higher population growth with overpromising is positive and highly significant statistically¹⁷ even though the positive correlation between extensive and intensive components of growth is fairly high¹⁸ (0.46 with unweighted data). Hence faster growth does not simply lead to overpromising, only population growth does so even though population growth is highly predictable.¹⁹ As cases in point, seven out of the eight countries that had the lowest rates of population growth, of under 0.35% per annum over the period 1990-2005 in the 21-country sample, overpromised by very little: 1% in the case of Germany, about 2% for the United Kingdom, Finland, Belgium and Denmark, and 4% for Italy and Japan.

The final variable that may influence the degree of overpromising is the 1990 base level of *Emissions Intensity* constructed as the logarithm of the ratio of annual CO₂e emissions per international dollar of GDP-PPP.²⁰ Following the logic of “economic convergence-club” hypotheses, a high rate of emissions intensity in the base year should increase the degree of compliance and reduce the degree of overpromising to help bring countries gradually into line. The negative sign found on this variable supported this logic

but fell just short of being statistically significant. One could speculate that countries with high 1990 emission levels relative to GDP found the change in industrial activity away from heavily polluting manufacturing more helpful than expected. This could have facilitated complying more fully with their formal targets than countries that had made much of this structural adjustment already. However, “lack of foresight” does not contribute to the rational overpromising regime here envisioned; instead it introduces random errors, like ψ in equation (13). One systematic reason for lower overpromising by high-emission countries could be that these countries feel more peer pressure than other countries to get their emissions down close to what they promised. Doing so would raise the level of comfort of all others about what will be accomplished by the group.

The economic weight of the three smallest countries in the sample is less than 1% that of the United States for New Zealand, and less than 2% for Finland and Ireland. This very large difference in size could encourage free-riding by small countries because there is little they can do individually to reduce the global supply of public “bads.” Judging only by pairwise correlation coefficients, there is a statistically insignificant indication by sign that Kyoto targets are slightly more generous for small than large countries. But then, judging by the pairwise correlation coefficients with size (col. 1) reported in the notes to Table 3, small countries overpromise a little less and perform insignificantly better relative to their 2005 implied Kyoto targets adjusted for overpromising than large countries. All told, size does not matter significantly at all, and free-riding does not appear to be a problem in this context. Hence it is not clear why small countries should be prejudged as more trouble than their contributions could be worth in international

environmental agreements, as is commonly done. Olmstead (2007, pp. 173-175) provides a balanced review.

Overall, judging by the values of R^2 adjusted for degrees of freedom shown in the bottom part of Table 1, these four explanatory variables account for 27% of the variation in the dependent variable when all countries are given equal weight, and for 74% (76% when the tiny intercept is suppressed) when a weighting factor is applied. Had weighted regression results turned out to be statistically weaker than those derived from not weighted data, the regression pattern would fit small countries more tightly than large countries. Since emissions reduction is a matter of concern ultimately in the aggregate, it is fortunate that the opposite was found to be the case. However, estimating a regression with weighted data implies putting the greatest weight on fitting the data for the largest countries. As a result, with weighting, estimated regression patterns may change somewhat and explanatory power generally increases, as it does in Table 1. For this reason, results derived for all countries weighted equally (“not weighted”) are used to fairly rate their performance relative to the regression-predicted pattern of overpromising.

IV. The Performance of Countries Relative to their Pattern of Overpromising

Table 2 shows the average logarithmic deviation rate from countries’ individual targets to be 0.1067 (i.e., 10.67% continuously compounded) as already mentioned, and the standard deviation of *Kyoto Deviation Rate* is very large, 0.1163. As seen from the residuals of the regression estimated with unweighted data, the two countries with the largest emission reductions relative to the regression prediction were Sweden (-0.186) and France (-0.131). These negative values indicate performance much better than would

be in line with these two countries conforming to the pattern of overpromising established by all 21 countries. The two worst performers by that residual indicator were Austria (0.178) and Italy (0.128), followed by Spain (0.114), Canada²¹ (0.095), Denmark (0.080), and Japan (0.070).

