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Assessing Voluntary Commitments: Monitoring is Not Enough!

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Assessing Voluntary Commitments: Monitoring is Not Enough!

Christoph Böhringer and **Manuel Frondel**

Abstract. This paper deals with a special type of voluntary approach to protect the environment, for example, that we would like to term *voluntary commitment*. Its major characteristic is that it represents a unilateral declaration without a decisively active role of regulators. In other words, voluntary commitments are, by definition, not the result of intensive mutual negotiations between participants and regulators. By combining theoretical considerations on the economic rationale for the popularity of voluntary commitments with an investigation of principal *conceptual* and *statistical* problems regarding their empirical assessment, it seems unlikely that voluntary commitments generally trigger significant deviations from business-as-usual. This casts doubt on the effectiveness and, hence, the efficiency of this specific type of voluntary approach. Effectiveness, guaranteed through more demanding goals, requires intensive mutual negotiations – monitoring is not enough.

JEL classification: C1, D2, Q4.

Key words: Voluntary Agreements, Counterfactual, Evaluation.

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Non-technical Summary.

Voluntary agreements, specifically in the field of environmental protection, have become a vital alternative to mandatory policies based on regulation or legislation. Generally, three types of voluntary approaches can be distinguished: The first type induces participation by providing positive incentives such as cost-sharing (*carrot approaches*). In a second type of approach, participation in a voluntary agreement can be achieved by threatening a harsh, legislative compulsion (*stick approaches*).

This paper deals with a third type of voluntary approaches that we would like to term *voluntary commitments*. Their major characteristic is that they represent unilateral declarations without a decisively active role of regulators. In other words, voluntary commitments are, by definition, not the result of intensive mutual negotiations. By combining theoretical considerations on the economic rationale for the popularity of, specifically, voluntary commitments with an investigation of principal *conceptual* and *statistical* problems regarding their empirical assessment, we cast doubt on the general effectiveness of this specific type of voluntary approaches. We argue that, first, such unilateral voluntary declarations might represent the commitment to, in effect, hardly more than business-as-usual, and, second, it would be extremely difficult for politicians or any other outsider to decide whether or not their actual environmental performance differs from business-as-usual. Our hypotheses are illustrated by the empirical example of the declaration of the German industry on global warming prevention.

Notwithstanding the empirical validity of our hypotheses, taking on the perspective entailed in our hypotheses may reveal that a voluntary commitment can represent an effective strategy for firms to secure "business-as-usual profits": By means of unilateral declarations of, for example, industrial associations, regulatory pressure may be successfully delayed or even circumvented. It is much more likely that declaration targets will go beyond business-as-usual if regulators play an active role, and the goals to be achieved are the result of intensive mutual negotiations between regulators and participants of the voluntary approach. In sum, effectiveness of voluntary approaches, guaranteed through more demanding goals, requires intensive mutual negotiations – monitoring is not enough.

1 Introduction

Voluntary agreements, specifically in the field of environmental protection, have become a vital alternative to mandatory policies based on regulation or legislation. For example, in addition to a variety of voluntary farm programs, several federal programs have been designed in the U. S. to convince firms to reduce pollution voluntarily – see WU and BABCOCK (1999:159). In the European Union, all but one of the 15 member states rely on environmental agreements as a policy tool, with a wide range of applications, including water and air pollution and waste management – see EC (1996). In the OECD countries, more than 350 voluntary schemes have been established, with the majority of them accounting for Germany and the Netherlands – see OECD (2000).

Facing the increasing popularity of voluntary approaches, two fundamental questions arise. The first is whether or not voluntary approaches are generally effective. The study of SEGERSON and MICELI (1998) seems to be one of the most recent theoretical papers that deal with this first issue of effectiveness of voluntary approaches in the context of environmental protection. If effectiveness is guaranteed, a second task would be to evaluate how efficient voluntary approaches are compared with other approaches. ALBERINI and SEGERSON (2002) consider both the environmental effectiveness and the efficiency of voluntary approaches and provide an excellent discussion of theoretical and empirical issues that arise in the evaluation or assessment of a particular voluntary agreement.

