

Strategies to Prevent Global Warming After the Effectuation of the Kyoto Protocol

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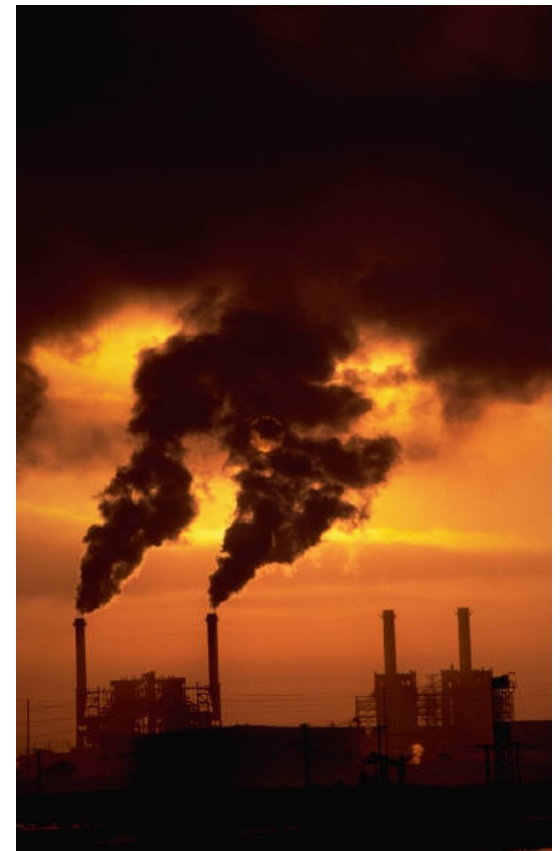
I

Measures taken against global warming
based on a market economic system

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Three different types of measures are being taken in order to reduce greenhouse gas (GHG) emissions: voluntary measures, regulatory measures, and economic measures. As long as one believes in the market, economic measures should be given priority; for instance, carbon taxation, making purchase and possession taxation on vehicles proportional to their fuel-efficiency, and so on so force. In particular, the recent trend of market liberalization and internationalization should be taken into consideration when we consider about preference among the three.



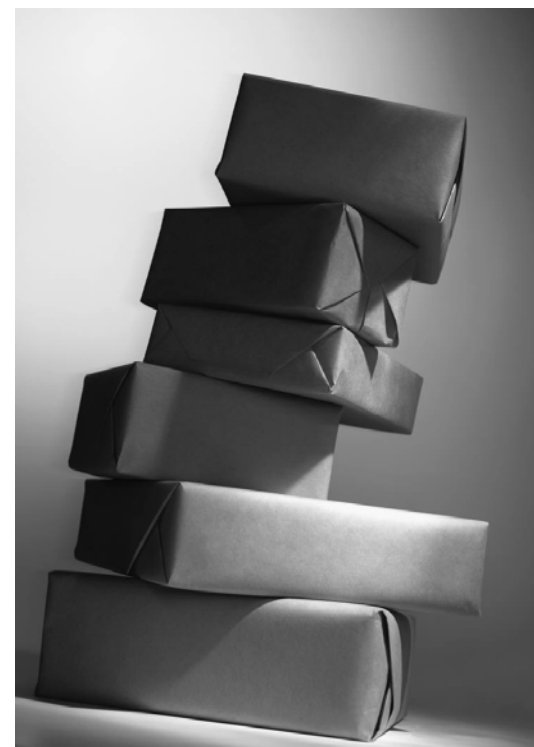
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Japan has an open market economic system, i.e., not a centrally-planned or command-and-control system. The appropriate approach against global warming for a free economy is to take predominantly economic measures and supplement these with regulatory measures: prohibitions and obligations.



03

In April 2005 Japanese government has published Plan to Attain the Goal Obligated by the Kyoto Protocol, in which numerous concrete measures are proposed and their 'effects' are numerically estimated. It should be noted, however, that nothing has been mentioned about how much these measures will cost and who and how the costs will be beard. Furthermore, policies to motivate households and firms to implement these measures have been totally overlooked.



Past trends and future forecasts of carbon dioxide (CO₂) emissions

04

From 1986 to 1997, the levels of CO₂ emissions increased at the average annual rate of 2.8%, but in 1998 emissions fell by 3.8%, reversing the past increasing trend. This continued with 2.8% and 0.9% increases in 1999 and 2000 respectively, 2.1% decrease in 2001, 2.8% increase in 2002, 0.9% increase in 2003 and 0.6% decrease in 2004. From 1997 to 2004 emissions has increased only by 0.8%.