To show the relations between the different rates, Austria, for example, deviated by 0.270 (col. 5, Table 3) from the 2005 Kyoto target: With slight reporting discrepancies due to independent rounding of the log rates of changes, its emissions increased 0.165 (last column of Table 2) rather than declining by 0.104 as promised (col. 2 of Table 3). Since the regression-predicted rate of overpromising for Austria is 0.092 (col. 2 of Table 2), however, Austria's emissions performance indicator was 0.178 (col. 4 of Table 3) in excess of the group pattern ($0.165 - (-0.104 + 0.092)$). This is well below its pro forma violation of 0.27.

The United States, like Australia, did not ratify the Kyoto Protocol and thus was not bound by the target it had agreed to in the negotiations. Yet after adjusting that formal target for the pattern of overpromising established by all the 21 countries weighted equally in the regression, U.S. performance turned out to be about average. Results in Table 2 that are reproduced in col. 4 of Table 3 show that the U.S. deviation from pattern is merely 0.023, the same as for Belgium, and statistically insignificant with a t-value of 0.265 (see the "standard residual" in Table 2). Australia, another non-ratifier, had a deviation of emissions from pattern of -0.033, likewise close to zero but on the more laudable, negative, side. Hence, judging by the record of these two countries, ratifying the Kyoto Protocol does not appear to have been associated with a demonstrably higher degree of compliance relative to the predicted value of the rate of deviation from target.

Table 3 decomposes the dependent variable, *Kyoto Deviation Rate*, shown in col. (5). The decomposition is into an overpromising adjustment (equal to the predicted value of the rate of deviation from target) in col. (3) plus a performance indicator (equal to the unexplained residual) in col. (4). Col. (1) shows country weighting factors that are proportional to the size of their GDP-PPP in the world total, while col. (2) presents the implied 2005 Kyoto target rate of emissions change relative to the 1990 baseline.

Col. 3 of Table 3 reveals that the degree of overpromising is largest for New Zealand (27%), followed by Spain (21%), Australia (20%), the United States (18%), Canada (18%), and Portugal (17%). There is a *positive* significant pairwise correlation of 0.52 between the entries in cols. (2) and (3) or between the size of formal percentage-change targets and the degree of overpromising.²² Thus, presumably because other things were not equal, there is no support for the intuition that the lower the emissions targets that a country agrees to accept (-), the more they will be missed (+). Presumably other things were not equal and lower emission targets relative to the 1990 baseline were not more ambitious for the countries that agreed to them. Indeed the positive bivariate relation actually found reveals that those countries that accept the highest target rates of emission reductions (-) overpromise least (-) and those that are granted the highest target rates of emissions increases (+) overpromise most (+). The reason could be that the latter group of countries, including Portugal and Greece, are under the greatest pressure to agree “to do their part,” at least rhetorically.

The indicators in col. 4 of Table 3 provide little evidence that performance differs systematically between large and small countries except that the differences in scores tended to be greater within the group of the largest than within that of the smallest

countries. For instance taking the 6 largest and 6 smallest of the 21 countries by size of their 2005 PPP-GDP, the mean absolute performance score and the sum of scores were 0.079 and -0.030 for (and from) the largest (US, Japan, Germany, UK, France, Italy) and 0.032 and 0.000 for (and from) the smallest (New Zealand, Finland, Ireland, Norway, Denmark, Portugal). There is remarkably little difference between these value pairs though the range of scores is twice as wide for the largest than the smallest countries.

V. Summary, Conclusions, and Alternative Approaches

According to Cohen (2008), “regimes embody implicit or explicit understandings about the rules of the game that help to sustain mutually beneficial patterns of cooperation (p. 100). Once up and running, [they] narrow the range of anticipated behavior, thus encouraging compliance with common norms” (p. 105). Any new norms which agents believe will change the behavior of others may have a positive effect on their own behavior (Knez and Camerer, 1994, p. 118; see also Farmer, 1993).