Generally, three types of voluntary agreements can be distinguished – see e. g. ALBERINI and SEGERSON (2002:158): The first type induces participation by providing positive incentives such as cost-sharing (*carrot approaches*). The importance of these incentives is stressed by WU and BABCOCK (1995) and more recently by LYON and MAXWELL (2003). Alternatively, participation can be achieved by threatening a harsh, legislative compulsion (*stick approaches*). In approaches of this type, agreements on e. g. levels of environmental protection are typically *negotiated* between a whole industry, represented by an industrial organization, and a regulatory agency, leaving it to the industry itself to solve coordination and free-riding problems.

In other words, a voluntary agreement of this second type requires mutual accep-

tance of the terms – yet without any legal obligation for the firms of such an industry. This type, however, is often said to be not truly voluntary because an industry is essentially choosing the lesser of two evils – see e. g. GOODIN (1986). It has been argued that differences between such agreements and direct regulation are rather trivial, since the regulator may simply threat to impose extremely harsh policy measures to enforce the acceptance of the agreement. Hence, some authors prefer the term "negotiated" instead of "voluntary" agreements (NYBORG (2000:126)) – for a recent survey on voluntary agreements, see KHANNA(2001).

This paper focuses on the *effectiveness* of a *third type* of voluntary approaches that has the particular characteristic that it is *not* the result of intensive mutual negotiations, but instead represents a unilateral declaration that is not based on a decisive government intervention. For this type we choose the term *voluntary commitment*. By combining theoretical considerations on the economic rationale for the popularity of, specifically, voluntary commitments with an investigation of principal *conceptual* and *statistical* problems regarding their empirical assessment, we cast doubt on the general effectiveness of this specific type of voluntary approach. With this conclusion, questions of efficiency turn out to be irrelevant.

Besides the carrot approach, the unilateral declaration is a wide spread type of voluntary approach in the US – see OECD (2001). A prominent example for voluntary approaches in Germany is the "Declaration of German Industry on Global Warming Prevention" – henceforth GGWP-declaration – of 2000, originally initiated in 1995[1]. Yet, while it is merely the first version of the GGWP-declaration that might be classified as voluntary commitment, this declaration is not a proper example for this specific type of voluntary approach, since the updates of the original declaration were at least partly due to government intervention.

[1]German industry committed itself to voluntarily reducing the specific carbon dioxide CO_2 emissions and/or specific energy consumption. These activities, often termed "business-led initiatives", "corporate environmentalism," or "industry self-regulation" – see ALBERINI and SEGERSON (2002:158) – represent a voluntary unilateral contribution to anticipate the abatement efforts demanded by the Kyoto-Protocol. In its original version, industrialized countries are supposed to reduce greenhouse gas emissions during the 2008-2012 period by an average of 5.2 % below their 1990 level – see e. g. BÖHRINGER (2002:51).

Nevertheless, in order to illustrate our theoretical and empirical arguments that cast doubt on the effectiveness of voluntary commitments in its pure form, the GGWP-declaration, which is regularly monitored, is an appropriate example. First of all, there is a major empirical problem due to the grave lack of data: Empirical data for a thorough scientific assessment of the declarations of individual industrial sectors are rare. Only for the cement industry does sufficient, but still poor, empirical data material appear to be available. Investigating the historical specific fuel consumption of this industry, we find that energy- and emission-reducing activities have not gone much beyond good intention: Indeed, despite the monitoring of the declaration, there does not seem to be a significant deviation from business-as-usual. While we must confine our empirical illustration to the example of the cement industry, our theoretical reasoning and discussion of conceptual problems with respect to voluntary approaches of the type voluntary commitments holds in general.