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One of the causes for the leveling out of emissions after 1997 is the negative economic growth rate during this period. However, during the Heisei recession that started in May 1991 and ended in October 1993, in spite of the nearly 0% economic growth rate, there was a significant increase in CO₂ emissions. This suggests that a significant structural change has occurred in the energy consumption pattern in late '90s.



06

The significant increase in energy consumption and hence CO2 emissions by the household sector from the late '80s to the early '90s was due to the rapid spread of domestic appliances such as air conditioners that consume daily large amounts of electricity, the propagation of domestic electrical goods with a standby function, and the rapid development of large-scale domestic electrical appliances during this period.



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Furthermore, the significant increase in CO2 emissions within the transportation sector during the same period was due to the transition to large-size cars, the continuing spread of recreation vehicles (RVs), by which the decrease of the average fuel-efficiency of vehicles was caused.



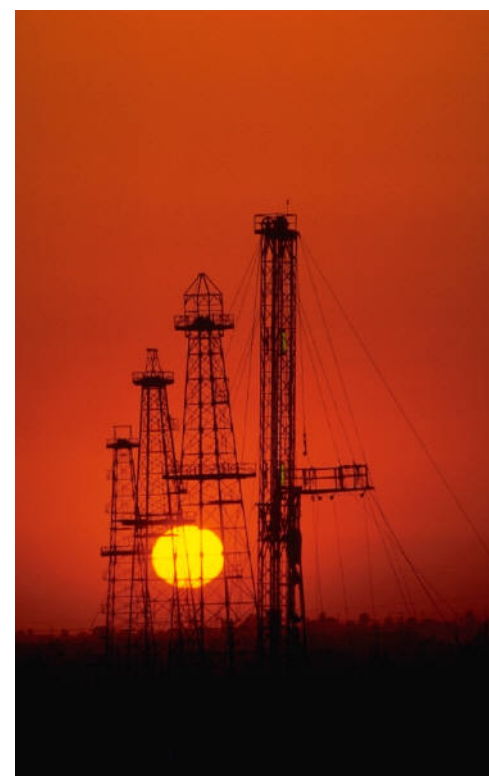
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The spread of domestic appliances which consume large amounts of electricity and the deterioration of the fuel-efficiency of vehicles within Japan is reaching so-to-speak a state of saturation. At the same time the Energy Conservation Law has been in force: the law enforces companies that manufacture electrical appliances and cars to improve energy-efficiency to the level assigned by the government appliance by appliance. Moreover, it is a recent tendency to move from the CIMA phenomenon to the VITZ phenomenon: i.e., smaller cars have become preferred to larger ones by the majority of consumers.



09

According to the government's forecast of the BAU (Business-As-Usual) CO₂ emissions right after the Kyoto Conference, in 2010 the total CO₂ emissions will increase by 18% compared to the reference year 1990 unless effective measures might be taken. I am afraid, however, that the government's forecast be over-exaggerated. In fact, at the end of 2004 fiscal year, the total annual CO₂ emissions were 11.5% less than 1990; while the annual GHG emissions were 7.4% less than the reference year.



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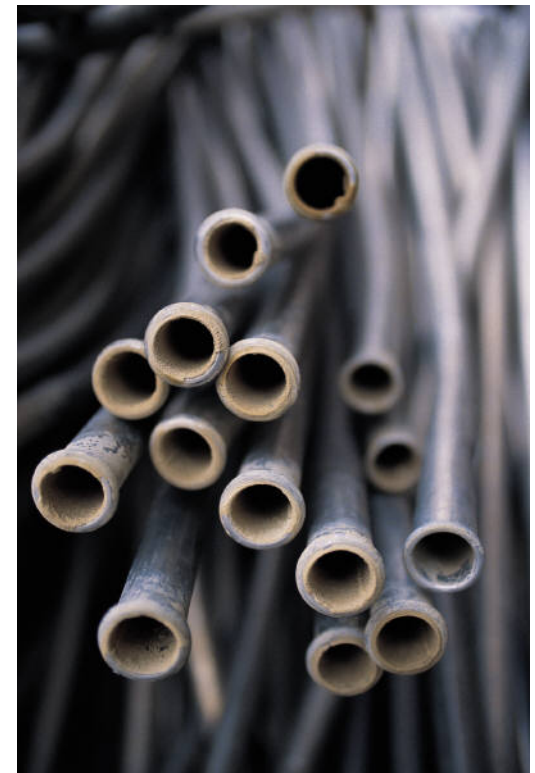
In particular, it is necessary to take the possible technological innovations in the near future into account. For instance, whether the continuing IT innovations will increase or decrease energy consumption. If one supposes that IT innovations will decrease energy consumption, the expected CO₂ emissions reduction must be adequately predicted and counted in the BAU forecast.