This paper treats the method of overpromising as part of these well-understood rules. It views overpromising as a means of facilitating soft agreement on a starter regime that needs to generate increased demand for its services before it can be deepened and hardened to an institution that may offer more reliable delivery of global public goods. If increased demand fails to materialize, the starter regime may atrophy and be succeeded by other untried regimes. In countries with high-frequency election cycles, there may be insufficient time for starter regimes to prove themselves. This may create incentives to offer something different in each election so that overpromising may spring eternal. Even serial overpromising by the same agent about the exact same thing may be sustainable if

those who receive moderately excessive promises have reason to be convinced that less would be accomplished, adjusted for risk, if the agent overpromised any less.²³

To support this intuition, the paper first modeled the constrained optimization calculus that can sustain overpromising politically. To recapitulate briefly, the basic idea is this: If an agent is expected to deliver 1 plus or minus 0.5 unit when promising an extra 2 units over the usual delivery, and to deliver 0.75 plus or minus 0.25 when promising an extra 1 unit, then the marginal productivity of promising the second additional unit is 0.25 at the cost of a doubling in performance risk. The agent's clients or voters then have to decide whether the latter deal is good or whether they prefer to settle for the promise of just one additional unit. Opting for no overpromising, and hence no additional unit of value at all, would not be optimal.

Having made the case that overpromising may be a sustainable method within countries whose pattern may be anticipated even by the Parties to international agreements, the paper then introduces a new scheme for scoring national commitments contained in those agreements. In the chosen application, the predicted rate of deviation of the actual 2005 CO₂e emissions from their implied 2005 Kyoto target for such emissions is used to adjust countries' agreed formal targets for the different net degrees of predictable overpromising they contain. It turns out that Europe had some of the best and worst performers. Surprisingly perhaps, the United States and Australia, which had not ratified the Kyoto Protocol after agreeing to targets, were thoroughly average performers, doing about as predicted. Of course, countries that may have done more to thwart and confuse, than to inform and guide, organized attempts at international burden-

sharing and at “steering our planet clear of the Anthropocene crisis” (Schellnhuber *et al.*, 2005, p. 17) could have failed in other ways.

A. Alternative Second-Best Approaches

Treaties to reduce global “bads” are hard to negotiate and even harder to enforce in a way that changes the prior equilibrium of the game (Guzman, 2001, p. 23). These difficulties are compounded when both the aggregate burden that realistically will be lifted, and the true national burden-sharing in the lifting, are quite uncertain. Some have concluded from this that countries should stop putting forward anything other than what they derive from a strict interpretation of the national interest, formulated in the absence of mutual commitments among governments, over the time scale preferred by its citizens. Alternatively, what commitments might come to pass would have to be constructed bottom-up rather than top-down. Thus Hamid, Stern, and Taylor (2007, p. 17) have expressed the belief that “[I]t is now possible to build international collaboration on the basis of national commitments which are voluntarily chosen and not necessarily as part of a contemporaneous or binding national agreement.”²⁴ Prins and Rayner (2007b, p. 39) have suggested a mix of instruments ranging from informational signals, such as labeling, through market instruments, such as emissions trading, to command and control mechanisms, such as technology standards. In their view, these measures should replace the emissions target setting conventions and protocols entirely which have characterized the approach to international policy in this area over the past 20 years.²⁵

If internationally agreed targets, contrary to this paper’s belief, do not have the capacity to induce any additional productive efforts at all, there is no point to negotiating targets and waiting for the returns to come in. Indeed overpromising then would be

counterproductive to the extent it draws attention away from the factors that govern the expected outcome. To make targets competently reflect the rationally expected outcomes is the only good that can be done with them when overpromising is dysfunctional. To this end countries should have to legitimate their targets as sound and fully documented and explicitly conditioned forecasts from the start. Hence they should submit their forecasts, together with their modeling and estimation frameworks and the assumptions about prospective policy actions and data on which they are based, to joint scrutiny and science-based review. Once accepted as best estimates conditional upon specific national policy actions being taken and technologies being developed, the national forecasts, and the actions supporting them, could be examined nationally and internationally on a continuing basis.