The following section explains the popularity of voluntary commitments. In Section 3, principal conceptual, statistical and empirical problems are illustrated with the example of the German cement industry. The last section concludes.

2 The Appeal of Voluntary Commitments

In this section, it will be illuminated from the theoretical perspective of rational economic behavior why voluntary commitments – to reduce CO_2 emissions, for instance – are generally very attractive for both politicians and governments on the one hand, and firms and industrial organizations on the other. For politicians and legislators, there are numerous reasons why voluntary commitments are appealing. First of all, it is often argued in the economic literature that voluntary approaches are generally vital competitors to mandatory legislation and regulation policies because they guarantee the achievement of environmental quality goals at lower cost. In the absence of any negotiations, monitoring cost appear to be the only administrative and transaction cost of voluntary commitments, while environmental compliance cost are believed to be much lower relative to inflexible regulatory and legislative approaches – see, for example, EC (1996): As opposed to regulatory approaches that *dictate* inefficient abate-

ment strategies, the greater flexibility of voluntary approaches represents a potential for cost-savings.

Besides these rather theoretical arguments, the most appealing advantages of voluntary commitments from a politician's practical point of view might be that, first, their own popularity may not suffer at all, or at least not as much as it would with mandatory approaches. The German Government, for example, appreciates – according to ALBERINI and SEGERSON (2002:175) – the GGWP-declaration as an opportunity to fulfill its national CO_2 reduction targets without placing a heavy burden on German industries. Moreover, in case of non-compliance, politicians can easily defer much of the weight of responsibility to the industries.

With respect to the cost of voluntary approaches, to the best of our knowledge, there does not seem to have been a single empirical or statistical analysis on this issue. This might simply be the result of the inherent principal difficulty in policy assessment that will be discussed in the following paragraphs: the determination of the counterfactual benchmark scenario that is indispensable for both to measure the environmental performance and cost-effectiveness of voluntary approaches – see also ALBERINI and SEGERSON (2002:174). It is a key difficulty for the evaluation of the success of any policy instrument, however, that counterfactual situations, precisely describing what would have happened in the absence of this instrument, are inherently unobservable.

Out of the multitude of counterfactual situations, with stopping production and emissions being an unrealistic option in the GGWP-example, two alternative counterfactual reference scenarios are usually adopted for the evaluation of a single instrument. First, the *status-quo-conserving scenario*, fixing the status-quo prior to the policy instrument. It is very unlikely, though, that this scenario coincides with reality even if economic circumstances remain unchanged: In the example of the GGWP-declaration, for instance, autonomous energy-efficiency improvements vary the status quo of the level of energy consumption and emissions, irrespective of economic conditions.

Typically, however, it is due to altered economic circumstances, but definitely not a consequence of the policy instrument alone, that the status quo changes. Yet, when choosing the status-quo-conserving scenario for the assessment of the impacts of a

policy instrument, one necessarily has to assume that any changes in the respective outcome measure are the sole result of the policy instrument, but not of, for example, changing economic conditions. This assumption is hardly true, whence this scenario represents an inadequate benchmark for correctly assessing the impacts of any policy instrument. Nevertheless, this benchmark is often selected when no empirical data prior to the instrument are available. It is also the scenario that is implicitly assumed in the monitoring of the GGWP-declaration, where post-announcement data are gathered, while data prior to the declaration seem to be rarely available (see Section 3).

The second reference scenario is the *business-as-usual scenario*, precisely reflecting the development that would occur if, apart from the introduction of the instrument, all other conditions – prices, in particular – varied as they actually did. Although not observable, this counterfactual scenario is often identified by an extrapolation of the historical development, provided that the required data prior to the policy instrument are available. The EEA (1997:52) thus calls it *trend scenario*, appearing to be unequivocal, which it is not, since extrapolating the historical development by fitting trend curves generally may allow for ambiguity – see the following Section 3.