The possible change in the industrial structure and globalization

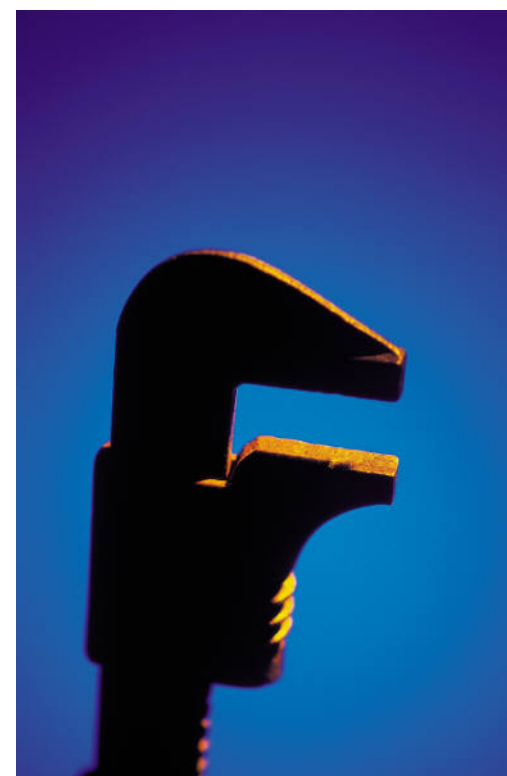
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The possible change in the industrial structure should not be overlooked. In 1985 the manufacturing industry accounted for 29.5% of the GDP, but in 2002 this figure fell down to 22.1%. Furthermore, the share of energy-intensive heavy and chemical manufacturing sectors, including steel, nonferrous metals, ceramics, and metal goods, among the whole manufacturing sectors fell from 24.3% to 14.1% in terms of the GDP. These trends are expected to continue in the near future as well. Such changes in the industrial structure could well cause a gradual decrease in CO₂ emissions per a unit of the GDP.



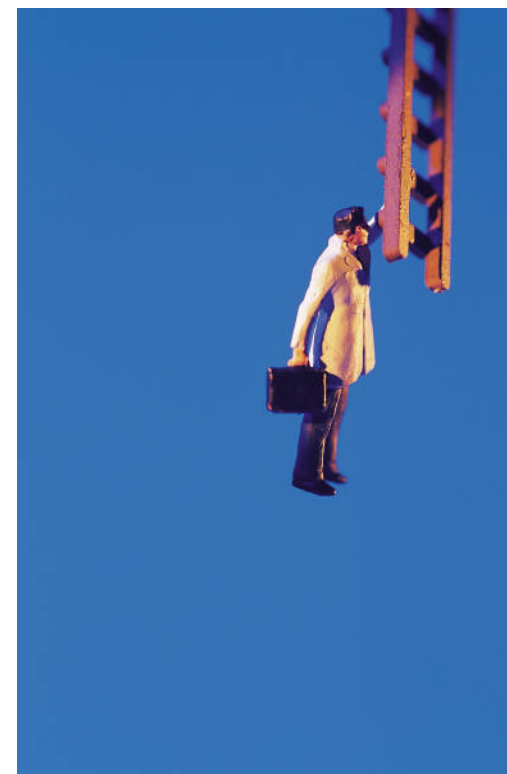
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One of the factors that have caused a significant fall in the share of GDP held by the manufacturing industry is overseas transfer of its production bases. The change in industrial structure, namely, what is called hollowing of the industrial structure, should be considered as a necessary consequence of economic development. In fact, William Petty rightly predicted such a tendency at the end of the 17th century. Western developed countries have gone through the same hardships.



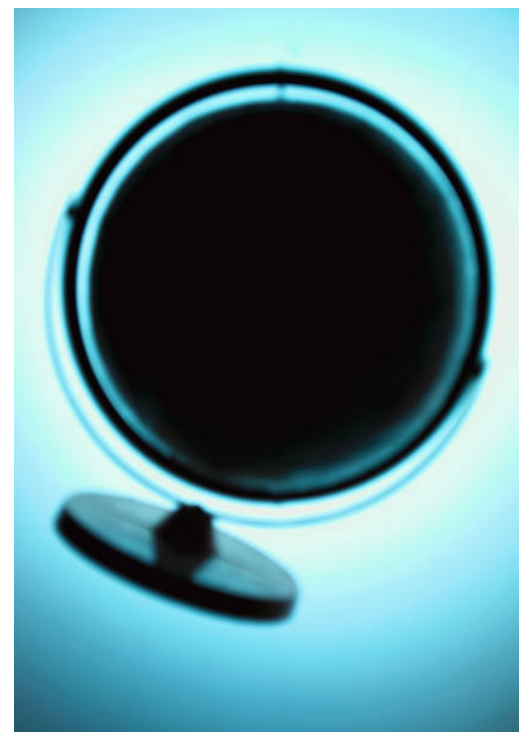
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In other words, the transition from the industrialized society to the post-industrialized society is inevitable, where the post-industrialized society is a society with economic structure based mainly on the hi-tech manufacturing industry and the software industry. Those who are afraid that measures against global warming cause hollowing of the industrial structure, are neglecting the inevitable rule of economic development.



