CESifo DICE REPORT

Journal for Institutional Comparisons

VOLUME 5, NO. 4 WINTER 2007

The international platform of Ludwig-Maximilians University's Center for Economic Studies and the Ifo Institute for Economic Research, Munich

EDITORIAL

The CESifo DICE Report has been published since 2003. From the beginning, Rigmar Osterkamp was one of the two editors. It is largely due to his efforts that the CESifo DICE Report has become a respected journal in international institutional comparisons. It is read not only by economists but also by policy-makers and journalists throughout the world. The Ifo Institute is grateful to Rigmar Osterkamp for his successful work.

Rigmar Osterkamp took a leave of absence from the Ifo Institute at the end of September 2007 to take on a new task in Namibia. As of October 2007, Marko Köthenbürger has taken over his position as an editor of the CESifo DICE Report. He holds a Ph.D. from the University of Paderborn and has been assistant professor at the Center for Economic Studies of the University of Munich.

CESifo DICE Report ISSN 1612-0663
A quarterly journal for institutional comparisons
Publisher and distributor: Ifo Institute for Economic Research e.V.
Poschingerstr. 5, D-81679 Munich, Germany
Telephone ++49 89 9224-0, Telefax ++49 89 9224-1462, e-mail ifo@ifo.de
Annual subscription rate: €50.00
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Copy editing: Anne Heritage, Paul Kremmel

DICE Database: www.cesifo.de/DICE

CESifo DICE Report

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Climate Change Policies

Burden Sharing in Climate Change Policy

Agnar Sandmo*

Economics has a long and proud tradition as regards the analysis of environmental issues, going back at least to the classic treatment by Pigou (1920). In the last few decades, environmental problems have been incorporated in the agenda of policy makers to a much larger extent than ever before, and new theoretical approaches have been developed to analyse problems that are increasingly acknowledged to be of major concern, both for individual domestic economies and for the world as a whole.

Of these problems none looms as large as that of global climate change.[1] This problem confronts public finance and environmental economists with at least two particular challenges. The first is that of designing policies that meet the twin objectives of efficiency and justice in burden sharing. To be effective, these policies have to be embedded in an international treaty (the Kyoto Protocol is a first step in this direction). The other challenge is to design a set of incentives that leads firms, individuals and national policy makers to comply with the policies adopted in the treaty. This paper will mainly be concerned with the first of these challenges.

The global climate can be seen as a leading example of what has come to be known as a global public good (Sandmo 2003). A global public good is one that is provided equally to all individuals in the world, and the global climate has exactly this property. Greenhouse gas emissions, in particular emissions of CO_2, that lead to global warming affect the quality of this public good, and they can accordingly be seen as a global externality. What does economic theory tell us about the design of policies to correct for this externality?

The principles of Pigouvian taxation

The policy that was recommended by Pigou (1920) as the best way to curb harmful emissions into the environment was a tax per unit of emissions.[2] Pigouvian taxation would have several advantages compared to direct regulation of each individual polluter. A tax on pollution gives the polluter a private incentive to cut back on emissions: it obviously pays him to do so as long as the marginal cost of reduced emissions is less than the tax rate, so that profit maximization implies equality between the marginal cost of reduced pollution and the tax rate. It follows from this that with a uniform tax the marginal cost of reduced emissions will be the same for all polluters, so that the total cost will be at a minimum: emissions will be cut back most by those consumers and firms that find it least costly to do so. This is socially efficient, because it means that any environmental target – in the form of a given environmental quality or a given reduction of emissions – can be achieved at the lowest possible aggregate cost to society. A further advantage of tax policy is that, compared to direct regulation, it reduces the costs of monitoring the activities of each single polluter. Moreover, by setting the tax at the level where it corresponds to the marginal social value of reduced emissions, one obtains an efficient balance between benefits and costs.

The Pigouvian tax accordingly achieves two objectives: It leads to an *efficient balancing of benefits and costs,* and it achieves *production efficiency* with respect to the quality of the environment.

Such a tax might conceivably have an undesirable effect on the distribution of real income among indi-

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[1] The importance of the problem was recently underlined by the award of the Nobel Peace Prize for 2007 to the Intergovernmental Panel on Climate Change and Al Gore "for their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change."

[2] It should be kept in mind, however, that Pigou was concerned with local, not global environmental problems.

viduals since it cannot be ruled out that poor people would have to bear a relatively high share of the costs. A concern for equality might therefore lead the designers of policy to lower the tax relative to the efficient level: a more equitable distribution of the costs of environmental policy can be bought at the price of a higher aggregate cost. But there is another option. Society has a number of policy instruments that have been particularly designed with a view towards redistributing income from rich to poor. Leading examples of such policy instruments are income tax progressivity, social security payments and subsidies to low income earners. If a greater weight on environmental taxation were really to have a regressive impact on the distribution of income – which, however, is by no means certain – the best policy would be to stick to the standard of efficiency in environmental taxation, but combine it with the use of other policy instruments to neutralise the adverse effect on real income distribution.

This brief review of the principles of environmental taxation is set in the framework of national tax policy. Do these principles carry over to policies affecting the global environment, or do we have to rethink them in a fundamental way?

Global environmental policy

Global environmental policy must necessarily be analysed from a somewhat different point of view. The discussion of national policy choices was based on the supposition that there is a well-defined governmental authority that can set tax rates, enforce compliance and decide on other policy instruments in order to arrive at a socially acceptable package of policy tools. But there is no world government that has a similar authority, and in the global community of sovereign nations some careful thinking is required before we apply the principles of Pigouvian taxation to the problems of the environment.

Let us first consider the problem of production efficiency. From the point of view of the world as a whole, it would obviously be desirable if any given reduction in, e.g., CO_2 emissions could be achieved at the lowest possible cost for the world as a whole. This could be achieved by a globally uniform carbon tax, to be paid at the same rate per unit of emissions in rich and poor countries. This would give the strongest incentives to reduce emissions in those countries where it is least costly to do so, and lead to a situation where the global reduction in emissions is achieved at the lowest possible resource cost for the world as a whole. For this reason, a globally uniform carbon tax has been recommended by a number of policy analysts, and its desirability has been strongly emphasised by the Stern Review (2007).

A cutback of emissions requires the use of each country's resources for purposes that compete with their use for private and public consumption. This use of resources is particularly burdensome for poor countries whose standard of living is low. It is true that the imposition of this tax creates revenue for the public sector, but this revenue is basically a transfer from the private to the public sector. Even if the revenue were to be returned to private consumers, there will necessarily be a net decrease of consumption possibilities for the population. So a poor country that is required, by the criterion of efficiency, to reduce its emissions substantially may find itself in a situation where private and public consumption – already at a low level – may have to be reduced in the interests of global production efficiency. Thus, there may be a serious conflict between equity and efficiency considerations at the global level. What are the ways out of this dilemma? The previous discussion of the principles of national environmental policy gives us some clear guidelines to the available options.

An obvious possibility is differentiation of the tax according to the income level of the individual countries. Relative to the standard of production efficiency, the carbon tax in poor countries could be lowered, while being increased in the rich countries. In this way one could preserve the target regarding the reduction of world emissions, but the reduction would be achieved at a higher cost to the world as a whole. This policy eases the burden on the poor countries and increases it for the rich. The additional cost would have to be justified by the distributive gain of a more equitable distribution of the cost between rich and poor countries.

But there is also another option. Let us assume that the emission taxes are collected not by the national governments but by an international agency set up by the international treaty. This agency distributes the revenues not according to emission reduction but according to income, thereby redistributing aggregate revenue from rich to poor countries. Poor countries would receive more tax revenue than they collect from domestic emissions, while in the rich countries

the reverse would be the case. In this setup one achieves a separation between the problem of equitable distribution and that of the preservation of the environment, and an efficient and uniform carbon tax can be implemented without regard for its international redistributive effects. This is the option recommended by the Stern Review (2007, 364), which , after having argued the case for the uniform tax, adds that "[a]n additional mechanism would need to be put in place to transfer resources to developing countries".

The main conclusion of this analysis must be that whether global production efficiency in cost sharing is desirable or not depends crucially on the mechanisms that exist for income redistribution. The more developed these mechanisms are, the stronger is the case for distributing the cost burden on the basis of production efficiency. In a world with only limited scope for international redistribution, there is a strong case for deviating from production efficiency in order to ease the burden on developing countries.

Taxes versus quotas

A system of tradable quotas is an alternative to the regime of Pigouvian taxes, and this general insight holds also in the case of global climate policies. If agreement were reached on an international distribution of emission quotas corresponding to the target level of emissions, national governments could sell quotas to individual polluters (thereby raising public revenue just as under the tax regime). If polluters were given access to an international market for quotas, a uniform quota price would then be established with the same production efficiency properties as the Pigouvian tax. Indeed, if the total volume of quotas were set at the level corresponding to that achieved by the Pigouvian tax, the theoretical prediction is that the price of a quota unit would be exactly equal to the tax rate, and the same balance between marginal costs and benefits would be achieved.

The difference between the two systems is mainly that under a system of tradable quotas, restrictions on international quota trade would be necessary in order to differentiate the price of emissions between rich and poor countries, and these restrictions might be difficult to design and enforce. Instead, distributional objectives could more easily be achieved via an initial allocation of quotas in favour of developing countries. If these countries were supplied with an excess of quotas making them net sellers of quotas on the world market, international quota trading would serve as a mechanism for income transfers between the industrialised and the developing world. This system could be used to achieve the same distribution of the burden between countries as in the case of a uniform tax combined with redistribution of the revenue.

Gross vs. net burdens

In evaluating the distributive effects of global climate policy one needs to keep in mind that the distribution of net and gross burdens between countries may differ substantially. Although the climate is a global public good, this does not imply that the *benefit* from preventing global warming is the same for all countries. Benefits may be of different types. Following the classical Samuelson (1954) formulation of the theory of public goods, it has been common to think of public goods as yielding primarily consumption benefits, but in the case of the global climate one has to take a broader view. A change in the climate affects a country's production possibilities, so that an evaluation of the benefits should include the effects of climate change on both consumption and production possibilities. A rise in the level of the ocean in a country like Bangladesh, for example, will have serious direct effects on human well-being because periodic flooding may give rise to epidemics. But in addition a rising see level will affect the conditions for production, especially in agriculture. A rise in the level of the oceans will have serious consequences for all coastal areas, but they will be much more serious for Bangladesh than for most other countries. It seems likely that in most people's view of global welfare, a fair distribution of the costs of preventing climate change should take account not only of income levels, but also of the difference in benefits.[3]

But what is fair? Can one arrive at objective and universally accepted standards of fairness for the distribution of the burden of global climate policy? Clearly, the answer is no; judgements of fairness differ both between individuals and countries. What theory can provide is a framework for thinking about the issues of equity and efficiency in a systematic manner, there-

[3] The main implication of this conclusion is obviously not that developing countries should bear a higher burden of the cost, but that in allocating the burden between countries at the same level of income, one should also take the benefit side into account.

by helping to establish a "grammar of policy arguments" that may help to bring about a common frame of reference in international climate negotiations.

Nevertheless, some welfare judgements would probably command wide support. Most people, including most economists, would agree with the view expressed by Pigou (1920) that an extra pound of income is worth more for the poor than for the rich. But to arrive at a conclusion regarding the fair sharing of the burden of international climate policy one has to go further than this and ask: how much more? In the answer to this question individual ethical judgements will necessarily have to lead to different answers.

Additional considerations

Are considerations of economic efficiency and distributive justice sufficient to capture common notions of fair burden sharing in climate policy? In 1991 Lawrence Summers, then chief economist at the World Bank, circulated a memorandum,[4] subsequently published in *The Economist,* that aroused strong reactions. Briefly, the gist of his argument was that pollution was likely to be much less costly and a clean environment to be much less valued in poor countries, so that there was a good efficiency case for the migration of polluting industries from the industrialised to the developing world. Although the underlying assumption was that both rich and poor countries stood to gain by the proposal, many people reacted to what they perceived as the unacceptable cynicism of suggesting that rich countries could bribe the poor to take over their environmental problems.

Related controversies have arisen in the recent debate about burden sharing in climate policy. In Norway, there has been considerable discussion about how much of the national target for the emission of greenhouse gases should be achieved by domestic reductions and how much by quota purchases from developing countries. While the government's position has focused on the two strategies being combined, opposing environmentalists have criticised this policy as being a way to buy ourselves out of what is essentially a moral obligation. Other critical voices have argued that Norway should provide an example to the rest of the world and reduce its own emissions below the level at which it would be cheaper to buy quotas from others. These are interesting issues that should definitely be included in broader discussions of international burden sharing.

Problems of implementation

A difficulty in implementing the insights from the theory of public goods lies in the peculiar incentives that arise when one considers the possibility of voluntary or market-based provision of such goods. Once a public good has been provided it is impossible to prevent an individual agent from benefiting from it, whether he has paid a share of the cost or not. This gives the agent an incentive to under-report his benefits. Moreover, if the total cost of production is going to be distributed among agents on the basis of individual cost conditions they have an incentive to over-report their costs. But if all agents under-report their benefits and over-report their costs the result will be that the provision of public goods will be below the optimal level. This reasoning has led most economists to conclude that the provision of public goods is a natural task for the government, which in principle is able to overcome the incentives that characterise allocation mechanisms based on voluntary participation. The national government has the power to construct systems for benefit estimation and public goods provision that do not rely on individual preference revelation, and in addition it has the power to enforce payment through taxation. But in the absence of a world governmental authority, agreement on climate policy must be based on voluntary participation in international agreements. This raises all the incentive problems familiar from the theory of public goods: each country has an incentive to free ride on the policies adopted by other countries with the predicted result that policy efforts to prevent global warming will be severely inadequate. So far, experience seems sadly not to contradict this prediction.