In order to explain the special appeal of voluntary commitment for firms and industries, we now formulate two working hypotheses. In our first hypothesis, we assume that voluntary commitments represent hardly more than the commitment to business-as-usual, which represents all activities that would have also been pursued in the absence of voluntary commitments. Given the problem that counterfactual situations are inherently unobservable, and that appropriate counterfactual baseline situations – indispensable for evaluation purposes – are thus difficult, yet not impossible to identify, our second hypothesis reads: In a situation of asymmetric information between firms and industrial organizations on the one side and consumers, competitors, and public authorities on the other, it is difficult for outsiders such as politicians or scientists to decide whether or not these commitments differ from business-as-usual. In other words, the impossibility of observing counterfactual developments and the difficulty of getting a judgement on the most likely alternative development – something that is even hard to appraise for the firms and industries themselves – makes it easy for them to call the commitment a real effort.

Provided that our working hypotheses hold true, voluntary commitments clearly seem to be a sensible reaction of rational economic agents such as firms and industrial organizations: In those situations where politicians discuss the implementation of either of various mandatory policy interventions, the strategic objective pursued by firms and industries via voluntary commitments is either to completely avoid or, at least, delay costly mandatory policy interventions in order to secure "business-as-usual profits". Exactly these benefits might represent the principal cause for the declaration of voluntary commitments. Moreover, it seems unlikely that voluntary commitments of economic agents, knowing that the goals of the commitments are difficult to distinguish from business-as-usual, induce a significantly more ambitious level of environmental quality than in the counterfactual situation without such commitments.

A variety of ancillary incentives may additionally increase the attraction of voluntary commitments for firms and industries – see ALBERINI and SEGERSON (2002) for an exhaustive discussion on incentives for participation in voluntary approaches. Among these, the most relevant are: First, and probably most important, voluntary environmental regulation might be considered part of a firm's or industry's public relation activities – see e. g. ARORA and CASON (1996). According to e. g. CAVALIERE (2000:195-196), environmental reputation effects can be regarded as implicit contracts and are frequently even self-enforcing. Hence, voluntary approaches offer many examples of over-compliance with respect to environmental standards – see ARORA and CASON (1995) and the GGWP-example presented in Section 3.

Second, struggles actually going beyond business-as-usual could still be possible: They might originate from (unrealized) *no-regrets options*, that is, from those strategies that reduce both production cost and emissions, for example by energy-conservation measures. The public declaration of environmental goals in a voluntary commitment might – due to negative reputation effects in the case of non-compliance – support a more disciplinary realization of already perceived no-regrets potentials or might even initiate an intensified search for unperceived potentials. Exactly those no-regrets potentials that are merely realized or perceived as a consequence of the commitment appear to represent the potential of environmental effectiveness of voluntary commitments.

Yet, if voluntary commitments are announced at industry levels, rather than by individual firms, image losses due to non-compliance would rather be diffuse, probably diminishing disciplinary impacts almost entirely. Similarly, market-based incentives due to an environmentally positive public image may be weakened in the case of an industry- rather than a firm-related voluntary commitment. From the perspective of individual firms that would suffer substantially upon the implementation of mandatory measures, industry-related voluntary commitments offer *free-riding* for such firms, representing a special appeal of these specific kinds of voluntary commitments that are declared by industrial associations: If mandatory consequences such as regulation or taxes can be avoided even when some firms do not participate, because the participation of other firms suffices to circumvent these policies, non-participators benefit from the participation of others. Moreover, this kind of voluntary commitment appears to bear a high risk of infection by *adverse selection*, strongly questioning the environmental effectiveness of this specific voluntary approach: It is the participation of those firms with already high environmental standards that might save the others from costly consequences of mandatory policies.