International monitoring by a technical-assistance agency, like the new global environmental organization suggested by Esty (2007, p. 111), or an international secretariat linked with national environmental protection and energy information agencies could help prevent the continued offering of commitments without adequate technical back-up. Though efforts have been made to standardize data gathering and reporting, existing agencies and processes have failed to prevent submission of blanket commitments that lacked detailed supporting documentation thereby thwarting cumulative improvements in analysis. Supplying adequate documentation that corresponds to internationally accepted standards with any commitments will help identify and correct specification errors by source. It will also spotlight policy slippages, and separate out those deviations from forecast that may be excusable because they are due to unanticipated events at national, regional, or global scales. Morgenstern (2007, p.

218) has, more eloquently, made essentially the same point, starting with the sentence, “The key to success for any international system is to establish a credible evaluation process which encourages institutional learning at the scale of the nation state.” In addition, new scientific findings could then readily be factored into the decision process. One of these is that stabilizing climate requires near-zero future emissions (Schmittner *et al.*, 2008; Matthews and Caldeira, 2008) and that stabilizing emissions at even the lowest annual levels examined in the Fourth Assessment Report of the IPCC (2007, p. 44) is not adequate for that purpose.

Shifting the emphasis from getting agreement on pro forma targets to a system that provides increasingly well-supported and unbiased forecasts would turn international negotiations away from experimenting with a succession of regimes of overpromising and toward continuous learning and recalibration. “The more institutions can improve the relevant information environment, the greater ... their ability to facilitate cooperation” down the road (Cohen, 2008, p. 115). Overpromising could gradually be wrung out of the system when international collaboration is redirected to scientific forecast validation and replication. However, it would still need to be demonstrated that more can in fact get done by all the countries without the lubricant for reaching agreement and the stimulant to additional effort provided by overpromising.

Until technical, rather than decidedly political, collaboration among countries through an international agency has reached a high level of proficiency, overpromising regimes may continue to prevail in international emissions control and in other areas involving global collective goods. The analytical task then is to take out the net overpromising component, identified *ex ante*, from the targets accepted by countries. However, the

expected outcomes thus obtained continue to depend on the different degrees of overpromising chosen by the Parties to international agreements. This choice may follow a pattern that is well-understood and politically productive for each of them under the existing system. For this reason, patterns of overpromising at Conferences of the Parties, from Kyoto in 1997, past Bali in 2007, to Copenhagen in 2009 and beyond, may endure as long as the first-best solution, of international cooperation in providing the economically optimal amount of global public goods without overpromising, remains well out of reach.

Notice: The next page is not blank. It contains Figure 1 which takes a moment to come up.

Glossary

$x \geq 1$ Is the ratio of the promised result, PR, to the baseline, BL, outcome, so that $x = \text{PR}/\text{BL}$.

$y \geq 1$ Is the ratio of the rationally expected result, ER, to the "business as usual" outcome, BL, so that $y = \text{ER}/\text{BL} \leq x$, and $y = f(x)$.

Risk Associated with promising a degree of performance above baseline, $x-1$, is assumed to follow a diffusion process for $x > 1$ so that $\text{Risk}(\text{var}(x-1)) = x \text{Risk}(\text{var}(0))$, where the Risk function evaluated at $x = 1$ identifies the baseline level of the outcome risk perceived by the electorate.

IV Is the highest attainable vote-outcome indifference curve derived from a risk-averse electorate's utility function, $UV = u(y, \text{Risk}) = g(x)$.