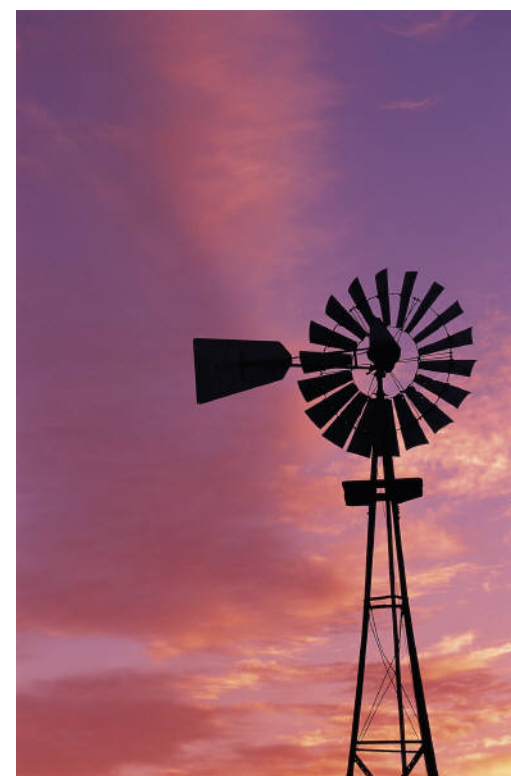
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Those who argue against the change in the industrial structure driven by globalization are really playing an unintentional role to cause a possible decline of the international competitive power of Japanese industries. However, it is an appropriate industrial policy to change the industrial structure so that it may be adequately adjust itself to such historical trends.



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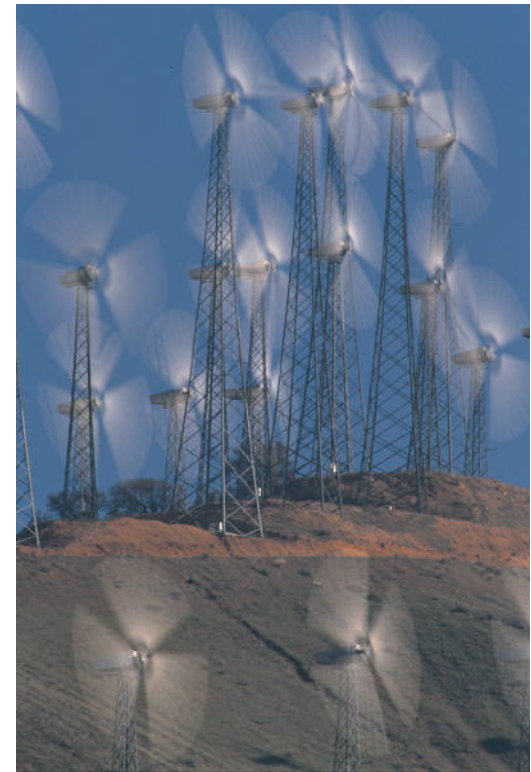
If you re-examines the economic history of Japan, you will immediately realize that many cases can be found when restrictions and shortages served as the driving force for economic development and growth. Surely, the CO2 emissions reduction based on the Kyoto Protocol could work as a springboard for economic growth. It is the government's responsibility to reveal and vitalize such a potential springboard for economic growth as quickly as possible.