In sum, taking on the perspective entailed in our hypotheses – notwithstanding their validity – may reveal possible genuine intentions behind voluntary commitments: For industries that, in effect, commit themselves to hardly more than business-as-usual, this kind of policy instrument may provide for net benefits originating from, first of all, the delay – or even the avoidance – of the actual imposition of mandatory economic threats such as a carbon/energy tax[2]. From a theoretical perspective, our first hypothesis does not seem to be unreasonable at all: Private firms should have no incentives to provide a public good like climate protection, unless it is in line with self-interests, which is the case for no-regrets measures inducing cost-savings and, hence, net benefits, or unless there are credible mandatory economic threats. Motivated by the conceptual problems discussed in this section, our second hypothesis states that

[2]In the GGWP-example, a heat recovery ordinance was the mandatory threat that the German government contemplated in order to meet the emission targets fixed in the Kyoto-Protocol – see JOCHEM and EICHHAMMER (1999:209). Regardless of the concrete mandatory alternative that might be implemented, however, firms and industrial organizations, particularly of energy-intensive industries, are expecting *a priori* substantially higher production cost.

genuine environmental impacts are extremely difficult to be discovered. The conceptual, statistical and empirical problems in distinguishing whether or not actual performance differs from business-as-usual, further illustrated with an empirical example in the subsequent section, may allow voluntary commitments to represent an effective strategic means to drastically weaken the relevance of a potential regulatory pressure. Based on the descriptive trend analysis of the following section, in the specific example of the German cement industry both our working hypotheses cannot be rejected.

3 Empirical Illustration

In 1995, the Federation of German Industries declared the reduction of CO_2-emissions by up to 20 % relative to 1987 levels by the year 2005. In effect, due to the variability of the upper limit this GGWP-declaration was nothing more than symbolic. In 1996, as a consequence of the severe criticism of the government, the overall target was changed to a *definite* 20 % reduction level relative to the *new base year*, 1990, which is in line with international practise. Hence, it was not until the update of the GGWP-declaration in March 1996 that a set of *minimum requirements* such as the *exact* fixing of emission or fuel consumption targets is met – see RENNINGS et al. (1997:254).

Moreover, the declaration was joined by additional associations. With a total number of 18 industry associations involved today, it encompasses more than 70 % of final industrial energy consumption and almost the entire public electricity generation. In 2000, eventually, when most of the individual commitments of the 18 industrial associations were already fulfilled within the half of the period, the GGWP-declaration was – also as a consequence of a stronger influence of the government – again updated: The overall target was revised to a 28 % reduction level relative to 1990 by the year 2005. Additionally, a new target for specific emissions of other greenhouse gases was recommended: The reduction of the emissions of 6 gases by 35 % relative to the 1990 level by the year 2012.

The Germany cement industry, specifically, committed itself in March 1996 to reducing its specific fuel consumption by 20 % relative to the level of the base year 1987

by the year 2005. In absolute terms, this still valid target implies a specific fuel consumption of 2800 kJ per kg cement in 2005. In the course of the monitoring of the GGWP-declarations, post-announcement data have been gathered in order to control the progress in reaching environmental targets, whereas longitudinal data of a large range prior to the declaration has hardly been available. The cement industry represents the sole exception.

Based on the historical data, we now evaluate the impact of this declaration relative to the period before its announcement by a so-called *before-after* comparison. Due to the lack of sufficient data, unfortunately, more sophisticated methods such as a difference-in-difference approach cannot be applied – for a summary of evaluation approaches in environmental contexts, see FRONDEL and SCHMIDT (2001). A before-after comparison is one of several approaches to the solution of the classical evaluation problem, consisting of the construction of an appropriate counterfactual situation, which means a precise statement of what would have happened in the absence of a policy intervention. Although not observable, the business-as-usual scenario – the relevant counterfactual situation invoked by our first hypothesis – is identified by estimating the historical trend of the cement industry's specific fuel consumption,

$$\log fuel = \log fuel_{1974} - r \cdot trend + \varepsilon, \tag{1}$$

and predicting specific fuel consumptions for the near future, that is, up to 2005 by extrapolating the historical specific consumption curve. The estimation and extrapolation of the historical trend amounts to forecasting by "sighting along the data", as SCHMALENSEE, STOKER and JUDSON (1998:16) call it. In model (1), the variable $fuel$ denotes specific fuel consumption of cement production. An estimate of parameter r yields the estimated rate of fuel-efficiency improvements, when energy efficiency is captured in terms of specific energy input.