Figure 1. Promises, Increasing Performance Risk, Expected Results and Vote-Maximizing Policy

Table 1
Not Weighted and Country-Size Weighted Regressions of *Kyoto Deviation Rate*

	Not Weighted	Weighted	
Intercept	-0.1232 (-0.80)	Suppressed	-0.0059 (-0.18)
Per Capita Real Income Growth	-0.4743 (-0.16)	-5.1960 (-2.31)	-5.0375 (-2.03)
Population Growth	29.1124 (3.00)	36.9968 (4.43)	36.7060 (4.19)
Per Capita Income Relative to US Level	-0.1708 (-1.15)	-0.1946 (-1.14)	-0.1998 (-1.12)
1990 Emissions Intensity Rate	-0.1067 (-1.29)	-0.1609 (-2.00)	-0.1609 (-1.94)
Correlation Coefficient (R)	0.648	0.921	0.889
R Square	0.420	0.848	0.790
Adjusted R Square	0.274	0.762	0.737
Standard Error of Estimate	0.099	0.074	0.077
No. of Observations	21	21	21
Degrees of Freedom	16	17	16

Source: Author's estimates with data described in the text and Appendix C.

Notes: The t-values are shown in parentheses.

Table 2
2005 Actual and Predicted Values of *Kyoto Deviation Rate* and Baseline Deviation Rate

		Deviation from 2005 Implied Kyoto Target				Deviation from 1990 Baseline
		Actual Value	Predicted Value	Residual	Standard Residual	
Australia (8%)	1	0.170	0.203	-0.033	-0.371	0.228
Austria (-13%)	2	0.270	0.092	0.178	2.013	0.165
Belgium (-7.5%)	3	0.045	0.023	0.023	0.256	-0.013
Canada (-6%)	4	0.272	0.177	0.095	1.071	0.226
Denmark (-21%)	5	0.104	0.024	0.080	0.902	-0.073
Finland (0%)	6	-0.025	0.021	-0.046	-0.515	-0.025
France (0%)	7	-0.016	0.115	-0.131	-1.477	-0.016
Germany (-21%)	8	-0.027	0.014	-0.041	-0.466	-0.204
Greece (25%)	9	0.068	0.116	-0.048	-0.544	0.236
Ireland (13%)	10	0.142	0.143	-0.001	-0.012	0.234
Italy (-6.5%)	11	0.165	0.037	0.128	1.444	0.114
Japan (-6%)	12	0.113	0.043	0.070	0.791	0.067
Netherlands (-6%)	13	0.043	0.086	-0.044	-0.495	-0.004
New Zealand (0%)	14	0.220	0.270	-0.050	-0.563	0.220
Norway (1%)	15	0.077	0.068	0.009	0.107	0.085
Portugal (27%)	16	0.177	0.169	0.008	0.085	0.356
Spain (15%)	17	0.323	0.209	0.114	1.283	0.427
Sweden (4%)	18	-0.105	0.081	-0.186	-2.099	-0.075
Switzerland (-8%)	19	0.079	0.149	-0.069	-0.782	0.017
UK (-12.5%)	20	-0.060	0.019	-0.079	-0.891	-0.160
United States (-7%)	21	0.205	0.182	0.023	0.265	0.151
Average (-1%)		0.1067	0.1067	0.0000	0.0000	0.0931
Median (-6%)		0.1038	0.0916	-0.0011	-0.0121	0.0848
Standard Deviation		0.1163	0.0753	0.0886	1.0000	0.1648
Skewness		0.0356	0.4559	0.0752	0.0752	0.1403
Kurtosis		-0.7049	-0.7526	-0.0345	-0.0345	-0.4836

Source: Results from the regression with “not weighted” data in Table 1.

Notes: All entries represent continuously compounded annual rates. The entries in the first column are calculated as the actual 2005 rate of deviation from the implied 2005 Kyoto target where that target is estimated as (1990 Baseline Emissions Value)(1+Kyoto Target Rate of Change 2008-2012)^{0.75}. The Kyoto percentage rate of emissions change agreed for the first commitment period is shown in parentheses behind each country’s name and behind average and median value for all countries. Positive skewness and negative kurtosis here indicate, respectively, that the data are spread out more in the direction of large deviation rates and their distribution is flatter than for the normal distribution.