Conclusion

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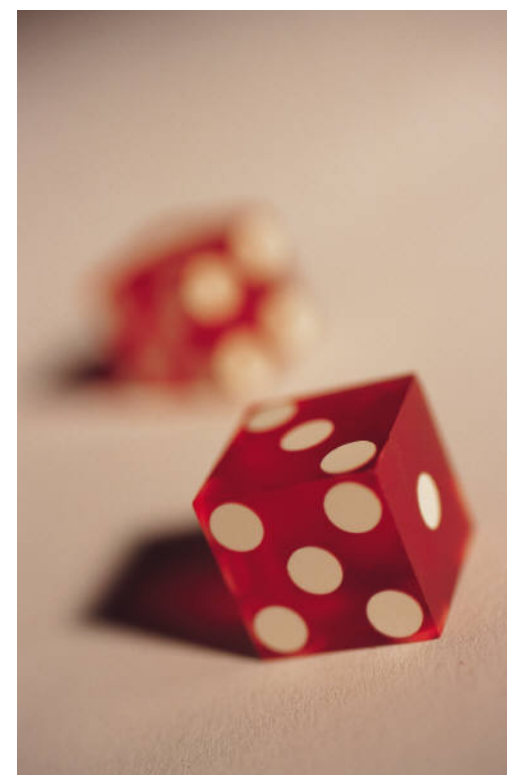
As we have seen above, it is by no means impossible to reduce the annual GHG emissions during the period from 2008 to 2012 by 6% compared to those in 1990. As long as the appropriate measures are implemented without delay, the goal set out in the Kyoto Protocol might be attainable, only through domestic policies such as carbon taxation, but also through promotion of the clean development mechanism (CDM).



17

By effectively utilizing the CDM, credits of CO₂ emissions can be obtained at a relatively cheap cost, and hence we can avoid paying unnecessarily high costs to reduce CO₂ emissions domestically.

An appropriate combination of domestic policies and the CDM will enable us to achieve the greatest effect at the lowest cost.



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Since our economic system is market-oriented, it is quite likely for us to fail to comply with the target. In such non-compliance case the Kyoto Protocol permits us to make up for the deficiency by transferring emissions rights to us from other countries who have surpassed their reduction target.



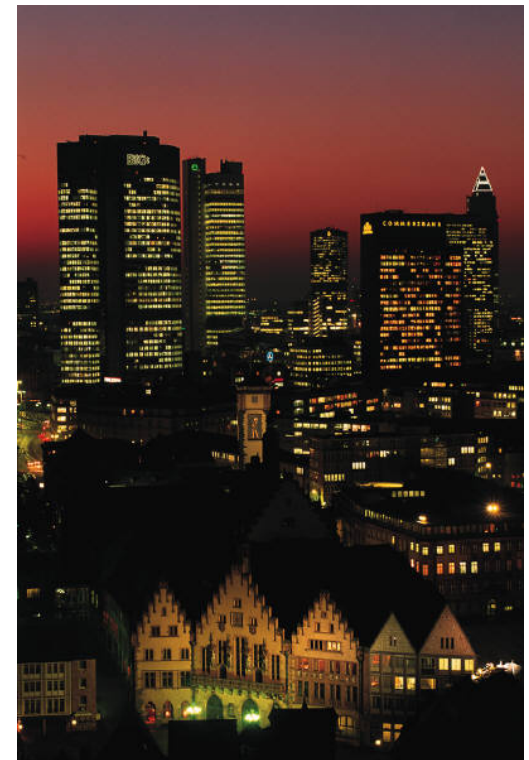
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The breakaway of the US from the Kyoto Protocol has given a significant effect on the emissions trading market. According to model simulations, it had been pronounced that the market price of one carbon-ton emission right or carbon credit obtained from the CDM is expected to be 50 to 80 dollars before the US's breakaway; while it is now expected to be far less than 10 dollars. This implies that the incentive to the CDM has been much decreased due to the US's breakaway.



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As a matter of fact, according to a quite simple simulation, the total CO₂ emissions of Annex I countries will increase about 8% if the US participates; otherwise, decrease a little bit more than 5%.



II

The effect on economy of measures
taken against global warming

Differences in macro-economic effects between developed and developing countries

21

Scandinavian three countries, Holland, and Denmark introduced carbon taxation in the early 1990`s. Germany introduced somewhat irregular carbon taxation in 1999; Britain a climate change levy in April 2001. In principle, these countries are keeping what we call revenue neutral: reducing income taxation or the burden of social security to compensate the burden additionally imposed by carbon taxation.



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It is one of the most controversial issues whether or not the CO2 emissions reduction due to carbon taxation necessarily restrains economic growth. My conclusion is as follows: this is certainly true in developing countries, but not necessarily true in developed countries.



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It is a matter of course that the CO2 emissions reduction requires firms and consumers to share a part of necessary costs, but this does not necessarily mean that the macro-economic growth rate does certainly decrease.



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The investment in equipments to effectively reduce CO₂ emissions and the investment to enlarge production capacity are mutually linked to a trade-off in developing countries.

Regulation and taxation to reduce CO₂ emissions enforce the former investment and hence restrain the latter due to limitation of available funds. Consequently, the CO₂ emissions reduction restrains the potential growth rate.