The descriptive exponential growth model (1) illustrates a very simple route for an industrial association to define its commitment targets. Deliberately, we abstain in model (1) from additional variables: While climatic conditions, for instance, are important in the textile industry, they should not play any role in the cement industry and, hence, are not incorporated. Business-cycle effects can be expected to influence absolute rather than specific fuel consumption. In addition, business-cycles do not

seem to vary absolute cement output and, hence, absolute fuel consumption substantially. Thus, proxies of economic conditions such as GDP are not included in model (1), either.

Above all, specific fuel consumption should be affected by energy prices – foremost past energy prices. Therefore, a more complex model would be, for example, a distributed lag model that includes lagged fuel prices. Yet, because we do not know future fuel prices that could help us to predict specific fuel consumption in the German cement industry for the years 2003 to 2005, we ignore any fuel price information. Moreover, fuel prices were rather moderate and even decreased in the post-announcement period 1995 to 1999. Hence, economic incentives for efficiency improvements originating from fuel prices should have been moderate as well. If energy prices were to strongly increase in the future, the incentive to reach the commitment target would be much stronger. By ignoring a potential pressure by possibly strongly increasing prices, we would like to provide a conservative prediction, that is, an upper limit for the prediction of the future specific fuel consumption in the cement industry.

Clearly, structural changes such as the German reunification might be influential, as can economic shocks such as the oil-price shocks in the 1970's: Figure 1, reporting time-series data (1960-1999) on the specific fuel consumption of German cement production, displays a drastic decrease of specific fuel consumption in 1974. It roughly amounts to merely 80 % of 1973's specific fuel consumption. Figure 1 indicates that there seems to be an attenuation effect, with specific fuel consumption being much lower in the period after the oil price shocks. Because of this attenuation effect and the likely persistence of the oil-crises, we ignore data before the first oil price shock in 1973/74.

Overall, for the estimation of model (1), we employ yearly specific fuel data from 1974 until 1995, the year of the first announcement of the GGWP-declaration. In order to capture reunification effects, a reunification dummy should be added to model (1). Yet, this dummy turns out to be insignificant. When thus ignoring this dummy, estimates of the parameters of model (1) are obtained by using Ordinary Least Squares (OLS):

$$\log fuel \quad = \quad 20,642 \qquad - \; 0,0063 \cdot trend \tag{2}$$

$$(1,952) \qquad (0,00098)$$

Standard errors of the OLS-estimates are given in parentheses. On average, yearly fuel efficiency improvements amount to 0,63 % within the period 1974 - 1995. By contrast, average yearly fuel efficiency improvements are around 1,3 % within the whole period from 1960 - 1995, where the years before the oil-price shocks are included.