The incentive problem for global public goods can be put somewhat differently. Let us go back to the case of global production efficiency, where the marginal cost of preventing global warming is the same for all countries. This common marginal cost should at the optimum be equal to the global benefit. But this means that at the optimum each country is required to contribute at a level where its marginal cost is higher than the domestic marginal benefit (which is necessarily less than the *global* marginal

[4] The memorandum is quoted in Hausman and McPherson (1996).

benefit). If each country takes account only of its national interest, narrowly defined, the result will be that the global public good is severely underprovided for the world as a whole.

Concluding remarks

The international burden sharing in climate policy is a challenging issue that raises central issues of welfare economics: How can we achieve a rational balance between benefits and costs, and distribute the costs between nations in a way that satisfies reasonable standards of efficiency and equity? Economic theory can make a substantial contribution to clarifying the basic issues involved.

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Green Taxes and Climate Change: Theory and Reality

Janet E. Milne*

The primary goal of tax systems is to raise revenue for government so that it can perform its public functions, but the various systems of taxation, which reach deeply into the intricate financial network of industrial, commercial and personal decision-making, can also simultaneously deliver substantive signals. Greening the tax code can allow government to harness its fiscal structure to help achieve its environmental goals. It can target the key pressure points where the tax system intersects with financially sensitive decisions that can significantly affect behavior. Although the concept of environmentally oriented tax instruments is not new (Irwin and Liroff 1974), today's focus on climate change has created new momentum for examining the ways that tax instruments can reduce greenhouse gas emissions.

Green tax theory

There are two sides to the proverbial coin of the green tax theory – tax increases that discourage activities or commodities that are environmentally damaging and tax decreases that encourage those that are environmentally beneficial. In both instances, the tax instruments should be based on traditional tax principles that consider issues of equity, economic effect and administrative feasibility, but they also are grounded on an additional principle – the environmental impact of the tax instrument.

A green tax increase can have an environmental impact in an economically efficient way under one of several, sometimes overlapping theories. Early in the twentieth century, A.C. Pigou first presented the concept that taxes could capture the costs of private activities that otherwise would be borne by society and apply them to the activities generating the costs (Pigou 1920, 168). By internalizing those external costs (although Pigou did not use those terms), a tax could reflect the real environmental cost of the activity and build that cost into private-sector decision-making. A related theory is the polluter pays principle, which started primarily as a prohibition against government subsidies of pollution control measures (OECD 1972) but frequently is presented as something akin to the cost-internalization principle (OECD 1992). The concept of least-cost abatement provides another rationale: by avoiding the one-size-fits-all approach of some regulation, tax increases set to achieve the desired degree of aggregate pollution reduction can allow individual polluters to decide when it is economically efficient for them to abate pollution (Surrey 1973, 156). Finally, the double-dividend theory (Pearce 1991, 940), also known as ecological tax reform (von Weizsäcker and Jesinghaus 1992, 18), would use the revenue raised under any of these theories to reduce some existing tax burden, such as taxes on labor that may be dampening the economy. The environmental tax would produce the first – environmental – dividend, and the tax relief would produce the second – economic – dividend (Milne 2003, 10–12).

All these theories share, in general terms, the idea that adjusting the economic calculation can result in more environmentally beneficial and economically efficient results. Few green tax increases perfectly execute these theories, given challenges such as identifying and enacting the exact external cost for internalization, but the theories guide the design and certainly contribute heavily to the political rhetoric surrounding their enactment.

Green tax decreases have a more pragmatic foundation. By awarding a tax credit, deduction, exemption or reduced tax rate that otherwise would not be available, government finds a way to encourage an environmentally positive commodity or activity. The

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primary motivation is to achieve a given environmental benefit by subsidizing activities that otherwise would not occur, not to make the market more economically efficient or rational. If costs were fully internalized, the demand for these measures might decline.

Green tax decreases also have a very different fiscal effect than tax increases, obviously reducing the flow of revenues to the government rather than increasing it. This difference can have significant political consequences. Tax increases are often politically unpopular, unless accompanied by offsetting tax relief, while constituents may welcome tax cuts from which they can benefit. For politicians, tax cuts may also offer the opportunity to deliver benefits more quietly through the tax code than through the conspicuous scrutiny of the annual appropriations process. However, as Stanley Surrey explained when he coined the term "tax expenditure", targeted tax incentives have the same fiscal impact as direct appropriations and, in fact, are government expenditures (Surrey 1973, 3–4).

Green tax increases in action

Both the European Union and the United States put their toes into the green tax waters in the early 1990s when they proposed broad-based energy taxes. Although they found the water too chilly, their proposals capture key political and policy issues involved in using green taxes to address climate change.

From an environmental perspective, the ideal green tax for climate change would be a tax on the carbon content of fossil fuels. When combusted, the carbon in the fuel produces the carbon dioxide that increases the greenhouse gases in the atmosphere. Taxing the carbon would help internalize external costs and cause the polluter to pay. The taxes that were proposed, however, did not follow the pure carbon tax model.

In 1992, the European Commission proposed a revenue-neutral tax based half on carbon content and half on energy value (European Commission 1992). Thus, it extended the tax to non-carbon fuel sources such as nuclear power and hydropower, recognizing in part the fact that a carbon tax alone would have disparate impacts on the competitive position of different member states (European Commission 1991). It also provided some tax relief for energy-intensive industries, recognizing that competitiveness concerns had to somewhat temper the environmental goal. Even so, energy-intensive industries resisted the tax, as did some member states that were hesitant to accept a tax system that, for the first time, would have imposed rates unified at the Community level (Boeshertz and Rosenstock 2003, 152–53; European Commission 1992). As part of a deficit-reduction package in 1993, the Clinton Administration proposed a federal tax based solely on energy content, realizing the regional and economic difficulties of imposing a carbon tax on coal, but the tax still fell under political pressure from opponents (US Treasury 1993). As these accounts illustrate, the environmental principle underlying green taxes will not automatically trump the policy principle that looks at economic effect, and few taxes are immune from political considerations. Nevertheless, these taxes, if enacted, would have represented the first internationally significant steps toward using fiscal policy on a global scale to increase the cost of a broad range of fossil fuels, well beyond the longstanding taxes on transportation fuels.

Broad-based energy or carbon taxes need not occur only at the highest levels. In the early 1990s, Denmark, Finland, Norway and Sweden introduced carbon taxes, and recent studies of the effect of their carbon-energy taxes on the industrial sector have found that the taxes have reduced carbon dioxide emissions (Speck et al. 2006, 217–20). Other countries have acted as well. For example, Germany began phasing in a tax on energy products and electricity in 1999, and two years later the United Kingdom imposed a climate change levy on electricity and fossil fuels used outside the household sector as part of a larger program to reduce carbon dioxide emissions by 20 percent by 2010 (European Environment Agency 2005, 52–53).

Support continues to grow for the market-based approach. The Stern Review in late 2006 underscored the importance of attaching a price to carbon emissions, whether by tax, trading regime or regulation (Stern 2006, xviii), and in March 2007 the European Commission issued a Green Paper to launch a discussion on increasing the use of market-based instruments, including green taxes, in Europe. In line with the approach it proposed in 1992, the European Commission again has suggested that fuels should be taxed according to both their energy content and their greenhouse gas emissions

(European Commission 2007, 2 and 7). Although the United States has not taken any significant steps toward broad-based energy taxation since 1993, two members of Congress have introduced legislation proposing carbon taxes, and one presidential candidate has called for carbon tax.

This thumbnail sketch of history cannot do justice to the details, but it provides some evidence of the historical and continued interest in broad-based energy taxes. It would be a mistake, however, to think only of energy-based taxes when considering how green tax increases can reduce greenhouse gas emissions. For example, a tax on gas guzzler cars in the United States rises as high as USD 7,700 for cars with fuel economy of less than 12.5 miles per gallon, although its effectiveness has been constrained by a loophole for sport utility vehicles, which were not on the drawing boards when the tax was enacted. Norway imposes a tax on perfluorocarbons (PFCs) and hydrofluorocarbons (HFCs) based on their contribution to the greenhouse effect (European Environment Agency 2005, 59). The tax approach is fungible. It is only a matter of finding and defining a tax base that generates greenhouse gas emissions and then of imposing a tax on that base to internalize costs or achieve the desired change in behavior.

Green tax decreases in action

In the climate change arena, green tax decreases can send targeted, positive price signals that can increase the use of renewable energy and improve energy efficiency in an effort to reduce reliance on fossil fuels. These decreases can take the form of tax credits, deductions, exemptions or reduced tax rates that otherwise would not be available under neutral principles of taxation.

The United States in recent years has chosen to use tax expenditures rather than tax increases to pursue these ends. For example, since 1992, the producers of electricity from wind power have been able to claim an income tax credit (now USD 2.0 cents) for each kilowatt hour of electricity they sell. As a result of legislation enacted in 2005, purchasers of cars powered by alternative fuels may be eligible for an income tax credit; businesses that make energy efficiency improvements in their buildings can claim a tax deduction of up to USD 1.80 per square foot; manufacturers of energy-efficient refrigerators, dishwashers and clothes washers can claim an income tax credit ranging from $125 to $175 per machine produced during 2006 and 2007, depending on the type of machine, degree of energy efficiency, and level of production beyond historical levels. Many of these incentives have limited life spans, targeting the transitional time for the new technology and reducing the long-term fiscal impact.

The United States is certainly not alone in the use of tax expenditures to address climate change. To cite just a few examples, the United Kingdom offers landlords an income tax deduction of up to GBP 1,500 per property for the installation of insulation in residential properties they lease, and the province of British Columbia in Canada exempts energy efficient furnaces from its sales tax (OECD 2007, 108 and 111). In the transportation sector, Sweden has offered tax benefits to employees whose compensation includes employer-provided vehicles using alternative fuels (European Environment Agency 2005, 109).

However, the United States has had greater freedom to use tax expenditures than the European member states, because it has nothing comparable to the European Union's state aid rules, which impose a formal discipline on the circumstances in which member states can provide tax subsidies for environmental protection (European Commission 2001). In addition, the federal budget rules in the United States requiring that tax bills must be revenue neutral lapsed from 2002 to 2007, allowing the federal government to enact green tax decreases without having to find offsetting revenues to pay for them. The Energy Policy Act of 2005 carried a five-year price tag of $15 billion in tax expenditures for energy, some environmentally positive, and some environmentally negative (Joint Committee on Taxation 2005).

One should not leave the topic of tax expenditures without noting at least in passing that another way to green the tax system is to eliminate or reduce existing tax subsidies for fossil fuels and other commodities that contribute to greenhouse gas emissions. Removing those tax (and non-tax) subsidies can take one step toward correcting prices, even if one does not continue down the path toward fully internalizing external costs.

When to use green taxes for climate change

Tax instruments are just a means to an end, in this case reducing greenhouse gas emissions. There are no

absolute rules governing when and how to use green tax instruments, or whether to use the tax-increase or tax-expenditure side of the green tax coin, but perhaps in closing a few observations are in order. First, when green taxes are used in the climate change context, they often serve the dual motives of reducing greenhouse gas emissions and promoting energy security. Consequently, their policy and political foundations may not be limited to the environmental context and their design may reflect multiple goals. Their green may bear stripes in other colors as well.

Second, policymakers must consider carefully the choice between green tax instruments that send negative signals and those that send positive signals. As a general matter, pervasive, strong, negative signals, such as broad-based energy taxes, have the potential to induce long-term structural and attitudinal changes that over time will change the ways in which business and daily life are conducted. They can extend deep into the broad reaches of economic decisions. On the other hand, carefully targeted, positive signals of tax expenditures may be useful to help society over specific speed bumps of technological change in the short term, improving the economic viability or acceptance of new technologies until they can compete independently.

The choice, however, does not depend just on whether to use broad or targeted, negative or positive signals. It also rests on the fundamental question of who should pay. Should the polluter pay, as in the case of tax increases, or should the beneficiary (society) pay in the case of tax expenditures? And if using both is an option, if the negative signal is sufficiently strong, can it accomplish most or all of the desired result without the assistance of targeted tax expenditures, leaving the full cost on the polluter? This choice of who should pay will reflect fundamental policy, fiscal and political decisions.

Third, as other articles have illustated, taxation is just one of numerous ways in which government can effect change, and a looming issue in the climate debate is the relationship between broad-based energy taxes and permit trading regimes. They are both market-based instruments; they both send price signals; and they may raise similar issues of equity and economic impact, particularly if the permits are auctioned, not grandfathered. But they also are different. Taxes on fossil fuels will carry a known price, set by the tax rate, whereas the price of permits will fluctuate with the market. Taxes will not yield a pre-determined level of emissions' control, whereas a properly enforced trading scheme will achieve a known target. Taxes will carry a cost that is more visible to voters and consumers and therefore more politically volatile, while permit trading may be more politically opaque to the general public. Both policy and political calculations will govern the choice, but the choice need not be limited to one or the other. The two may operate in concert, for example, by using different instruments for different sectors or by using taxes in conjunction with permits that are not auctioned. Government can use more than one type of green coin in its purse of market-based options.

Finally, the question of who decides which coin to use – a question that has more novel implications in the case of tax instruments. Within many governments, tax matters are handled in the first instance by the tax writers and tax administrators and environmental matters by those involved primarily in environmental protection, but green taxation is built in the hybrid world that combines the disciplines of taxation, environmental protection, and economics. Tax specialists become environmental specialists; environmental regulators need to incorporate the role of taxation in their universe; and economists should inform the analysis. This broadening may require the development of enhanced expertise and different forms of collaboration, and the plot may thicken with jockeying for control over potential new revenue streams. It may also be constrained by institutional limits, such as the European Union's unanimity rule, which requires that all member states agree before a tax can be implemented at the Community level. The challenges of climate change demand new solutions and interdisciplinary expertise, and, as demonstrated by experience to date, the well-matched pervasiveness of greenhouse gas emissions and tax systems offers significant opportunities for the future.