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On the other hand, in fully mature developed countries such as Japan, almost all industries have excess production capacities, and hence quite low incentive and necessity of investing production equipments. Furthermore, since investment in plants and equipments has become highly electronic nowadays, its multiplier effect is relatively small compared to investment that consumes huge amounts of steel and cement. Relatively speaking, investment in equipments to reduce CO₂ emissions make use of more amounts of steel and cement, and hence has stronger multiplier effect: it contributes to economic growth to larger extent than investment to electronic equipments.

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The introduction of carbon taxation brings about an income transfer from consumers and firms to the government. Unless the government misuses the transferred income, a slowdown in the economic growth rate may be avoidable. In fact, personal consumption expenditure decreases due to such an income transfer, but it is possible to compensate it by the government expenditures



27

In case when the personal income tax is reduced so that the tax revenue is kept to be neutral, the personal disposable income increases, and hence personal consumption expenditure will increase. The question is whether an offset account is positive or negative. It is difficult to give a definite answer to this question a priori, since it depends on so many macro-economic structural parameters such as the propensity to consume in a very complex manner.



Will carbon taxation really reduce CO2 emissions?

28

Those who oppose the introduction of carbon taxation pose a question on its effectiveness of reducing CO2 emissions. Indeed, electricity, gas, and gasoline are all necessities, and hence demand for them is quite inelastic to price variation: i.e., demand is largely independent of price. However, this is only in the short-term, the mid-term effect is another story. For example, when the gasoline price rises, demand for gasoline will not decrease so significantly. However, after 3 to 6 years when it comes to purchasing a new car the tendency to go for more fuel-efficient cars ought to increase. Therefore, in the mid-term demand for gasoline is elastic enough to price variation. This implies that effectiveness of carbon taxation is fully significant.

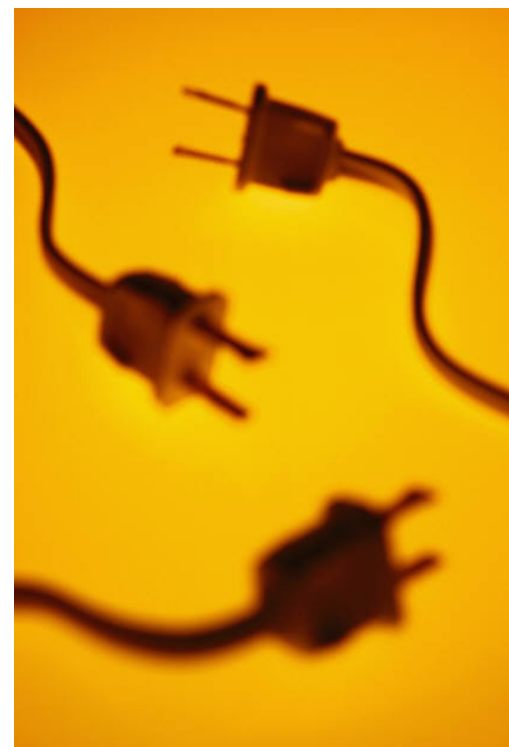
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By presenting a time series line graph of the gasoline price and consumption as well as the electricity price and consumption, some economists argue as follows: the graph shows that consumption of energy does not fall at all in response to a price hike, i.e., the price elasticity is nearly zero. This is a simple example of an elementary mistake of statistics. In short, the above misleading argument is mixing up partial correlation and simple correlation between a demand and a price. The details are as follows.



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Apparently, the price is not the sole factor that determines the demand for gasoline and electricity: the demand for gasoline depends on many other factors including income, increase in size of appliances, improvement of energy- or fuel-efficiency, changes in lifestyle, and so on so force. If one can find no significant negative correlation between the residuals obtained by removing the effect of the other factors from the prices and consumption of gasoline and electricity, then we should conclude that the price elasticity of energy demand is zero.



Problematic points and side-effects of carbon taxation

31

One of the controversial points of carbon taxation concerns the choice among the following three alternatives: first, the carbon tax revenue should be counted in the general fiscal account; second, it should be counted in a special account for implementation of measures against global warming; third, based on the revenue neutral principle the personal income tax should be reduced by the amount of the carbon tax revenue. The financial authorities tend to support the first, while authorities concerned with taking measures against global warming support the second. The third alternative is most often supported by economists.



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Since carbon taxation causes a rise in manufacturing costs for energy-intensive exporting industries, including steel, nonferrous metals, ceramics, and metal goods, their international competitiveness is likely to be harmed. As an allowance, customs measures can be taken to lessen the bad effect. For example, when steel is exported, the carbon tax already paid by domestic steel companies to produce steel exports is refunded at the port, while the carbon tax is charged on steel imports at the port. In short, taxing domestically consumed steel, but not taxing steel consumed abroad would solve the problem. Another solution would be to follow Sweden: a carbon tax is exempted for some chosen industries that consume larger amounts of fossil fuels in production process.