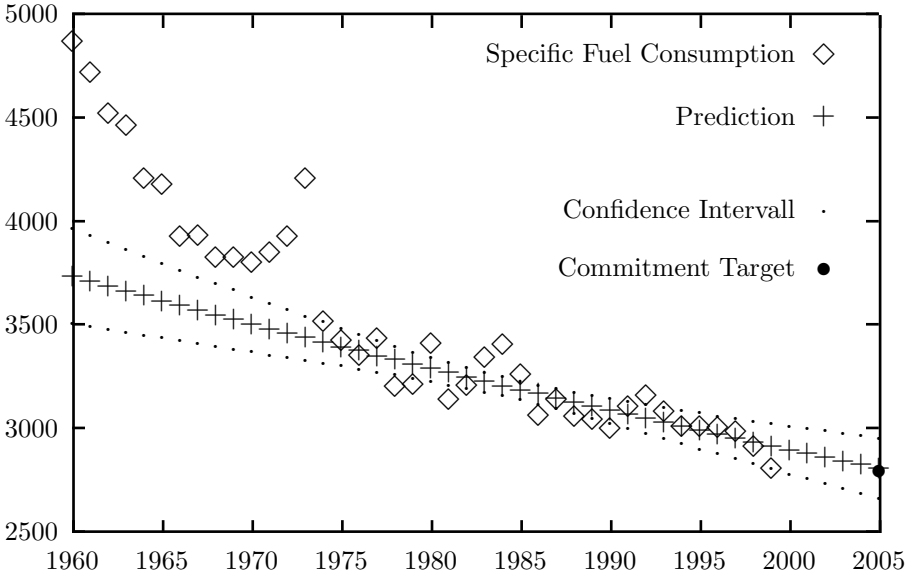
Alternatively, a linear trend model performs equally well in terms of fit and prediction,

$$\begin{array}{rcll} fuel & = & 43636,11 & -\ 20,37606 \cdot trend \\ & & (6332,928) & \quad (3,19118) \end{array} \tag{3}$$

indicating an average decline of roughly 20 kJ per kg in specific fuel consumption per year, which corresponds to the yearly fuel efficiency improvements of 0,63 % for the same period (1974-1995). The presentation of the alternative model (3) shall illustrate that the identification of the business-as-usual scenario by estimating historical trends is clearly not unequivocal. For interpretational convenience, for example, one might prefer model (1), whose predictions for 2003-2005 provide the future business-as-usual scenario. In short, although the simplicity of these descriptive models have been mainly dictated by the lack of data, they are plausible in the case of the cement industry.

According to the classical way of statistical testing, we take the first hypothesis of Section 2 as the null hypothesis: the actual development of specific fuel consumption after the declaration in 1995 more or less reflects the business-as-usual scenario given by the extrapolation based on model (3). The null is simply tested by using a forecast interval for the 99 % confidence level, for example, which is depicted in Figure 1. Obviously, with the business-as-usual prediction hitting the commitment target almost perfectly, the null cannot be rejected, irrespective of the selected significance level. In other words, the commitment target seems to be perfectly consistent with historical experience. This leads to the conclusion that in order to achieve substantial environmental effectiveness, a more demanding exogenous goal orienting towards the targets of the Kyoto-Protocol, for example, should have been negotiated between government and cement industry.

Figure 1: Actual Specific Fuel Consumption[3] of the German Cement Industry (1960 - 1999) in kJ per kg and its Prediction for 2000 - 2005.



In sum, the voluntary commitment of the industrial association of German cement producers hardly seems to be environmentally effective because trends in specific fuel consumption appear to follow business-as-usual. Hence, this example is an illustration of our first hypothesis. Yet, the monitoring report of the German cement industry is the sole report that allows a rough evaluation of its commitment. Genuine environmental impacts of the commitments of all other industries involved in the GGWP-declaration cannot be discovered without data prior to the declaration, because these data are indispensable for evaluation approaches such as before-after comparisons: Post-announcement data provided by the monitoring report are not enough! The grave lack of evaluation data prior to the GGWP-declaration definitely makes a scientifically based decision on whether or not the environmental performance of all other industries differ from business-as-usual impossible.

Given that business-as-usual is what is intended, however, it would clearly not be the highest priority of industrial associations to alleviate information deficits with respect to pre-announcement data. Yet, in order to convince both German government and the public that voluntary commitments are environmentally effective, more information than heretofore documented in the monitoring reports is required. If pre-

[3]Data sources: BUTTERMANN (1997:19), BUTTERMANN and HILLEBRAND (2000).

announcement information is not available at individual industry-level, which seems to be very unlikely, the question is how individual commitment targets could have been determined.