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US Experience with Emissions Trading

A. Denny Ellerman*

Although the EU's CO_2 Emissions Trading Scheme is now by far the world's largest, the US has the distinction of having provided the seedbed for public policy experiments with emissions trading. Various forms of trading were introduced into the Clean Air Act in the 1970s; but a widely recognized success, the lead-in-gasoline phase-down program, did not occur until the mid-1980s. Soon thereafter proposals were put forward both for a national cap-and-trade program to control acid rain precursor emissions and for a similar program (RECLAIM) in the Los Angeles air basin to deal with persistent local pollution. The Northeastern NOx Budget Program followed in the late 1990s, as well as several other local programs, among them the Chicago VOC (volatile organic compounds) program. Finally, mercury trading and a significant tightening of both the existing SO_2 and NOx caps under the Clean Air Interstate Rule (CAIR) are in the offing. Most of the programs implemented to date have been considered successful, but not all.

Elements of what would now be called credit trading were very tentatively introduced into the overwhelmingly command-and-control structure of the Clean Air Act beginning in the mid-1970s in the form of netting, offsets, bubbles and banking. These cautious experiments aimed at providing flexibility in compliance with Clean Air Act requirements, but the application of each was carefully circumscribed and each trade was subject to regulatory approval. While cost savings were achieved, the use of the added flexibility was not widespread, and almost always internal to one firm (Hahn 1989). The main problem was the transaction costs involved in demonstrating what would now be called "additionality," or, in the lingo of the day, demonstrating that the credits being created were not "anyway tons."

The lead phase-down program marked a step forward in not requiring additionality, perhaps because its objective was the complete elimination of lead in gasoline. It was an averaging, or baseline-and-credit, program in which credits were granted to firms doing better than the rapidly declining lead content standard (from 1.0 to 0.1 grams per leaded gallon in three years) and usable by firms not yet meeting the standard. In effect, it provided flexibility over time for the lumpy investments that were required to remove lead from gasoline. Firms that invested early were rewarded by earning credits that could be sold to those who invested later. Unlike credit trading within the Clean Air Act, the lead phase-down program was widely considered a success and provided the "break-through" in permit trading that made the next policy experiments possible (Newell and Rogers 2004).

The US SO_2 Trading Program also known as the Acid Rain Program benefited from the success of the lead phase-down program, but also from a decade of political stalemate over proposed, predominantly command-and-control legislation to reduce acid rain precursor emissions. For the new Republican president in 1989, a market-based approach to an environmental problem was just right. This next step removed the last pretense that it was the regulator who decided the level of emissions at the level of the firm. This was done by creating allowances, barely disguised property rights, distributing them to emitters in amounts less than pre-existing emissions, and allowing them to be traded without limitation (except for a ban on borrowing from future vintages). Within the limits imposed by the pre-existing prescriptive rules on SO_2 emissions, firms were free to choose their level of emissions and their method of abatement subject only to the requirement to surrender an allowance for every ton emitted. Effectively, a scarcity was imposed by the cap, while the ability to trade created the potential for a market that would provide a price that could be used by firms in deciding what abatement would be worth undertaking. The hope was that

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marginal abatement costs would be equalized and costs minimized.

Few doubted that the program would be effective in achieving the intended 50 percent reduction in SO_2 emissions. However, during the debate on the legislation in 1989–90 and in the years prior to implementation in 1995, there was considerable doubt that a market would emerge. The program applied only to electric utilities, which were viewed as conservative, price-regulated entities lacking an effective incentive to maximize profits. It was thought that they would readily trade internally among power plants they owned, but not externally with other electric utilities. Cost savings would occur within firms, but the larger savings available from inter-utility trading would not be realized. While most early compliance plans conformed to this expectation, market intermediaries quickly appeared and started to arbitrage the inter-company differences in marginal cost. The market developed with sufficient rapidity to cause a well-defined single price to appear before the program started in 1995. And, the volume of trading within a year or two made it clear that there was plenty of inter-utility trading (Ellerman et al. 2000).

To the surprise of many and despite a barely constraining initial cap, the sub-set of emissions included in an initial transitional phase dropped by almost 50 percent in the first year of the program. This unprecedented emission reduction solidly established the reputation of emissions trading as a means of reducing emissions quickly, as had been first demonstrated with the lead phase-down program. The reduction was the more impressive in that it was entirely voluntary in response to the possibility of banking early reductions to reduce the cost of the later more stringent cap. As such, it provided clear evidence that economic incentives worked (Ellerman 2004). Thereafter, the SO_2 program became the "poster child" of emissions trading and fully earned the epithets of "grand policy experiment" and "living legend" that have been bestowed upon it (Stavins 1998; Burtraw and Palmer 2004).

At approximately the same time as the US SO_2 Trading Program was being developed, air quality authorities in the Los Angeles air basin decided to adopt a cap-and-trade approach to replace a detailed but infeasible command-and-control plan to further reduce local SO_2 and NOx emissions to address persistent local air quality problems. The result was the two separate programs known as RECLAIM that came into effect in 1994 (Harrison 2004). These two programs are noteworthy for several reasons. They applied to sources across several industries. They introduced a form of spatial differentiation into trading. And they provided the first of many instances in which air quality regulators, who possess ample legal authority to implement a command-and-control program, would choose to refocus efforts on designing a market-based system that would provide appropriate incentives for the desired abatement, and thereby overcome the informational asymmetries and political resistance that were increasingly rendering prescriptive regulation less effective.

The NOx part of the RECLAIM program encountered significant difficulties in 2000–01 that led to its partial suspension. In brief, the price of permits soared from less than $5,000/ton to more than $90,000/ton in the space of a few months; some sources were unable to acquire permits at any price; a $15,000/ton fine for non-compliance was implemented retroactively; and electric utility sources were separated from other sources and subjected to prescriptive regulation mandating the installation of NOx removal equipment before being reintegrated into the program several years later. The causes of this break-down are essentially two: the absence of banking or borrowing and the highly unusual confluence of events surrounding the California electricity crisis in 2000–01. The latter placed extraordinary demand upon a set of old, generating units without NOx controls that had previously been used for only a few hours a year to meet peak demand. The inability to bank or borrow made it impossible to meet the extraordinary demand for permits within the one-year compliance period in a program that was also small in its geographic scope. The effect of this temporal constraint was clearly signaled by forward prices that were significantly lower than current compliance period prices and which reflected the ability to retrofit NOx control equipment with sufficient time and the expected passing of the unusual events of 2000–01. The unavoidable result was the break-down of the trading program and the temporary return to more conventional prescriptive measures.

The Northeastern NOx Budget Program lagged the national SO_2 and the RECLAIM programs slightly in its development and implementation; however, when it started in 1999, it provided yet more evidence of the turn towards the use of cap-and-trade mechanisms to deal with air quality issues. As was

the case with RECLAIM, the air quality regulators possessed the legal authority under the Clean Air Act to mandate appropriate measures, but they turned instead to a market-based approach as more effective and efficient. The distinctive feature of the Northeastern NOx Budget Program is that it was an interstate agreement to establish a common emissions market to deal with a problem that was the responsibility of each state but which was in large part caused by out-of-state sources (Aulisi et al. 2005). The federal Environmental Protection Agency (EPA) assigned NOx "budgets" to each state and operated the registries, but enforcement and the allocation of allowances to sources within the state were the responsibility of each state. The program is also important in introducing an element of time differentiation; the cap applies only during the months from May through September when the meteorological conditions conducive to ozone formation are present in the Northeast.

The Northeastern NOx Budget Program provided the foundation for what was to be the most radical and telling (if unheralded) change in air quality regulation in the United States, the NOx SIP Call. The acronym SIP stands for State Implementation Plan, which is the detailed source-specific set of regulations that prescribes air emission limits on all sources within the state in order to attain or to maintain the National Ambient Air Quality Standard (NAAQS) for specified pollutants. As such, it is the heart of the command-and-control approach of air quality regulation that had become the norm with the Clean Air Act Amendments of 1970. In response to a tightening of the NAAQS for ozone in the late 1990s, the EPA offered the affected states the option of either submitting a conventional prescriptive SIP to EPA for approval or accepting an EPA-determined state budget and adopting the "Model Rule" that would allow trading among all sources in the multi-state region. Every state chose the latter option and thus was born in 2003–04 what is now called simply the NOx Budget Program, which extends well beyond the Northeast to include all sources east of the Great Plains. In offering this choice and in accepting it, both the federal EPA and the state air quality regulators recognized and acknowledged the limits of the traditional prescriptive form of regulation.

The Chicago VOC program was a local application of cap-and-trade, like RECLAIM, and like the NOx programs, it aimed at ozone attainment, but it targeted a different set of ozone precursor emissions: volatile organic compounds. As such, it was another first, but it is also notable in being judged largely a failure, at least in its initial form. Firms complied with the program, which went into effect in 2000, but there were some remarkable anomalies that indicated something was amiss, such as a positive price and expiring, unused banked allowances. The problem was a set of prescriptive hazardous air pollutant (HAP) regulations that had gone into effect at the same time concerning the same set of emissions. The interaction of the two instruments meant that some installations were constrained by the HAP regulations and others by the VOC trading program. The latter bought allowances, but the former did not always sell their excess allowance holdings and tended simply to ignore the market possibilities. The authors of the definitive study of this program describe it as market-based "window dressing" for a dense set of traditional regulatory measures that did the real work (Kosobud et al. 2006). Using two instruments to achieve the same goal provided some flexibility to a few participants but succeeded mainly in adding cost.

Although debate now focuses on cap-and-trade proposals to limit greenhouse gas emissions, it would be a mistake to omit the further extensions of emissions trading that will take effect in 2009–10 as a result of the Clean Air Interstate Rule (CAIR) and the Clean Air Mercury Rule (CAMR). Both have followed the regulatory route pioneered by the NOx SIP Call whereby federal approval of the state's implementation plan can be obtained by accepting the EPA-determined state budget and the trading rules set out in the respective Model Rules (Napolitano et al. 2007). In the case of CAIR, the SO_2 and NOx caps in the existing SO_2 Trading and NOx Budget Programs are being effectively reduced by about two-thirds over a five year period in order to address persistent ozone non-attainment and the new fine particulate standards. In the case of the mercury rule, a new emissions trading program is being set up to limit power plant emissions of a quasi-global pollutant that has been previously unregulated. These measures were implemented by administrative rule by the Bush Administration and they have gone virtually unnoticed by all but the parties involved.

The lack of controversy over the CAIR and CAMR contrasts markedly with the debate concerning greenhouse gas (GHG) emissions trading proposals now under consideration in Congress. After what would seem like an almost triumphal march of near universal acceptance of cap-and-trade systems for

dealing with challenging air quality problems, the whole concept is now being called into question with serious and well-meaning suggestions that alternative regulatory approaches may be more appropriate for GHG emissions. The contrasting reception of CAIR and the climate proposals is the more striking in that, when emissions trading emerged as a viable and practicable regulatory instrument in the 1990s, it was seen as applicable mostly to new problems that were not covered by the existing air quality regulation under the Clean Air Act. In fact, since then, it has proven harder to extend emissions trading to new problems, such as climate, than it has been to apply emissions trading to air quality problems falling squarely within the ambit of the Clean Air Act, perhaps because the legal authority and conventional prescriptive alternatives existed as an always present alternative.

If the time has not already arrived, the implementation of CAIR will soon create a situation where the extensive apparatus of prescriptive regulation of SO_2 and NOx emissions from stationary sources will be redundant. Emissions from any given source will be determined by the cost of the respective allowances instead of the increasingly archaic prescriptive regulations that tell firms to do what they would do anyway as a result of the high price on emissions.

Whether the trend to increasing reliance on market incentives instead of prescriptive regulation will hold for greenhouse gases is the issue now being joined. As of this writing there is no cap-and-trade system for CO_2 or GHG's in existence in the US, although the Regional Greenhouse Gas Initiative is scheduled to start operating in 2009 if by then a sufficient number of Northeastern states adopt the proposed regulations, as they say they will. California's legislature and governor have empowered a regulatory agency to issue regulations to take effect in 2012 that would return the state's GHG emissions to 1990 levels by 2020, but it is almost certain that emissions trading will play only a partial role, probably restricted to electric utilities and perhaps some industrial facilities. Meanwhile, the more important and real debate is being engaged at the federal level, where several serious proposals to cap GHG emissions starting in 2012 are under consideration in the Congress. There are, however, significant differences concerning major design features among proposals and their supporters that will require a number of years to reconcile. The debate will be difficult and protracted, and the outcome is uncertain. It seems unlikely, but it would be the supreme irony if the calls for an alternative "simpler" approach are heeded, ignoring the lessons from America's extensive experience with emissions trading and leaving Europe alone as the champion of a global GHG trading system.

References

The preceding essay draws principally from the following sources without attempting to summarize or present their complete findings. Readers interested in learning more about the US experience with emissions trading are advised to consult the following works.

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Specific programs are evaluated more extensively in the following resources.

Aulisi, A., A. E. Farrell, J. Pershing and S. VanDeveer (2005), *Greenhouse Gas Emissions Trading in U.S. States: Observations and Lessons from the OTC NOx Budget Trading Program,* World Resources Institute, Washington DC.

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Evaluative research has not yet been possible for CAIR and CAMG; however the following article provides a good summary for those interested in learning more about these future programs.