Table 3. Overpromising Adjustment and Performance Indicator: Decomposition of the Rate of Deviation of Actual 2005 Emissions from their Kyoto Target Implied for 2005

	Weights Summing to N=21	Implied Kyoto Target	Overpromising Adjustment (=Predicted V)	Plus: Performance Indicator	Equals: Actual Value
Column:	(1)	(2)	(3)	(4)	(5)
Australia	0.447	0.058	0.203	-0.033	0.170
Austria	0.196	-0.104	0.092	0.178	0.270
Belgium	0.241	-0.058	0.023	0.023	0.045
Canada	0.761	-0.046	0.177	0.095	0.272
Denmark	0.131	-0.177	0.024	0.080	0.104
Finland	0.120	0.000	0.021	-0.046	-0.025
France	1.282	0.000	0.115	-0.131	-0.016
Germany	1.701	-0.177	0.014	-0.041	-0.027
Greece	0.189	0.167	0.116	-0.048	0.068
Ireland	0.120	0.092	0.143	-0.001	0.142
Italy	1.196	-0.050	0.037	0.128	0.165
Japan	2.755	-0.046	0.043	0.070	0.113
Netherlands	0.378	-0.046	0.086	-0.044	0.043
New Zealand	0.071	0.000	0.270	-0.050	0.220
Norway	0.134	0.007	0.068	0.009	0.077
Portugal	0.160	0.179	0.169	0.008	0.177
Spain	0.796	0.105	0.209	0.114	0.323
Sweden	0.204	0.029	0.081	-0.186	-0.105
Switzerland	0.179	-0.063	0.149	-0.069	0.079
United Kingdom	1.401	-0.100	0.019	-0.079	-0.060
United States	8.538	-0.054	0.182	0.023	0.205
<i>AVERAGE:</i>	<i>1</i>	<i>-0.014</i>	<i>0.107</i>	<i>0.000</i>	<i>0.107</i>

Notes: The weights in col. (1) are proportional to the share of countries in GDP-PPP. The Kyoto target rate of change implied for 2005 in col. (2) is calculated as $0.75\text{LN}(1+\text{Kyoto Target Rate of Change from 1990 to 2008-2012})$. Entries in cols. (3) through (6) are logarithmic deviations from the implied 2005 values of the emission levels established in the Kyoto protocol. The regression-predicted values of such deviations for 2005, which should be zero if there were no overpromising, using unweighted data, yield the rates of overpromising by country shown in col. (3). The performance indicators in col. (4) are the difference between the actual 2005 value of the rate of deviation from the implied 2005 Kyoto target value and the corresponding regression-predicted value. The correlation coefficient (R) of variable (1) with (2), (3), (4) and (5) are -0.21, 0.09, 0.09, and 0.13, respectively. The R values of variable (2) with (3), (4), and (5) are 0.52, -0.18, and 0.20. Similarly, R of (3) with (4) and (5) is 0.00 and 0.65.

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Endnotes

¹ Encyclopedias explain that a treaty is an agreement under international law entered into by states or international organizations. A Treaty may be known as (international) agreement, protocol, covenant, convention, exchange of letters, exchange of notes, memorandum of understanding, etc. Regardless of the terminology, all of these international agreements under international law are equally treaties and the rules are the same. This international usage is accepted in this paper. However, under United States constitutional law, only a treaty that has achieved advice and consent of two-thirds of the US Senate present is properly designated as a “treaty” and such a treaty, in the true constitutional sense, overrides all other laws except the constitution. Congressional-executive agreements like NAFTA and pure executive agreements thus would not be treaties in strict US usage, but only in international usage.