4 Summary and Conclusion

The term "voluntary commitment" is chosen here for a specific type of unilateral voluntary approach, having the particular characteristic that it is *not* the result of decisive government interventions, e. g. mutual negotiations between participants and regulators. This particular voluntary approach lies at the heart of this paper. We argue that, first, unilateral voluntary declarations might represent the commitment to, in effect, hardly more than business-as-usual, and, second, it would be extremely difficult for politicians or any other outsider to decide whether or not their actual environmental performance differs from business-as-usual.

Notwithstanding the empirical validity of our hypotheses, taking on the perspective entailed in our hypotheses may reveal that a voluntary commitment can represent an effective strategy for firms: By means of unilateral declarations of, for example, industrial associations, the realization of regulatory threats may be successfully delayed or even circumvented. It is much more likely, though, that declaration targets will go beyond business-as-usual if regulators play an active role, that is, if the goals to be achieved are the result of intensive mutual negotiations between regulators and participants of the voluntary approach.

In other words, in order to guarantee effectiveness of voluntary approaches, mutual negotiations might help to make goals more demanding so that potential regulatory threats appear to be more clear, strong, and credible. These are key features that, according to ALBERINI and SEGERSON (2002:177), are likely to increase the effectiveness and efficiency of voluntary approaches. Yet, from the vantage point of both our theoretical and empirical arguments, it seems unlikely that voluntary approaches of the type "voluntary commitment" are able to induce significant deviations from business-as-usual. This casts doubt on the effectiveness and, hence, the efficiency of

voluntary commitments.

A prominent example for voluntary approaches is the "Declaration of German Industry on Global Warming Prevention" (GGWP-declaration). While it does not represent a proper example for a voluntary commitment in its pure form, it shows that regular monitoring must not be confused with a thorough assessment of this voluntary approach. Our discussion of conceptual, statistical and empirical problems in the assessment of the environmental effectiveness of voluntary commitments supports the second hypothesis that a judgement on the effectiveness is difficult for outsiders, with the grave lack of pre-declaration data being a major one. All these problems indicate that post-announcement monitoring like the one in the GGWP-example is definitely not sufficient to guarantee environmental effectiveness. The improvement of effectiveness necessitates target enforcement. Furthermore, our first hypothesis is illustrated by the empirical investigation of the declaration of the German cement industry, the only industry where pre-declaration data are available. In line with conclusions of former studies on the overall voluntary commitment of German industries, e. g. EEA (1997), we find little evidence that the commitment of the German cement industry is substantially effective, that is, leads to the reduction of the specific energy consumption significantly below the business-as-usual level.

Merely those no-regrets options that are realized or perceived as a consequence of the commitment appear to represent the potential of environmental effectiveness of voluntary commitments. Yet, if voluntary commitments are announced at industry levels, rather than by individual firms, as in the example of the GGWP-declaration, their disciplinary impacts might be diminished almost entirely and market-based incentives, due to an environmentally positive public image, may be weakened decisively as well. In order to be environmentally effective, targets should be *firm-specific* and orient towards environmental goals such as the Kyoto-targets, while taking into account firm-specific requirements to avoid detrimental economic effects. In addition, more demanding environmental goals imply *absolute* rather than *relative* targets, which still dominate across the individual commitments of the GGWP-example.

In conclusion, while a post-announcement monitoring of industries is certainly not enough, the achievement of substantial environmental effectiveness requires *firm-*

specific targets that are mutually negotiated between *firms* and regulators. Of course, such an approach also excludes free-riding of firms. Voluntary agreements achieved in this way, however, are reduced in their potential to save cost due to much higher administration and transaction costs compared to voluntary commitments. Moreover, it is an open question as to whether resulting compliance costs are lower than those originating from an emissions certificate trading system which is said to allow for a high degree of flexibility as well. In sum, emission trading – which is a true market instrument as opposed to voluntary approaches – appears to be a serious competitor to voluntary approaches in the combat against global warming.

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