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The European Emissions Trading Scheme: an Overview of Operation and Lessons

Michael Grubb*

After a decade of struggle during the 1990s, during which the European Union sought to introduce a carbon tax as a principal means of tackling climate change, a sudden change of approach produced a radical breakthrough in attempts to introduce a carbon price in Europe. Considerations of subsidiarity, legal and institutional structures, and the inherent political difficulties of the large-scale revenue transfers embodied in a carbon tax combined to make emissions trading – long proposed by the US Clinton Administration – more practical. After the EU's turnabout on this issue, it took just three years – fast by the standards of European legislative development – to move from concept to a completed EU Directive on Emissions Trading. This article looks at its key features, experience to date, lessons and prospects.

The EU ETS: key features

The EU emissions trading scheme, which began operating in 2005, caps CO_2 emissions from heavy industry – power generation and half a dozen mandatory energy-intensive sectors, plus all combustion plants above a certain size threshold (20MW). Covering almost half of all EU CO_2 emissions, it forms the centrepiece of European policy on climate change. Trading the allowances to emit CO_2 gives value to reducing emissions and has formed a market with an asset value worth tens of billions of euros annually.

Although unprecedented in its scale and scope, the main pillars of the EU ETS were built on many years of economic research into theories of emissions trading, combined with practical experience of schemes principally for various other pollutants in the US.

The basic idea is straightforward. Based on Coasian theory, defining rights to emit and permitting trade in these allowances enables participants to look for the cheapest way of delivering the aggregate environmental goal. A market emerges and price of emission allowances defines the lowest-cost way of meeting the constraint set. The external impact is internalised, with maximum efficiency. Moreover, allocating free emission allowances enables governments to overcome the problem that had bedevilled carbon tax proposals for a decade, by separating the *efficiency* property of a market-based instrument, from the *revenue transfers* involved in taxation. Free allocation, in other words, offers from a standpoint of political economy a neat, intrinsic way of buying off political opposition to an efficient market solution.

It is such a simple idea it is a wonder it took so long to gain credibility – and in the eyes of some critics, so quick to lose it. Like many simple ideas, its practical implementation posed many challenges. The Directive was carefully designed to be an evolutionary process, in at least three phases:

- A first phase from 2005–07, with various opt-out provisions
- A second phase, with tougher non-compliance provisions, running from 2008–12 to coincide with EU governmental targets under the first commitment period of the Kyoto Protocol
- Subsequent phases to be developed in the light of experience with the first two.

This article appears at the cusp of transition from the first, trial phase, to the "real thing" in terms of its operation at full strength under the umbrella of Kyoto commitments – and shortly before the release of the first salvo on its longer term future, in the form of a European Commission proposal for post 2012 design. It is thus an excellent moment to take stock.

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Lessons from phase I

Phase I began operation on schedule and the mechanics of market services soon appeared, with information services, brokers, monitoring and verification agencies emerging in abundance. With many millions of euros at stake, CO_2 finally reached the boardroom of companies across Europe.

The main market focus of course was on the price. In the early months, carbon prices rose steadily, tracking the rising gas price that determined the cost of switching away from coal in power sector generation. As gas prices continued to soar, the CO_2 price broke free from this marker and oscillated in the range EUR 20–25/tCO_2 for much of the year (Figure 1).

From several perspectives, 2006 was the defining year for the EU ETS. It started with prices for phase I (2005–07) emission allowances reaching levels higher than anyone predicted, peaking at EUR 30/tCO_2, whilst governments confidently issued draft National Allocation Plans (NAPs) for how they intended to allocate allowances for phase II, the Kyoto period of 2008–12. The year ended with phase I prices sinking close to zero, and several countries threatening to take legal action to overturn the European Commission's rejection of almost all the submitted NAPs as inadequate. It was certainly a year of vast learning – as befits the middle of the first, learning, period of a major new system.

The key to prices of course is scarcity, and the biggest difference between the EU ETS and other markets is that government decisions create the scarcity. Concerns from some analysts about overall shortage in phase I proved groundless, when in May 2006 the release of data on verified emissions for 2005 showed a substantial surplus. The price halved overnight, and as the situation clarified over subsequent months, it sank further. The final tally showed that emissions in 2005 were about 100 Mt (5 percent) below the allocated amount, and shortly after the New Year phase I allowances became essentially worthless. Data for 2006 show that emissions increased fractionally, but not nearly enough to mop up the excess supply of allowances.

Debate continues about the reasons for the surplus. The suggestion that some companies might actually have cut back their emissions in the face of a stringent carbon price was for a while drowned in the noise of condemnation about overallocation, but the most detailed studies (e.g., Ellerman and Buchner 2006) suggest that actual abatement was an important component – potentially accounting for the majority of the surplus.

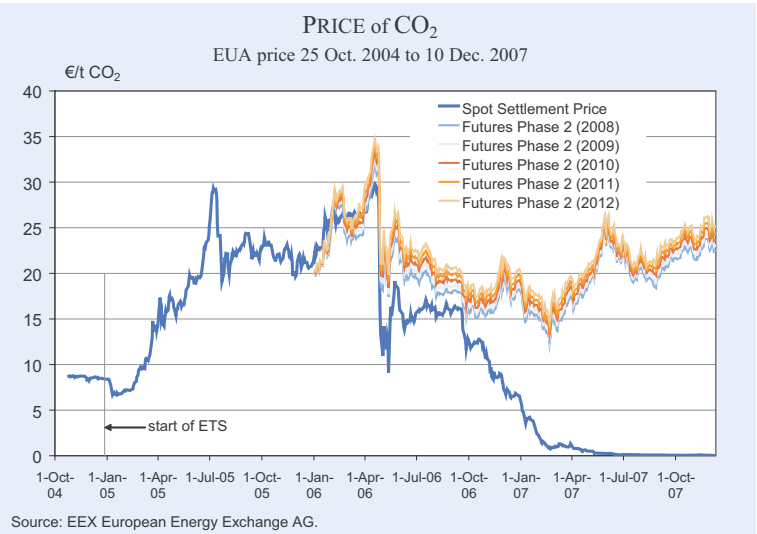
After their initial anguish, the brokers stopped worrying, as forward trade in phase II allowances became an equally active market, and all eyes turned to the struggle over phase II allocations.

Phase II allocation

It was against this roller-coaster backdrop that countries sought to develop their National Allocation Plans (NAPs) for phase II, the Kyoto period of 2008–12. There was a great deal at stake. Phase I had already shown the huge potential financial value of emission allowances – at EUR 20/tCO_2, governments were allocating assets worth probably more than EUR 200 billion in total. Not surprisingly, they were subject to huge lobbying pressures. Yet the EU ETS in phase II was central to meeting Kyoto Protocol targets.

Under the terms of the EU ETS Directive, the European Commission is empowered to reject NAPs if they do not meet certain criteria laid out in the directive, relating to the avoidance of surplus allocations and consistency with Kyoto targets. However, the data on verified 2005

Figure 1



Source: EEX European Energy Exchange AG.

emissions were published only six weeks before the official deadline for submitting proposed phase II NAPs to the European Commission – clearly insufficient for governments to consider wholesale revisions.

Most of the NAPs initially proposed for phase II offered modest cutbacks relative to projections of sharply rising emissions – and, in aggregate, would have resulted in an increase of around 5 percent relative to the verified levels of 2005, after correcting for differences in coverage. This was not only inconsistent with Kyoto targets; it would also have left a precariously thin margin below "business-as-usual" emission projections. Depending upon assumed relative energy prices (gas vs. coal, as illustrated) and the inflow of emission credits from abroad, the EU ETS could have been rendered almost impotent for the whole of phase II, requiring hardly any real abatement.

Faced with this risk, on 29 November 2006 the Commission announced a momentous decision. In evaluating the first 11 NAPs (10, after the French government withdrew its plan a few days before), it rejected all but the UK's as inadequate.

In fact the Commission went further than this. It clarified its interpretation of the directive in terms of specific total allocations that would be deemed acceptable, linking allowed allocations to two main factors. The first was a requirement that allocations be consistent with Kyoto targets, after taking account of other aspects of member state implementation plans including provisions for purchase of international Kyoto credits. The second was an explicit numerical formula that total allocations could not exceed 2005 levels multiplied by projected economic growth, corrected for trends in energy intensity (energy per unit of economic output). Moreover, the economic growth projections and energy intensity corrections were taken from international (EU) sources, not those that member states themselves presented.

Under the terms of the directive, member states had three months to appeal against the Commission decisions. By announcing decisions on such a big group of countries simultaneously, the Commission raised the stakes enormously. Any country that challenged its ruling – as the German economics minister initially threatened to do – would be disputing the underlying interpretation of the directive, which had been applied consistently across all countries, and would thereby open the floodgates for all to appeal. This would have locked up the EU ETS in legal disputes from which it would probably never have recovered – certainly not in time to be of much use to investors wanting to know the rules for phase II. Faced with rising public debate in the year of its EU and G8 presidencies, Germany backed down and others did so too.

In aggregate, the Commission's decisions cut total allocations in Europe by 10 percent as compared to the initial submitted and draft plans – turning a proposed aggregate *increase* of 5 percent from 2005 levels into confirmed allocations 5 percent *below* 2005 levels. The final allocations total almost exactly ten billion tonnes of CO_2 over the period – two billion tonnes annually. CO_2 emissions associated with European industry are firmly capped, for the first time, anywhere, since concerns about climate change first emerged on the international political stage some two decades earlier.

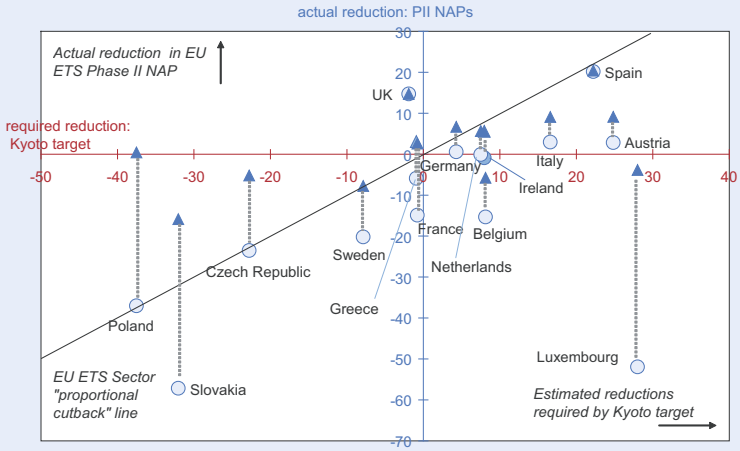
Distribution and Kyoto compliance

Another major impact of the European Commission decisions was to greatly reduce disparities between the different NAPs and to bring them much closer to consistency with national Kyoto targets. Figure 2 shows for each country the percent cutback relative to 2005 levels (vertical axis), against the percent cutback in national emissions required for a country to meet its Kyoto target domestically (horizontal axis). The diagonal line indicates the "proportional share line", i.e., emission reductions for ETS sectors that would be proportional to the national total cutback implied by Kyoto targets. It also compares the final outcome (triangle) with the original national proposal (circle).

Figure 2 reflects two main themes in the battle over phase II allocation plans in Europe. The first concerned allocation in the EU-15 countries, principally western and southern European countries that are mostly falling short of a path towards their Kyoto targets. The UK, the biggest exception to this pattern, had submitted a relatively ambitious allocation plan and the draft Spanish plan proposed even bigger cutbacks. The German government led the charge against the Commission's tightening of the screws, but as it backed away from its threat to take legal action, the other EU-15 countries did so too. The net effect of the Commission winning its political struggle – apart from saving the EU ETS as a

Figure 2

EMISSION CUTBACKS AND KYOTO CONSISTENCY BY COUNTRY
vs 2005 emissions in %



Note: For each country, the vertical axis shows the percent cutback in NAPs from verified 2005 emission levels in the EU ETS sectors. The horizontal axis shows the national percent difference between 2005 total emissions and national Kyoto targets. Consequently, the diagonal line shows the "proportional share line" if EU ETS sectors (which typically make up 40–50 percent of total national emissions) are cut back in proportion to the Kyoto target. The circle at the bottom of each vertical bar shows allocations proposed as of November 2006; the triangle at the top shows the final outcome.
Source: Carbon Trust (2007).

credible market – was to align most of the other EU-15 countries closer to the "proportional share" cutback, many with a significant cutback relative to 2005; those that fell short had to demonstrate stronger offsetting action, in other sectors or through international purchases.

The effort to strengthen NAPs faced a different issue in the new member states of eastern Europe. These were all (except Slovenia) easily on track to comply with their Kyoto obligations, thanks to the decline in emissions far below 1990 levels in the aftermath of economic transition. Here the other element of the Commission's formula – the cap relative to verified 2005 emissions adjusted for economic growth and energy intensity changes – came to the fore. In some cases (e.g. see Poland, Slovakia and the Czech Republic), this imposed dramatic cutbacks on their plans. To some degree, this turned out to be a struggle over the meaning of accession to the EU itself. The Commission insisted that all EU members had to abide by common rules and expectations, including the provisions to stop surplus allocations forming an implicit subsidy. The majority of the new member states continue with legal challenges – but this has not stopped phase II from proceeding and most challenges are likely to peter out, perhaps with minor adjustments. The result all round is to set national aggregate allocations on a more "level playing field" across Europe than in phase I.

A pause for reflection: what makes the EU ETS different?

As the dust settles on phase II allocations and attention turns to the phase beyond, this is an opportune time to reflect what makes carbon and the EU ETS so different from trading schemes that have gone before and the policy implications of this.