² For instance, the leading nuclear powers gave little or no indication that they would take concrete steps to meet their obligations to negotiate joint reductions in their nuclear arsenals under Title VI of the Nuclear Non-Proliferation Treaty. There have obviously been questions about some of the non-nuclear signatories’ intentions and actions in relation to their obligations as well. In the more recent example, major donors did not provide the appropriations for fully meeting their aid commitments under the MDGs, thereby failing to meet some of their obligations from the start. See World Bank (2006, pp. 73-99) and United Nations (2007, pp. 28-29). As the latter example and the Kyoto Protocol show, there is safety in numbers since penalties for overpromising cannot be imposed on whole groups of countries, least of all if members would first have to agree to being disciplined, or if violators are strong enough to refuse to submit to the agreed rules when they choose.

³ For an evaluation of the, almost invariably only partial, degree of fulfillment of “summit” commitments in different areas see von Furstenberg and Daniels (1992) and Kirton and Guebert (2007). These studies use pro-forma compliance scores whose application is detailed in Appendix A, available upon request. Mitchell (2003) surveys a large number of international environmental agreements and their history.

⁴ Cf. UNFCCC (2006). Victor (2001) was not alone in predicting that the Kyoto Protocol was unlikely to enter into force, but if it did, it would surely fail. Appendix B, available upon request, provides an overview of the United Nations Framework Convention on Climate Change of 1992 and its evolution through 2007.

⁵ The instantaneous rate of reduction would actually be 16.7%, because, as explained in the notes to Table 3, it is the solution of $\text{LN}(0.80^{0.75}) = -0.167$ when three-quarters of the time for a 20% decline has passed.

⁶ Helm and Sprinz (2000) have attempted to evaluate actual environmental policy against a counterfactual without an international environmental regime (and a collective optimum) to see what, if any, difference such a regime might make. They also provide an excellent discussion of the misgivings surrounding the use of inevitably speculative counterfactuals and how to allay some of these concerns (p. 633).

⁷ In Eugene O’Neill’s classic, *The Iceman Cometh*.

⁸ Overconfident countries are hard to visualize in the absence of a powerful chief executive who could exude and apply overconfidence, referring perhaps to private information resources. In the areas of behavioral finance and corporate management in which much of the “overconfidence” literature has originated, overconfident managers mistakenly shift the mean of the distribution of outcomes they envisage in a favorable direction and underestimate the outcome variance, thus increasing the perceived return/risk ratio above its true value. Whatever misperceptions the implied unintentional overpromising may temporarily produce among financial analysts and colleagues are not of interest here as we do not connect overpromising with misperception. Because the literature on overconfidence is already vast, only a recent survey of key contributions, by Subrahmanyam (2008), is referenced here.

⁹ The logic of such two-level games is explored by Wagner (2001, pp. 402-404).

¹⁰ Although these authors equate overpromising with cheating, overpromising as a well understood motivational strategy within certain bounds does not need to surprise or deceive anyone, nor do such predictably excessive promises represent the expected outcomes that are mutually understood and agreed to. Thus evaluating performance involves more than comparing outcomes with pro forma commitments.

¹¹ The approximation is quite close even though the utility function is not quadratic. Using the values $\rho=2$, and $a=1$, and $x = x^* = 1.225827$ and $y = y^* = 1.174829$ derived further down, yields $UV = -0.862$ for equation (4) and $UV = -0.880$ (with $\varepsilon = 0$ in the approximation given by equation (5)).

¹² A value of $\rho = 2$ represents about the lowest degree of relative risk aversion which finance economists tend to find admissible.

¹³ “Inefficient behavior [may be] created by the mere expectation that there is at least one weak link in the chain, rather than by the incentive to free-ride if others are strong links” (Knez and Camerer, 1994, p. 105).

¹⁴ The argument can be sketched as follows: If $y/x = 1$ when $\pi = 0$, as in Figure 1, then $g(z, \pi)$ and $A[h(z)]$ should have the same value when $\pi = 0$. If this is the case, y/x will always have to be 1, and $E[\ln(y/x)] = \pi = 0$, because y/x is independent of π when $\alpha = 1$.