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Generally speaking, the promotion of measures against global warming, such as the introduction of carbon taxation, sets up an incentive for technical innovations. The competition in research and development of alternative fuels that emit low levels of CO₂ and fuel-efficient cars will be heated up. Therefore, the Kyoto Protocol offers an opportunity for promotion of new research and development within the industrial world.



The micro-economic effects of carbon taxation

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In the implementation of measures against global warming, such as the introduction of carbon taxation, it is hard to avoid a division into winner industries that make a profit and loser industries that make a loss.



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The biggest loser industry is the coal industry. For this reason countries with big coal industry such as Australia have reacted negatively to taking measures against global warming. On the other hand, since Japan's coal industry is close to extinction, Japan is one of the rare countries that can implement measures against global warming without any significant resistance by the coal industry.



36

As for the oil industry, given the increase in demand for natural gas which is a by-product of crude oil, difficulties in developing a liquid fuel to replace oil, and the fact that oil will last only for the next 40 years, we can not necessarily say for sure that it will be a loser.



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Similarly, it is also hard to avoid a division of winner companies and loser companies in the same industry. Winners include car manufacturers developing fuel-efficient cars, and electrical equipments manufacturers developing appliances with electricity saving designs.



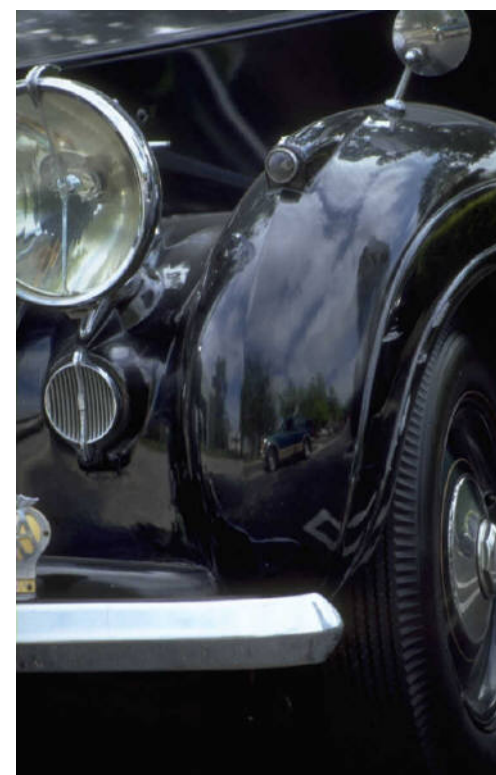
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Given that sorting of winners and losers is developed not only at a national scale but also on an international scale, it is preferable that Japan takes the initiative in implementing measures against global warming. The early actions are indispensable for Japanese auto-makers to be winners in forthcoming hard competition in developing more fuel-efficient cars such as fuel-cell cars.



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The Kyoto Protocol offers an opportunity for the world-wide reorganization of the car industry. The merger of Daimler-Benz with Chrysler in 1998 can be seen as a forerunner to the reorganization of the car industry triggered by the Kyoto Protocol. Fierce competition in research and development of fuel-efficient cars has already begun.



Kyoto Mechanism

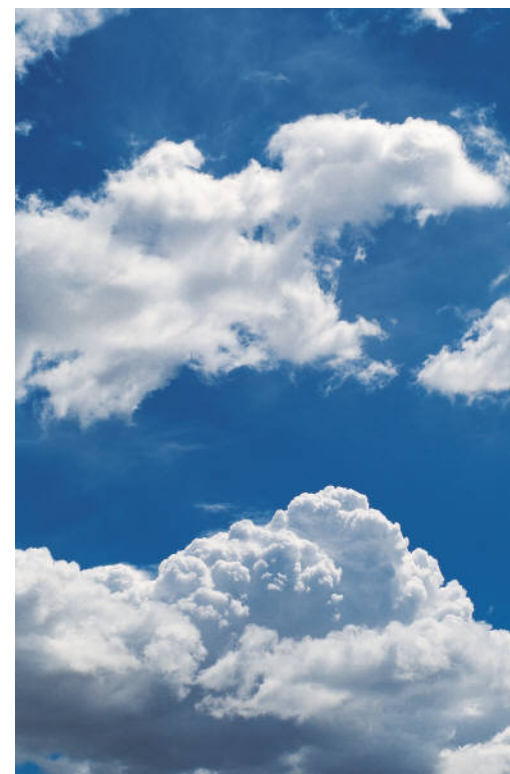
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The Kyoto Protocol introduced an international system of emissions trading, joint implementation and clean development mechanism, the common name of which is the Kyoto Mechanism.