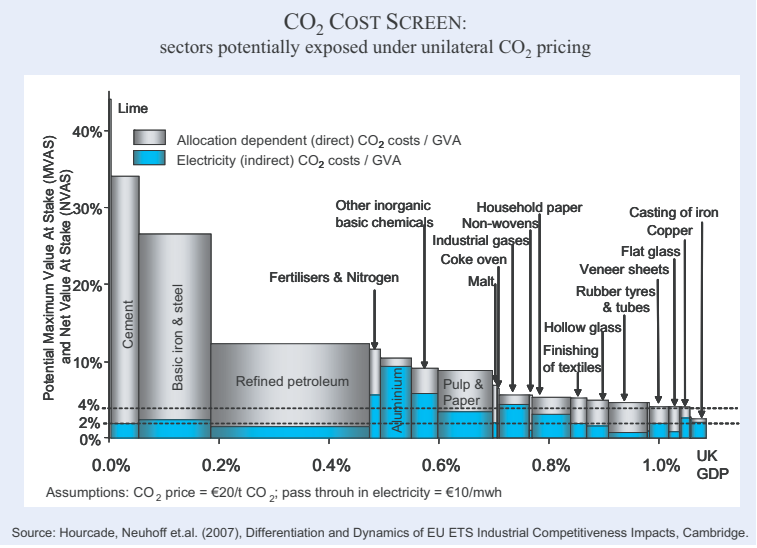
One factor is the sheer scale. The EU ETS is the biggest such scheme in the world by an order of magnitude. At allowances prices in the range of EUR 10–30/t CO_2, the value of allowances issued every year is EUR 20–60 billion, compared with the US's East Coast NOx trading programmes (EUR 1.1 billion) or SO_2 trading schemes (EUR 2.8–8.7 billion).[1]

The sheer scale of the EU ETS means that it could affect the costs of key industrial sectors more than any previous environmental policy – perhaps more than all the others put together. Yet part of the problem in the debate over the EU ETS is the tendency to make sweeping generalisations, not least about costs and competitiveness impacts. Figure 3 provides some context, by plotting the potential cost impacts of a EUR 20/tCO_2 price on the most carbon-intensive manufacturing activities, against the value-added of these activities, using the UK example. Cement and steel stand out; for no other significant activity do such carbon costs amount to much more than 10 percent of value-added *even if they had to pay in full*. Free allocation does much to protect cement, steel and a number of other sectors. Out of 159 activities in this study, only 20 – amounting to about 1 percent of value-added in the UK economy – face a full carbon cost impact exceeding 4 percent of their value-added.

This does not make the costs minor, but in terms of potential trade impacts with other regions of the world, it does set them in the context of other international differentials of raw materials, labour costs, interest rate impacts and exchange rate variations, for example.

[1] CO_2 – 2.2 billion tonnes annual emissions in phase I at EUR 10–30/tCO_2; SO_2 10 Mt at USD 270–850/t, NOx East Coast market, 640,000t at USD 2000/t.

Figure 3



Source: Hourcade, Neuhoff et.al. (2007), Differentiation and Dynamics of EU ETS Industrial Competitiveness Impacts, Cambridge.

Aside from the scale, many other features stand out, each of which differentiates the EU ETS from a "pure" market and raises important policy issues.

Small cutbacks and price instabilities

The economic scale, combined with the relative difficulty of reducing CO_2 emissions compared to many other pollutants, underlies the relatively small cutbacks observed. This is problematic particularly since both evidence and theory suggest that projection-based targets and allocations tend to be biased upwards.[2] Small cutbacks in the context of intrinsic uncertainty inevitably create price volatility, which carries a cost. Difficulties in predicting future allowance prices delay investment decisions. By waiting, a company can gain more knowledge about future CO_2 prices, and risk aversion may further reduce the inclination to invest, reflecting classic results of real options theory (e.g., Baldursson and von der Fehr 2004). Given relatively modest cutbacks in the face of large uncertainties, policies which can provide a greater degree of price stability in the EU ETS would be valuable.[3]

During the battles over allocation for phase II, many governments moved to increase the level of auctioning of allowances, with many now set to issue 5–10 percent of allowances through auctions during phase II. This offers a ready means to improve price stability and investor confidence, if governments set a reserve price. This would then act as a price floor (to the extent that the market needed access to the auction). To avoid competition between member states, they would have to agree the minimum price and basic auction rules. This would not conflict with the existing terms of the directive, remains an option available throughout phase II, and there are several familiar, readily available approaches to conducting such auctions (Hepburn et al. 2006).

The opposite concern is that prices might rise to levels deemed to pose an unacceptable risk to European industry (e.g., Bouttes, Leban and Trochet 2006). Assessment of the phase II supply-demand balance, and of the economics of competitiveness over the five-year period, suggests this is unlikely. It is, however, true that a planned response to any such eventuality would be better than a panic-based reaction such as occurred in the California NOx trading system, and a price cap or "safety valve" could allay such concerns. One option, should prices rise to levels of serious political concern, would be to relax current constraints on imports of emission credits from developing countries and perhaps expand the scope of emission credits that could qualify for compliance purposes.

Over-compensation and windfall profits

A related feature is the tendency towards "overcompensation". CO_2 costs raise production costs and the

[2] This is for three reasons. First, business, like the rest of humanity, tends towards optimism – no business sets out its store based upon pessimism, contraction, or projected failure; it is the aggregate market that suggests the above interpretation to some participants. Second, linking allocations to projected needs creates a huge incentive for businesses to inflate forecasts. Third, assumptions that cutting emissions would take time and capital underestimate the scope for some basic housekeeping measures: companies "don't know what they don't know" about mitigation possibilities until they find out. For evidence on emission forecast uncertainties and inflation, see Grubb and Ferrario (2006).

[3] Obviously industry is exposed to volatile prices for many other input factors, but if all producers use similar technologies, then they can pass on changes in input prices to product prices. In contrast, if two competing technologies, e.g., with different levels of energy efficiency, can be used to manufacture the same product, then cost differences that only affect one technology are more difficult to pass to the product price. Risk-averse investors then prefer the solution with lower capital costs – which is usually not the energy-efficient approach. Reducing uncertainty about post-2012 can thus accelerate investment in low-carbon technologies, reducing emissions and CO_2 allowance prices.

normal response is to raise product prices to compensate. Economically, free allocation amounts to an alternative way of compensating companies. If companies in competitive markets maximise profits by setting prices relative to marginal cost of production, these marginal costs now include opportunity costs of CO_2 allowances – in which case there is potential "double compensation", leading to windfall profits.

This has been most evident for the power sector (e.g., Sijm, Neuhoff and Chen 2006). In countries with liberalised power markets, generators have passed through most of the opportunity costs, as expected, with aggregate profits totalling billions of euros. There are notable exceptions, where the retail price levels are set by government contracts or regulation.[4] However, whilst consumers may welcome such protection from the real costs of CO_2, all these approaches create distortions that can undermine the incentives for CO_2 reductions.

In other sectors, price responses may be constrained by competition from outside Europe. This is not an "all or nothing" constraint: if firms maximise profits, they will still generally pass through much of the opportunity cost, making profits at the risk of some loss of market share (Smale et al. 2006). Granting free allocations is thus highly imperfect as a protection against foreign competition: companies still face the full costs in their marginal production decisions. In most products, the price rise required to recoup the net exposure alone is trivial (Carbon Trust 2004; Sato et al. 2006); the marginal cost incentive is to go beyond this, and end up both making profits from the system and losing some market share.

The more robust justification for free allocation is that it compensates existing assets for the impact of environmental regulation that was not foreseen at the time of construction. This interpretation would create clear criteria for the amount and basis for allocation and indicate that free allocation is part of a transitional process towards a strategic objective of fully internalising CO_2 costs.

Operational distortions

Free allocation can distort incentives. If installations cease to receive free allowances when they close, this creates a perverse incentive to keep inefficient facilities operational. The repeated negotiations of allocations for subsequent periods create additional challenges. Even beyond 2012, the need for flexibility to adapt to learning in both climate change science and mitigation may make it difficult to commit credibly to much longer allocation periods. The complications of international negotiations put further constraints on such commitments.

Many countries have allocated allowances in relation to historic CO_2 emissions. If companies expect a continuation of this approach, this undermines the incentive for companies to reduce emissions, since higher emissions in one period would be rewarded by greater allocations in the next. This is the "updating" or "early action" problem (Neuhoff, Keats and Sato 2006). In fact there is a "hierarchy" of potential distortions arising from repeated allocations. All distortions can be reduced if governments credibly commit to reducing in subsequent rounds the free allowance allocation related to historic data or existence of installation.

Note that these incentives apply to methodologies at *facility level*. Where countries separate aggregate emission allocations from the way they are distributed between facilities, the incentive effects need to be distinguished.

Investment distortions

Most governments set aside free "new entrant reserves", which economically amount to an investment subsidy. If the volume were unlimited, such subsidies might reduce the product price – which may be part of the aim, but is not actually achieved.[5]

Governments use NERs to help support new construction, but giving free allowances in proportion to the carbon intensity of new plants can bias the incentive towards more carbon-intensive investments (Neuhoff et al. 2006). When projected forwards, such distortions are amplified by the multi-period nature of the EU ETS.

[4] In these countries, domestic bills are not affected despite an increase in wholesale price levels, and the vertically integrated companies cross-subsidise their retail costs with the profits from the free allocation. In other countries, dominant power generators might anticipate government intervention and thus refrain from passing on CO_2 opportunity costs to wholesale price levels.
[5] The amounts available in most allocation plans are limited, and the response of new construction too slow. Moreover once operational, carbon-intensive new entrants face the same incentive as incumbents to factor-in opportunity costs of production.

Unlike existing facilities, where one aim of differentiated free allocation is to avoid stranded assets and reduce major revenue transfers between companies, there is no serious rationale for differentiating new entrant reserves. The ideal would be to abolish them altogether, so that zero carbon investments received the full value of their contribution towards decarbonisation. Politically the desire to attract new investment is, however, a strong driver, not only between EU and other regions, but between EU countries. Benchmarking new entrant reserves on the basis of capacity avoids the worst of distortions, but even this can be difficult unless all do the same. It is one of the clearest areas in which potential difficulties in allocation are exacerbated by the lack of harmonisation – if a sector in one country can plausibly argue that the methodology adopted in another is more favourable. We now consider this final characteristic of the EU ETS.

Devolution of allocation responsibilities

The final way in which the EU ETS differs from many other trading systems is in the devolution of allocation responsibilities, in this case to its 27 member states (now 30, including the EEA countries). This was an essential part of the deal that enabled the adoption of the directive: Member states would never have ceded to the European Commission the power to distribute valuable assets to their industries. Nor is the EU ETS unique in devolving powers of allocation: it is typical in a number of US systems. Moreover, there are different degrees of harmonisation, applicable to different aspects of the EU ETS, and the Commission can and does seek to increase the degree of harmonisation through guidance notes (del Rio Gonzales 2006).

Nevertheless, the devolution of allocation responsibilities does cause significant problems. The most notable area is with respect to new-entrant rules, where free allocation offers a *de facto* subsidy to new investments, raising the prospect of a "race to the bottom" as member states compete to attract investment. In practice, competition on broader aspects of the allocation method to incumbents is also problematic. Politics is largely comparative, and claims by one company or sector that it is being treated more severely than its neighbour can create powerful pressures to weaken allocations. Greater harmonisation over time, particularly for new-entrant rules and in the most heavily traded sectors, is likely.

Prospects for the future

Considering post-2012 design may appear to be premature, but is likely to be just as important as getting phase II right, given the timescales of new investments and the importance of expectations. Following a review in the latter half of 2007, early in 2008 the European Commission will publish proposals for the design of phase III. It will be the opening salvo in what is bound to be a major battle over the relationship between environment and industry in Europe, and between the member states and the EU's institutions.

The world will be watching. Negotiations on post-2012 quantified commitments in the framework of the Kyoto Protocol were launched by the Montreal Meeting of Parties in December 2005, but rapid progress is not expected, not least because of continued non-participation by the Bush Administration. Given the complexity of the issues, combined with the international political situation, a global agreement on post-2012 quantified reduction targets is unlikely before 2010. This is too late to be of much use in assisting efficient investment under the EU ETS: a credible EU commitment and structure to support EU low-carbon investment needs to be established well before then.

Credibility on post-2012 targets requires clarity and commitment to a design that *effective, efficient,* and both *economically* and *politically* sustainable. This appears achievable, but not easy. Future design needs to avoid the perverse economic incentives that can result from repeated free allowance allocations, and concerns around competitiveness and leakage must be addressed to allow the EU ETS to maintain higher prices over longer periods.

Economic analysis underlines that competitiveness is primarily a *strategic* issue, not an *immediate* one. Most participating sectors can expect to profit from the EU ETS: but those for which this involves significant price rises on internationally traded products may start to see erosion of exports, and/or import penetration into domestic markets if product price impacts are high enough and sustained (Demailly and Quirion 2006; Smale et al. 2006; Houcarde, Neuhoff et al. 2007). Similarly, decisions on the location of major investments by multinational companies will be based on strategic evaluation of the costs and benefits of locating in different regions over periods of decades (Houcarde, Neuhoff et al. 2007).

Indeed, phase II could be considered as a transitional period in which the profits accruing to several sectors as a result of free allocations could be used to build up investment in low-carbon technologies and associated expertise, enhancing their position for a carbon-constrained world.

The drive to reduce windfall profits, to reduce some of the perverse incentives around grandfathered allocations and strengthen the incentives for low carbon investment all point towards much greater use of auctioning in phase III. Particularly if this is combined with mechanisms for stabilising the price, the EU ETS will start to acquire more tax-like properties over time, moving in an evolutionary way towards what has always proved politically impossible in one step.