¹⁵ To decompose the average annual rate of real-income growth over the period 1990-2005 into its per capita income growth and population growth components, GDP-PPP in 2005 is divided by its 1990 value, and the result is taken to the power $1/15$ to obtain the gross annual rate of growth. Taking the logarithm this gross rate then yields (i) the net average annual rate of growth by country. Proceeding analogously with data provided on GDP-PPP per capita yields (ii) the net average annual rate of per capita real income growth. The net rate of population growth is the difference between the logarithmic rates (i) and (ii).

¹⁶ *Per Capita Income Relative to U.S. Level* is entered as the natural logarithm of the ratio of the per capita income level of each of the 21 countries in international (PPP) dollars to that of the United States (so that the value entered for the U.S. itself is 0).

¹⁷ To be significant at the 5% level, the t-value of regression coefficients estimated with as few as 16 degrees of freedom has to be ≥ 2.12 .

¹⁸ Using a t-test with critical value of 2.12 for significance (5% level) for correlation coefficient R shows that $t = 2.124$ for $R = 0.438$ when $n=21$ in the formula: $t = [R^2(n-2)/(1-R^2)]^{0.5}$. Hence $R \geq 0.438$ is significant.

¹⁹ EPA (2007, p. ES - 16) notes that the average annual rate of growth of greenhouse gas emissions in the United States since 1990, 1.0 percent, is “much slower” than the rate of growth of real gross domestic product (of 3.0 percent) but only “slightly slower” than the rate of population growth (of 1.1 percent).

²⁰ As for all other variables, Appendix C available upon request provides the data sources and the precise operational definition of the variables constructed. Table 1A, at the end of that appendix, provides time series of all the explanatory variables.

²¹ Environment Canada (2007, p. 1) reports that “the long-term trend indicates emissions in 2005 were 25.3% above the revised 1990 total of 596Mt and represent a level 32.7% above the Kyoto target.” In explaining this rapid growth in emissions, it notes, “Between 1990 and 2005 significant increases in oil and gas production, much of which have been provided to the United States, have resulted in a significant increase in the emissions associated with the production and transportation of fuel for export.” Application of the “geographic emissions origin” principle in the Kyoto Protocol to countries can be misleading when countries directly or indirectly participate in emissions-boosting activities in other countries, such as through reckless deforestation of tropical hardwood forests. Yet increased oil and gas production in Canada, no matter where sold, could be cited as having contributed to the violation of its Kyoto targets only if that increase came as a surprise and could not reasonably have been anticipated at the time Canada accepted its Kyoto target. Beyond this, whether emissions associated with a product should be allocated to the locus (or loci with intermediate goods) of its production or consumption is an open issue.

²² The critical F value with 1 numerator and 19 denominator degrees of freedom at the 5% level is 4.38. The F value for testing the Null is $19R^2/(1-R^2)$. Hence, as before, $R \geq 0.438$ is required for significance. The simple correlation between the entries in columns (2) and (3) of Table 3 was 0.52 and thus significant.

²³ Repeated overpromising can be encountered in several different contexts, including loan repayment. For instance, serial default by certain Latin American countries cries out for an explanation why their creditors’ agents seem to thrive on courting sovereign default risk for rational investors so that overborrowing again and again remains feasible for these default-prone countries. See Reinhart and Rogoff (2004). Likewise overpromising in military contracting – chronic cost overruns – never seems to cease.

²⁴ As Stern (2008) has noted, this procedure of unilateral forerunner action on public goods supply is contrary to the practice in multilateral trade negotiation rounds, such as the Doha Round, that are conducted under the auspices of the World Trade Organization (WTO). There all commitments are conditional upon successful conclusion of the round making them binding on all WTO members.

²⁵ On the other hand, Ostrom, Walker, and Gardner (1992) found in a common-pool resource game that covenants or promises about future actions can be useful in maintaining cooperation, even when the promises are nonbinding. Sefton, Shupp and Walker (2007, p. 672) provide further discussion.