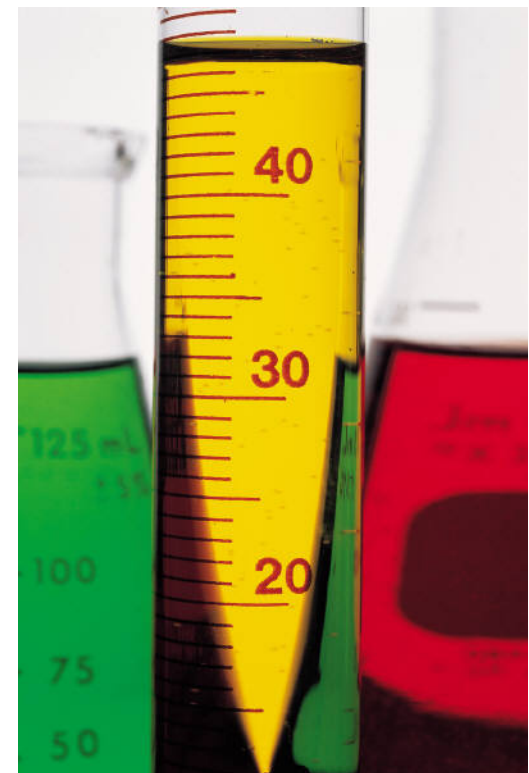
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The Kyoto Protocol requires Annex I countries to reduce the average GHG emissions for the period from 2008 to 2012 on the whole at least by 5% compared to the total emissions in 1990. The assigned reduction rates were differentiated among countries: 8% for the EU countries, 7% for the USA, 6% for Japan, and 0% for Russia and other East European countries.



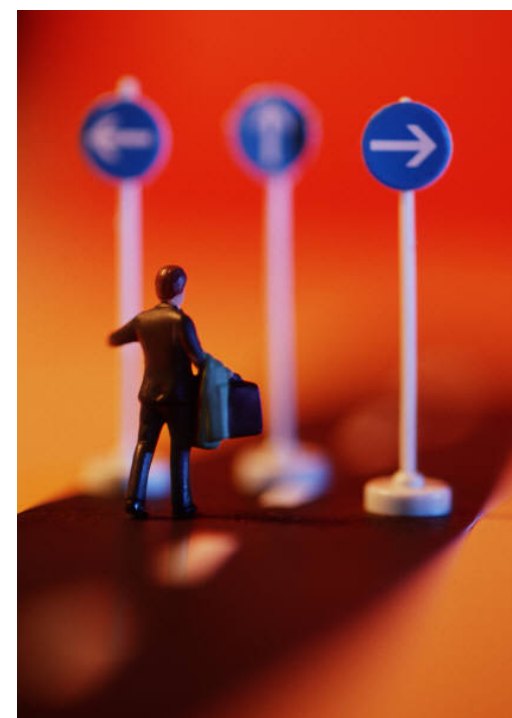
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Japan's assigned reduction rate is 6%. This implies that Japan has acquired emissions rights of the amount equal to 5 times 94% of the 1990 GHG emissions, which are effective during the above time period.



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The total reduction cost would be minimized, if the reduction rate of GHG emissions were assigned to each Annex I country so that the marginal reduction cost of GHG emissions be equalized among all Annex I countries. However, as the marginal reduction cost curves for Annex I countries are unknown, the assigned reduction rates do not satisfy the above optimality condition. The Kyoto mechanism was introduced in order to compensate existing unfairness of differentiation of assigned reduction rates.



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The marginal reduction cost, i.e., the cost to reduce one more unit of GHG emissions, is largely different among countries. Generally speaking, it is cheaper in developing countries, while more expensive in developed countries. In order to attain the assigned reduction rate we can try to minimize the total cost by adequately combining opportunities of the CDM with domestic measures.



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The introduction of domestic emissions trading is often recommended by some economists and climate change experts. Sales dealers of fossil fuels are obliged to attach emissions rights issued by the government as much as the carbon content of the selling fossil fuels. The total amount of issued emissions rights is equal to the total GHG emissions planned by the government. It is expected that the market will be created to sell and buy available emissions rights.



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A domestic market of emissions rights is certain to follow the creation of an international market. The creation of the market is indispensable to make private sectors' investment to energy-saving equipments in developing countries, i.e., the CDM economically viable.

— *fin*