Conclusions

After five decades of struggle over European energy and environmental affairs, establishing a binding emissions cap with a free CO_2 trading market across the EU is no small achievement. It has secured unprecedented management attention devoted to cutting CO_2 emissions and led to a surge of emission reduction efforts both within Europe and in developing countries through its link with Kyoto's Clean Development Mechanism. The EU ETS carbon price is watched, in Europe and around the world, as perhaps the principal index of how seriously the world is starting to tackle the problem of climate change, and of the potential value of low carbon investments.

Phase I of the EU ETS already shows that carbon cap-and-trade is feasible and that the EU ETS has a sound basic market design. Companies traded across Europe, against a transparent market price reflecting perceptions about scarcity and the cost of abatement. The traumatic events of 2006 demonstrated that verification systems are sound and essential; that companies cut their emissions perhaps more easily than expected; and that the market could respond promptly to new information. The big lesson was on the need for better information and tougher allocation.

A second lesson is the need for an independent authority (for the EU ETS, the Commission) that can act as a "policeman" to ensure that allocations accord with agreed criteria. Indeed the events of 2006 lead much further than this. The Commission's political victory in the allocation struggle, introducing a formulaic approach to establishing acceptable volumes, represents a huge de facto step towards harmonising the allocation process in Europe, at least at the level of aggregate caps. The member states have only themselves to blame for this: left to their own devices they proved collectively unable to offer allocations that would have delivered a meaningful carbon market, leaving no choice other than to centralise the cap-setting process.

However the Commission would have been powerless without the broad criteria agreed in the directive, the basis upon which it made its interpretive decisions. In particular, the Kyoto targets were the essential legal tool that was wielded to ensure meaningful cutbacks. Not only was the Kyoto Protocol's existence essential impetus to creating the EU ETS, but its specific targets proved to be the decisive tool in the battle to establish meaningful, if still modest, allocation cutbacks for European industry.

Phase II thus has already benefited from the biggest lessons in phase I, but it will reveal many more issues that have yet to be tackled. Whilst a credible carbon price will change decisions so as to reduce operational emissions, for example in the dispatch of power stations, the striking limitation of the EU ETS as currently implemented is the weakness of its long-run incentives for lower carbon investments. The New Entrant Reserves intrinsically weaken this by subsidising carbon intensive investments, and the lack of post-2012 clarity further impedes those seeking finance for large, risky investments in low carbon solutions. These are some of the underlying issues that will have to be tackled forcefully for phase III.

Finally, managing the future allocation and international trade of increasingly valuable emission allowances will require stronger institutional foundations. Allocations designed to compensate sectors for average costs need far more sophisticated approaches than yet considered, which might have to be differentiated much more according to specific sectoral characteristics. Long-term credibility is crucial, yet greater sectoral differentiation of approaches could make it even harder to resist pressures to tweak allocations for short-term political convenience. Pressures to harmonise allocation methods across Europe will be challenged by both domestic circumstances, and the desire to expand internationally. Faced with these conflicting pressures, govern-

ments may need to learn from monetary policy, in which the need for credible commitments to tackle inflation led to the establishment of independent central banks with clear mandates, and ultimately the creation of the European Central Bank. Establishing a long-term, clear and credible foundation for managing the EU ETS and its diverse international linkages could require thinking of a similar order.

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Feed-in Tariffs and Quotas for Renewable Energy in Europe*

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Reinhard Haas**

Renewable electricity has increased significantly in recent years on a global scale and especially within Europe. A major reason for this development at the European level is the national support strategies triggered by Directive 2001/77/EC on renewable energies in the electricity sector (European Parliament and Council 2001), which set the renewable energy sources (RES-E) target of 21 percent at the EU-25 level for the year 2010 and specified corresponding targets for all 25 member states. All EU member states have introduced policies to support the market introduction of RES-E and most of them have started to improve the corresponding administrative framework conditions (e.g. planning procedures, grid connection) as well. The market diffusion of new renewable energy technologies has increased significantly over the last decade. The existing support instruments encompass feed-in tariffs (FITs), quota-based tradable green certificates (TGCs), investment grants, tender procedures and tax measures. Up to now, these policies have been implemented exclusively on a national level and aim to fulfil the national targets as set in the RES-E directive. However, based on the currently implemented policies, these targets will most likely not be met in the majority of countries, which indicates that RES-E support systems are still not designed in a suitable way.

* This assessment of the effectiveness and economic efficiency of support schemes for renewable electricity was conducted for the European Commission, DG TREN within the European research project OPTRES (www.optres.fhg.de). For a detailed discussion of the above illustrated topic we refer to Ragwitz et al. 2007.
The authors and the whole project consortium gratefully acknowledge the financial and intellectual support of this work provided by the Intelligent Energy for Europe – Programme. In particular, special thanks go to the project officers Beatriz Yordi, DG TREN, and Ulrike Nuscheler, IEEA.
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Evaluation of policy instruments for promoting renewable electricity from a historical perspective

Classification of policy instruments and development of RES-E policies in the EU

Within this study, the assessment of direct regulatory promotion strategies is carried out by focusing on a comparison between price-driven (e.g. FITs) and quantity-driven (e.g. quotas based on TGCs) strategies, which can be defined as follows:

Feed-in tariffs (FITs) are generation-based, price-driven incentives. The price that a utility or supplier or grid operator is legally obligated to pay for a unit of electricity from RES-E producers is determined by the system. Thus, a federal (or regional) government regulates the tariff rate. It usually takes the form of either a fixed amount of money paid for RES-E production, or an additional premium on top of the electricity market price paid to RES-E producers. Besides the level of the tariff, its guaranteed duration represents an important parameter when evaluating the actual financial incentive. FITs allow technology-specific promotion and acknowledge future cost-reductions by applying dynamically decreasing tariffs.

Quota obligations based on Tradable Green Certificates (TGCs) are generation-based, quantity-driven instruments. The government defines targets for RES-E deployment and obliges a particular party of the electricity supply-chain (e. g. generator, wholesaler or consumer) with their fulfilment. Once defined, a parallel market for renewable energy certificates is established and their price is set following

demand and supply conditions (forced by the obligation). Hence, for RES-E producers, financial support may arise from selling certificates in addition to the revenues from selling electricity on the power market. In principle, technology-specific promotion is also possible in TGC systems. But it should be noted that separate markets for different technologies will lead to much smaller and less liquid markets.

Figure 1 shows the evolution of the main support instrument for each country. Only 8 of the 15 countries regarded did not experience a major policy shift during the period 1997–2006. The current discussion within EU member states focuses on the comparison of two opposed systems, the FIT system and the quota regulation in combination with a TGC-market. The latter have replaced existing policy instruments in some European countries, such as Belgium, Italy, Sweden, the UK and Poland. Other policy instruments, such as tender schemes, are no longer used in any European country as the dominating policy scheme. However, there are instruments like production tax incentives and investment incentives which are frequently used as supplementary instruments. Only Finland and Malta apply them as their main support scheme.

Effectiveness of policy instruments

The effectiveness of a policy for renewable electricity is based on its ability to increase the generation of electrical power. The definition of effectiveness used in this analysis is given in the following equation:

$$E_n^i = \frac{G_n^i - G_{n-1}^i}{ADD - POT_n^i}$$

E_n^i	Effectiveness indicator for RES technology i for the year n
G_n^i	Existing normalised electricity generation by RES technology i in year n
$ADD - POT_n^i$	Additional generation potential of RES technology i in year n until 2020

This definition of effectiveness has the advantage of being unbiased with regard to the available potential for individual technologies in a specific country. Member states need to deploy RES-E capacities proportional to the given potential in order to demonstrate the comparable effectiveness of their instruments. This appears to be a meaningful approach since the member state targets, as determined in Directive 2001/77/EC, are also mainly based on the realisable generation potential of each country.

Figure 2 shows the average annual effectiveness indicator for wind onshore electricity generation for 1998–2005 for EU-15 countries. Several findings can be derived from these figures. Firstly, the three member states showing the highest effectiveness during the considered period – Demark, Germany, and Spain – applied fixed feed-in tariffs during the entire period 1998–2005 (with a relevant system change in Denmark in 2001). The resulting high investment security as well as low administrative barriers stimulated a strong and continuous growth in wind energy during the last decade. It is often claimed that the high level of the feed-in tariffs is the main driver for investments in wind energy, especially in Spain and Germany. However, as will be shown in the section below, the tariff level is not particularly high in these two countries compared with the other countries analysed here. This indicates that a long-term and stable policy environment is actually the key criterion for the

Figure 1

EVOLUTION OF THE MAIN POLICY SUPPORT SCHEMES IN EU-15 MEMBER STATES

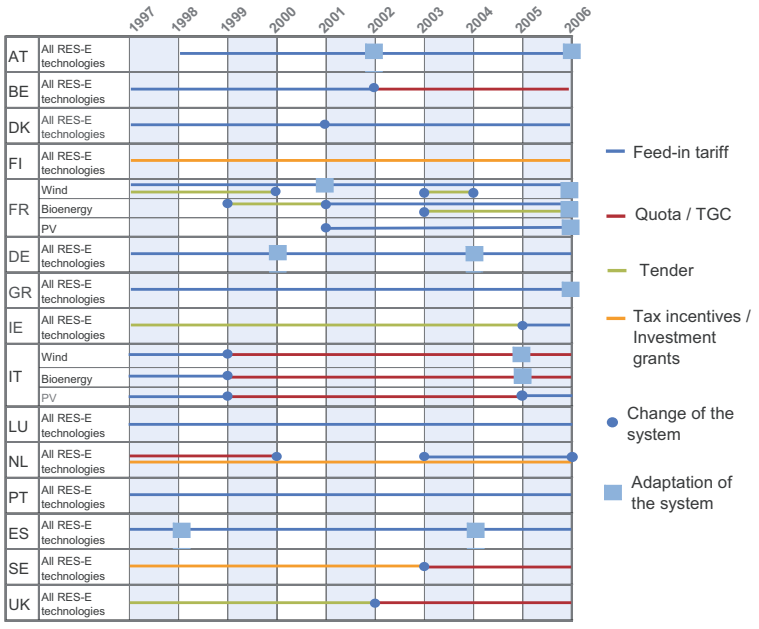
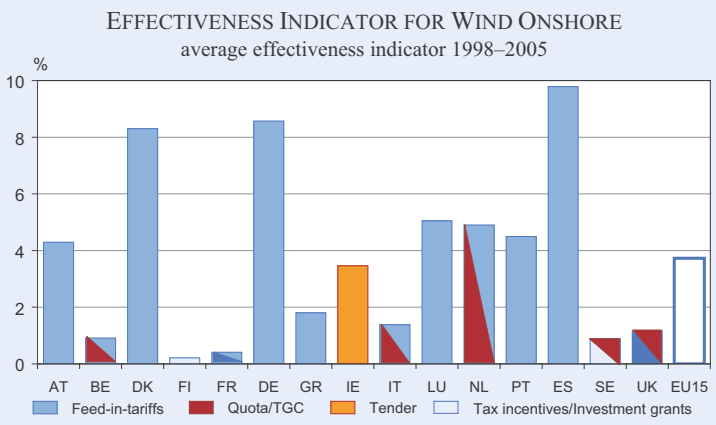


Figure 2



Note: This figure depicts the effectiveness indicator for wind onshore electricity in the period 1998 to 2005 in the EU-15 showing the relevant policy schemes during this period.

success of developing RES-E markets. As can be observed in a country like France, high administrative barriers can significantly hamper the development of wind energy even under a stable policy environment combined with reasonably high feed-in tariffs.

Economic efficiency from society's point-of-view

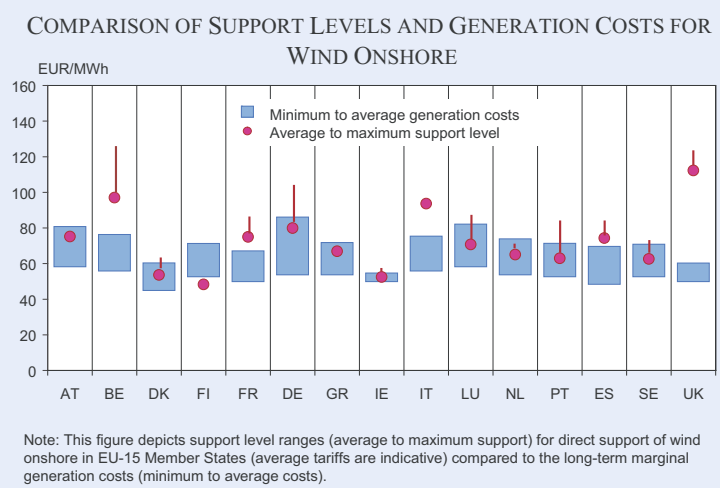
In order to analyse the economic efficiency of support from a historical perspective we compare the level of support in the case of wind energy onshore and the corresponding costs of electricity generation. Based on this definition the analysis shows (see Figure 3) that for many countries the support level and the generation costs are very close. Countries with costly potentials frequently show a higher support level. A clear deviation from this rule can be found in the three quota systems in Belgium, Italy and the UK, where support is presently significantly higher than the costs of generation. The reasons for the higher support level expressed by the current green certificate prices include still immature TGC markets, the non technology-specific design of the currently applied TGC-systems as well as the higher risk premium requested by investors. In the case of Spain and Germany, the support level indicated in Figure 3 appears to be above the average level of generation costs. However, the low cost potentials have already been exploited in these countries due to recent success in market growth. Therefore a level of support that is moderately higher than average costs seems to be reasonable.

Expected revenues and profits for investors

In order to correlate the effectiveness of an instrument with the efficiency of support as defined in the previous section, the levelised profit of potential wind energy investments was calculated for Austria, Belgium, the Czech Republic, France, Germany, Ireland, Italy, Lithuania, Spain, Sweden and the UK for the year 2004. Thus, calculations are based on the effective support conditions in each country during 2004.

By plotting the effectiveness versus the levelised profit as shown in Figure 4, the correlation between the levelised profit for investments and the level of effectiveness attained by the support instrument in the respective year is analysed.

Figure 3

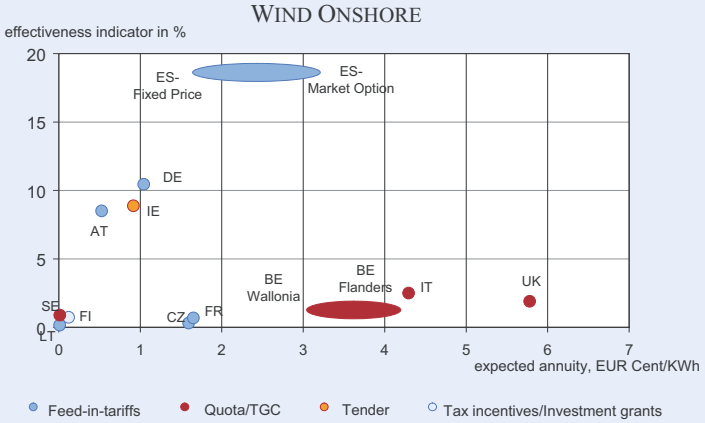


Note: This figure depicts support level ranges (average to maximum support) for direct support of wind onshore in EU-15 Member States (average tariffs are indicative) compared to the long-term marginal generation costs (minimum to average costs).

In Figure 4, the expected levelised profits as well as the effectiveness show a broad spectrum for the countries under consideration. It should be pointed out that the different instruments have different levels of maturity and that policy schemes in some countries – in particular quota obligation systems – are still in a transitional phase. It is striking that Italy, the UK and Belgium, which transformed their markets by introducing quota systems as the main support instrument

Figure 4

EFFECTIVENESS INDICATOR VERSUS LEVELISED PROFIT FOR WIND ONSHORE

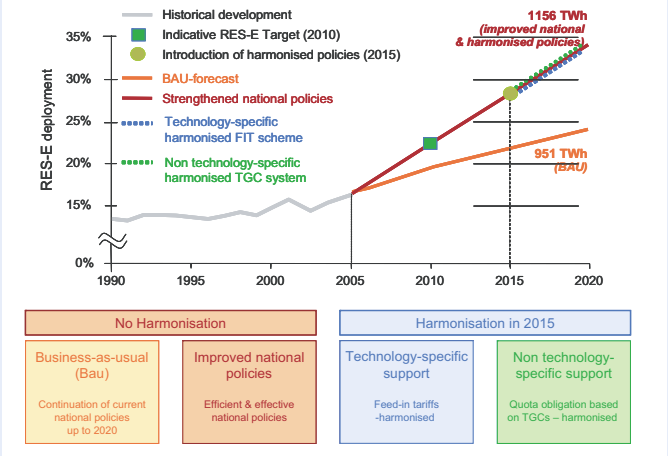


Note: This graph shows a possible levelised profit per unit of electricity generated by an investment in wind onshore in 2004.

between 1999 and 2002, are characterised by expected high levelised profits but low effectiveness. The high levelised profit results in particular from the extrapolation of the presently observed certificate prices. The results show that certificate systems lead to higher producer revenues than FITs, which compensate for high investment risks. Furthermore, the recent development of certificate prices does not show any decreasing tendency. On the other hand, countries with FITs seem to be typically more effective at generally moderate levelised profits per unit of electricity generated. The fact that expected profitability from the investor's perspective is significantly lower for FITs is directly linked with a higher efficiency of this strategy because additional costs for consumers are lower.

Figure 5

OVERVIEW OF INVESTIGATED CASES



Prospective analysis based on the model *Green-X*

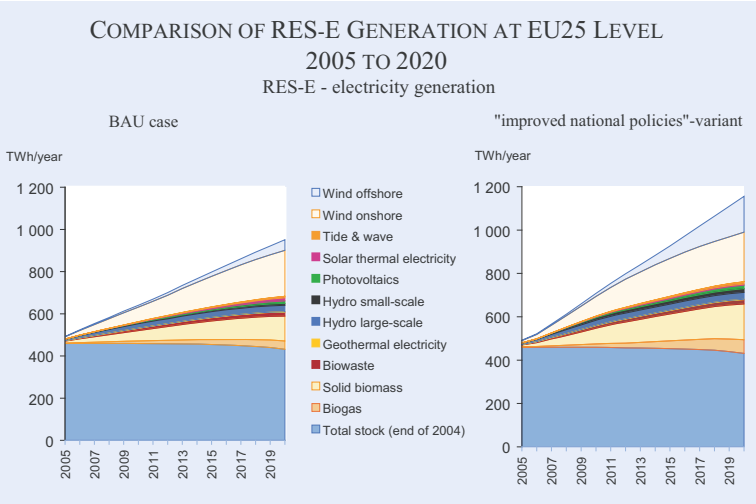
In this section we aim to signpost the way forward by presenting a prospective analysis of possible future RES-E support options at the European level. The effectiveness and efficiency of support schemes is based on the results obtained from simulation runs using the Green-X model (www.greenx.at). This tool enables us to make a comparative and quantitative analysis of the future deployment of RES up to 2020 in all energy sectors (i.e. electricity, heat and transport) based on applied energy policy strategies in a dynamic context. Geographically the assessment refers to the European Union as of 2006, comprising 25 member states (EU-25).

Figure 5 indicates the investigated scenario paths and the resulting RES-E deployment – comprising a business-as-usual (BAU) case based on a continuation of current national support schemes (BAU), a national improvement and a harmonisation of RES-E support at the European level based on either technology-specific support, i.e. a feed-in tariff system with technology-specific differentiated tariffs, or uniform support, i.e. a quota obligation based on TGCs commonly applied for all RES-E options.

Results with regard to non-harmonised conditions – BAU & improved national policies-scenario

In 2004 the total amount of RES-E generation within the EU-25 was around 460 TWh, corresponding to a share of about 15 percent of gross electricity demand. Without any changes to the current support schemes of the various member states, RES-E would achieve a demand share of 18.2 percent in 2010 at EU-25 level. If RES-E support is accompanied by energy efficiency measures as assumed for a sensitivity variant to the BAU case, a higher

Figure 6



demand share of 18.8 percent is feasible in 2010. By 2020, these differences will become more apparent: a share of 23.6 percent is projected for the default BAU case, whilst deployment in relative terms is 27 percent for BAU with accompanying DSM.

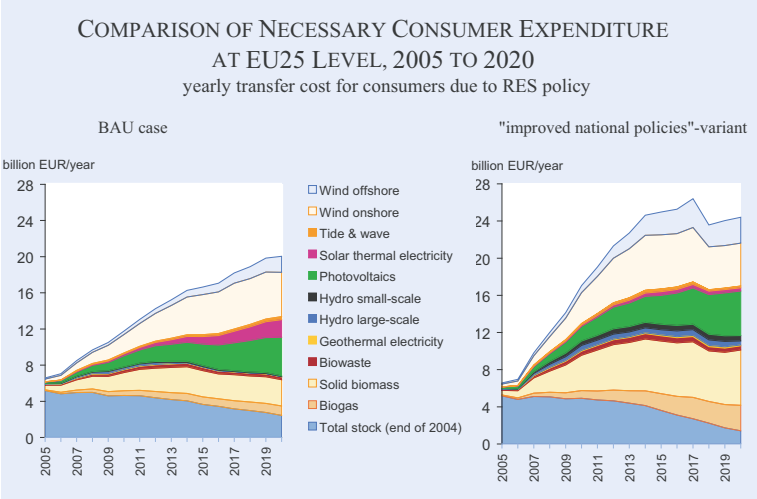
In contrast, it would be feasible to meet the European target as set by the RES-E Directive by improving the support conditions for RES-E rigorously and immediately in all EU countries, including a removal of non-financial deficiencies and the implementation of energy efficiency measures. In the "improved national policies" case, a RES-E share of 20.9 percent is reached in 2010, rising to 34.1 percent in 2020.

The dynamic development of RES-E generation in both cases is depicted in absolute terms at the EU-25 level in Figure 6. This graph illustrates the technology-specific deployment for new RES-E plants and shows the total RES-E stock (indicated by the blue area) comprising all plants installed up to the end of 2004. If currently implemented RES-E policies are maintained, as assumed in the BAU case, the total amount of RES-E generation will increase from 460 TWh in 2004 to about 951 TWh in 2020. This 2020 figure comprises almost equal contributions of new RES-E installations (from 2005 to 2020) in the order of 520 TWh (55 percent of total RES-E) and the stock of existing RES-E plants installed prior to 2005, which account for 431 TWh (equal to a share of 45 percent in total RES-E generation) by 2020 in the BAU case. "Improved national policies" will induce a much higher deployment of new RES-E in the investigated period: by 2020 this will amount to 725 TWh from new RES-E plants installed between 2005 and 2020, corresponding to 63 percent of the total RES-E generation of 1156 TWh.

Figure 7 illustrates the required consumer expenditure for both cases investigated at the EU-25 level due to the underlying national RES-E policies and the corresponding induced RES-E deployment. In this context, the consumer / societal expenditure due to the support for RES-E represents a net value based on the direct costs of applying a certain support scheme. This figure also illustrates both the technology-specific shares of new RES-E plants and the expenditures associated with the stock of existing RES-E plants (indicated by the blue area).

The required consumer expenditures will increase steadily over the next ten years with BAU. In relative terms, expressing the expenditures as a premium per MWh total demand, these are projected to rise from a level of 2.1 EUR/MWh$_{DEMAND}$ in 2005 up to about 5.0 EUR/MWh$_{DEMAND}$ in the final years 2019 and 2020. Obviously, within the "improved national poli-

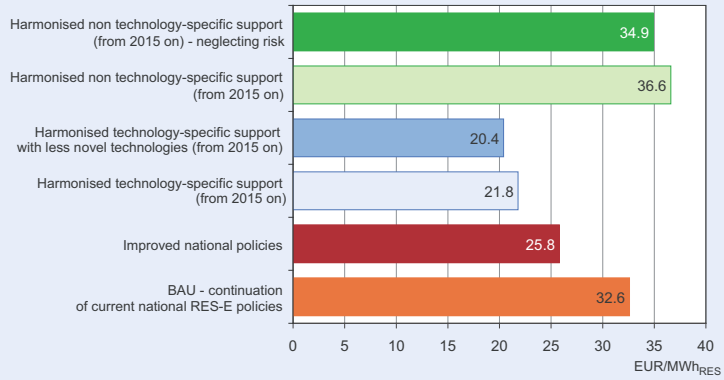
Figure 7



cies" variant, characterised by a 40 percent higher RES-E deployment in the investigated period 2005 to 2020, even greater financial support is required to achieve the ambitious RES-E target set for 2010. Accordingly, a steeper increase in expenditure in the period up to 2017 occurs, culminating in a peak at 7.7 EUR/MWh$_{DEMAND}$ in 2017.

Figure 8

COMPARISON OF NECESSARY CUMULATED CONSUMER EXPENDITURE FOR NEW RES-E



Note: This depiction shows the necessary cumulated consumer expenditure (i.e. the cumulated present value (2005) of yearly transfer cost) due to the support of new RES-E (installed 2005 to 2020), expressed per MWh induced RES-E generation for the investigated cases.

Harmonisation: Technology-specific versus uniform support

Besides the above discussed national support options (i.e. BAU and "Improved national policies") the following policy options at the European level are investigated below:

- *Harmonisation of support based on a uniform (non technology-specific) support scheme,* i.e. a quota obligation based on TGCs commonly applied for all RES-E options.
- *Harmonisation of support based on a technology specific support scheme,* i.e. a feed-in tariff system with technology-specific differentiated tariffs.

In addition, a further variant of each harmonised RES support case is also taken into consideration. Thereby, in case of technology-specific support it is assumed that the support is limited to less novel RES-E technologies, whilst in the case of non-technology-specific support the variant refers to the negligence of the investor's risk (as commonly associated with uncertain earnings in the TGC market).

One target is assumed for future RES-E deployment in 2020 in all cases based on harmonised support in order to be able to compare the economic efficiency of the different policy options – i.e. it is assumed that about 1156 TWh have to be generated by RES-E at the EU-25 level by 2020, similar to the "improved national policies" case. Note that regarding harmonised support options a transition period is taken into account. Accordingly, new and improved harmonised policies offering equal financial incentives throughout Europe are then applied to new RES-E installations from 2015 onwards.

A comparison of the cumulated consumer expenditure for new RES-E installations – i.e. the total transfer costs due to the promotion of new installations in the observed period 2005 to 2020 as well as the residual costs after 2020 – is shown in Figure 8 for the investigated cases. This figure illustrates both the cost-efficiency and the effectiveness of RES-E support options, expressing the cumulated consumer expenditures in specific terms, i.e. per MWh induced RES-E generation. The following conclusions are drawn from this diagram:

- The cumulated transfer costs for consumers are lowest when applying technology-specific support harmonised throughout Europe achieved by applying feed-in tariffs. There are marginal differences between the two variants, i.e. by considering or neglecting novel RES-E options.
- Improved national policies with a similar deployment of new RES-E result in slightly higher specific costs corresponding to an increase of +18 percent compared to the technology-specific support provided within a harmonised scheme (including novel RES-E options).
- Higher specific costs can be expected from continuing current RES-E support. With BAU, the specific costs are 49 percent higher compared to harmonised technology-specific support. It is worth mentioning that the overall deployment of new RES-E is 29 percent lower with BAU than with all other policy options.
- The most inefficient policy option in terms of costs is harmonised, but non technology-specific support as provided by a uniform EU-wide TGC system, which results in much higher consumer expenditures ranging from + 60 to + 68 percent compared to its technology-specific coun-

terpart incl. novel RES-E options – depending whether the investor's risk is neglected or taken into account.

Conclusions

The empirical findings presented in this paper show that instruments which have proven to be effective also tend to be economically efficient. Feed-in systems, which are implemented in the majority of EU member states, have initiated significant growth of renewable energy generation at moderate costs for society. The main reason for this observation is the long-term price security of the system combined with technology diversification of support. Compared to short-term trading in renewable certificate markets, the intrinsic stability of feed-in systems appears to be a key element for success.

The key criterion for achieving an enhanced future deployment of RES-E in an effective and efficient manner, besides the continuity and long-term stability of any implemented policy, is the technology specification of the necessary support. Concentrating on only the currently most cost-competitive technologies would exclude the more innovative technologies needed in the long run. Furthermore, it would not be possible to achieve any moderate to ambitious RES-E target without considering these novel RES-E options. In other words technology neutrality may be cost-efficient in the short term but is more expensive in the long term.

Even in the short term, the producer profits involved in the promotion of RES-E as well as observable cost differences among cheap to moderate RES-E options suggest a diversification of support. Most of the European success stories of promoting RES-E over the past decades in an effective and economically efficient way were driven by feed-in tariffs, which are implemented in a technology-specific manner.

The results of the modelling exercise clearly indicate that the major part of possible efficiency gains can already be exploited by optimising RES-E support measures at the national level – about two thirds of the overall cost reduction potential can be attributed to optimising national support schemes. Further efficiency improvements at a considerably lower level (about one third of the overall cost reduction potential) are possible through an EU wide harmonisation of the support schemes provided that technology-specific support is implemented. In contrast, if harmonisation meant putting all the RES-E options in one basket and giving equal support to all the RES-E technologies considered, then the accompanying consumer expenditures would increase significantly if the RES-E target is ambitious. Consequently, a harmonised non technology-specific support would decrease efficiency of support.

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Box

Climate Change: Impacts, Adaptation and Vulnerability

The report from Working Group II of the Intergovernmental Panel on Climate Change (IPCC) is the second of three working group parts of the Fourth Assessment Report. It describes current scientific understanding of the impacts of climate change on natural, managed and human systems, the capacity of these systems to adapt and their vulnerability. In the following a short summary of this report is given.

Climate change today: observed impacts and vulnerabilities

Observations from all continents and in most oceans show that many natural systems are being affected by regional climate changes, particularly temperature increases:

- *Physical systems*: Global ice melt leads to enlargement and increased numbers of glacial lakes, with increased risk of outburst floods. There is increasing ground instability due to thawing in permafrost regions, and a growing risk of rock avalanches in mountain regions. There is an increased run-off and earlier spring peak discharge in many glacier- and snow-fed rivers. Lakes and rivers in many regions are warming, with effects on thermal structure and water quality.
- *Biological systems*: Spring events – such as leaf unfolding, bird migration, egg-laying – are occurring earlier. Ranges of plant and animal species are shifting polewards at the global level and upwards at local levels. Arctic and Antarctic flora and fauna are changing, which leads to far-reaching disruptions of the food chain.

The *anthropogenic component of warming* over the last three decades has had a discernible influence on many physical and biological systems. Over 89 percent of the more than 29,000 data series from different locations document changes in the direction expected as a response to warming.

Evidence of effects from regional increases in temperature on managed and human systems include the following:

- *Agriculture and forestry*: Effects on management at higher latitudes in the Northern Hemisphere, such as earlier spring planting of crops, alterations in disturbance regimes of forests due to fires and pests,
- *Health*: Increased mortality in Europe and Asia during prolonged heat waves, changed distribution and infectious potential in some regions of infectious disease vectors, such as mosquitoes and ticks, increase of allergenic pollens in Northern Hemisphere high and mid-latitudes,
- *Human activities*: Aspects of indigenous livelihoods in the Arctic, such as hunting and travel over snow and ice. Winter sports in lower-elevation alpine areas are adversely affected.

Future climate change: estimated impacts and vulnerabilities

Assuming that climate change will not be mitigated and that adaptive capacity is not enhanced through resolute action, for the 21st century scientists expect far-reaching key impacts for different systems and sectors which will be relevant for humans and the environment alike. For the first time, the IPCC has evaluated climate impacts in relation to expected future temperature increases. Examples of the impacts of a further increase in the global mean temperature (as compared to 1980–99) follow:

- Global mean temperature changes *of up to 1.5°C* would exacerbate current key vulnerabilities and cause others, such as negative health effects caused by heat waves, floods an droughts, as well as malnutrition and infectious diseases, millions more people exposed to increased water stress, increased damage from storms and floods and increased coral bleaching.
- Global mean temperature changes *of 1.5 to 3.5°C* would result in an increasing number of key impacts at all scales, such as many million more people at risk from coastal flooding, widespread loss of biodiversity, and commitment to widespread deglaciation of the Greenland and West Antarctic ice sheets with associated sea level rise.
- Global mean temperature changes *greater than 3.5°C* would exceed the capacity of all systems – physical, biological and social, in particular of human societies – to adapt to this extent of warming, especially since it can be even more pronounced regionally. As examples, about 30 percent loss of global coastal wetlands and widespread mortality of corals.

Some *systems* will experience particularly severe impacts: Ecosystems such as tundra, boreal forests, alpine and Mediterranean ecosystems, mangroves, coral reefs; low-lying coasts, water resources in middle and dry low-latitude countries, agriculture in low-latitude regions, human health.

Regions that will be particularly affected are, for example, the Arctic, Africa, especially southern Africa, small islands and Asian mega-deltas, such as the Ganges-Brahmaputra and the Zhujiang.

Specifically, scientists expect the following impacts of climate change for individual climate-sensitive systems and sectors:

- *Water*: There is high confidence[a)] that runoff and availability will increase at high latitudes and in some wet tropical areas, whereas they will decrease over some dry regions at mid-latitudes and in dry tropical areas, in some of which water is already scarce. Water volumes stored in glaciers and snow cover will decrease and, with them, water availability in regions that are currently home to more than one billion people (one sixth of the world's population).
- *Ecosystems*: There is high confidence that the resilience of many ecosystems will be exceeded in the 21st century due to an unprecedented combination of climate change and associated disturbances (e.g. flooding, drought, wildfire, insects, ocean acidification) and other global change drivers, such as land use change, pollution and over-exploitation of resources. If the global mean temperature increases by more than 2 to 3°C above pre-industrial levels, it is expected that the functioning of some ecosystems will be impeded to such an extent that negative impacts on the products and services that they provide, e.g. water and food supply, are to be expected. Roughly 20–30 percent of plant and animal species (assessed so far) are expected to be at increased risk of extinction if global temperature exceeds 2 to 3°C above pre-industrial levels. Coral reefs are vulnerable to thermal stress and to progressive acidification of the oceans and have low adaptive capacity. Coastal wetlands, such as salt marshes and mangroves, will be negatively affected by sea level rise.
- *Food*: In temperate regions, increases in local mean temperature of up to 1.5 to 3.5°C above pre-industrial levels can have small beneficial impacts on crop yields, which subside in some regions if the temperature increase is greater. At lower latitudes, even moderate temperature increases are projected to have negative impacts on crop productivity, and increased droughts and floods will compromise agriculture especially in subsistence sectors.
- *Industry, settlement, society*: The costs and benefits of climate change will vary widely by location and scale. Some of the effects in temperate and polar regions will be positive and others elsewhere will be negative. In the aggregate, however, net effects will tend to be more negative the larger or more rapid the change in climate. The most vulnerable industries, settlements and societies are generally those in coastal and river flood plains, i.e. those whose economies are closely linked to climate-sensitive resources. Poor communities are especially vulnerable, in particular those concentrated in high-risk areas. They tend to have more limited coping capacities and are more dependent on climate-sensitive resources such as local water and food supplies. Many million more people are projected to be at risk from coastal flooding due to

sea-level rise during the 2080s, especially in densely populated and low-lying areas where adaptive capacity is relatively low and which already face other challenges such as tropical storms or local coastal subsidence. The numbers affected will be largest in the mega-deltas of Asia and Africa while small islands are especially vulnerable.

- *Health*: Researchers consider that the health status of millions of people will be affected by global warming, particularly in regions with low adaptive capacity. In these regions, malnutrition will increase, leading to negative impacts on the growth and development of children. Generally, more deaths, diseases and injuries are expected due to heat waves, floods, storms, fires and droughts. Cardio-respiratory diseases will increase due to higher concentrations of ground level ozone but some mixed effects are also expected, for example, the decrease or increase of the range and transmission potential of malaria in Africa.

Global warming: impacts on Europe

For the first time, wide ranging impacts of changes in current climate have been documented: retreating glaciers, longer growing seasons, shift of species' ranges, and health impacts due to a heat wave of unprecedented magnitude. The observed changes are consistent with those projected for future climate change.

In an *overall balance* for Europe, nearly all regions will be negatively affected by some future impacts of climate change and these will pose challenges to many economic sectors. Climate change is expected to magnify regional differences in Europe's natural resources, e.g. water availability.

- In *Northern Europe*, climate change is initially projected to bring mixed effects including some benefits for small changes in temperature: Reduced demand for heating, increased crop yields, increased forest growth. However, as climate change continues, its negative impacts (more frequent winter floods, endangered ecosystems, increasing ground instability) will outweigh any benefits.
- In *Central and Eastern Europe*, summer precipitation is projected to decrease causing higher water stress. Health risks due to heat waves are projected to increase. Forest productivity will decline and the frequency of peatland fires will increase.
- In *Southern Europe*, climate change is projected to worsen conditions (high temperatures and drought) in a region already vulnerable to climate variability: increased risk to health due to heat waves, more wildfires, reduced water availability and hydropower potential and lower crop yields.

Further impacts:

- *Flooding* will increase as a result of increased ice and snow melt, flash floods will become more frequent throughout Europe, winter floods and flooding will become more frequent in coastal areas and erosion will increase.
- *Health risks* (heat waves, flooding, diseases) will increase without adaptation measures.
- *Biological diversity* will change dramatically, especially in alpine communities, as the great majority of organisms and ecosystems will have difficulties adapting.
- The challenges for many *sectors of industry* (agriculture and forestry, tourism, energy production) will grow.
- The region has substantial *adaptive capacity* but there are considerable constraints to implementation and major challenges from changes in extreme events.

Responses: Adaptation and climate protection measures

The IPCC scientists expect the impacts of climate change to intensify in line with the rise in the average global temperature. As the temperature rises, the adaptive capacity decreases and adaptation costs increase. The limits of adaptation and its concrete costs remain unclear because effective instruments are highly dependent on specific geographical climate risk factors as well as on the policy environment. Researchers consider the following fundamental assumptions to be likely:

- Unmitigated climate change is, in the long term, likely to exceed the adaptive capacity of natural, managed and human systems. The impacts will vary from region to region. Calculated globally they will cause high costs, and these costs will increase more and more over time as global temperatures increase, outweighing possible benefits of climate change. Net effects are more likely to be strongly negative with greater or more rapid warming.
- A number of impacts, in particular those projected beyond 2020, can be delayed or reduced by decreasing the release of climate-damaging gases. The earlier and more ambitious emission reductions are the higher the probability that the impacts of climate change will be milder.
- Adaptation will be necessary to address impacts resulting from the warming that is already unavoidable due to past emissions.
- Further adaptation measures are crucial in order to reduce the vulnerability of physical, biological and human systems to future climate change, but there are barriers, limits and costs involved. The risk-reducing potential is either very limited or very costly for some key vulnerabilities, such as loss of biodiversity, melting of mountain glaciers or disintegration of major ice sheets.
- Vulnerability to climate change is exacerbated by environmental pollution and poverty. It is also dependent on the development path of a society.
- Sustainable development can reduce vulnerability to climate change by strengthening the adaptive and regenerative capacity of ecosystems.

The IPCC scientists point out that the *array of potential adaptive responses* available is very large, ranging from purely technological (e.g., sea defences), through behavioural (e.g., altered food and recreational choices) to managerial (e.g., altered farming practices) and policy decisions (e.g., planning regulations, emission reduction targets). Yet there remain formidable environmental, economic, informational, social, attitudinal and behavioural barriers to the implementation of adaptation measures.

[a)] The following terms have been used to express confidence in a statement: *Very high confidence*: At least a 9 out of 10 chance of being correct. *High confidence*: About an 8 out of 10 chance. *Medium confidence*: About a 5 out of 10 chance. *Low confidence*: About a 2 out of 10 chance. *Very low confidence:* Less than a 1 out of 10 chance.

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Sector-specific Regulation: Transitory or ad infinitum? An International Status Report on Regulatory Institutions*

Hans Schedl**

Initial needs of sector specific regulation

In the process of privatising public monopolies, the EU Commission is pursuing policy reforms that are advancing both the standardisation of institutional and regulatory frameworks and the creation of competition-oriented European utility markets. Existing monopolies have to be dissolved as a precondition to opening up the markets. From the 1980s onwards numerous reforms have been instigated in the conviction that competition would lead to an improvement in service offerings in terms of both price and technology. The international telecommunications industry has been affected by these reforms from the very beginning.

The transition from a monopoly market to a competitive market in telecommunications has been fraught with problems:

- The former monopolist (incumbent) owned all essential rights – e.g., the access to the customer through the local loop. The introduction of competition was thus connected with interventions in property rights.
- The dominance of the incumbent would have allowed for various abuses of market power – be it through pricing strategies or the specification of technical requirements.
- Investments in this market are asset specific, i.e., they cannot be used otherwise. New competitors will only consider the risk of sunk cost if framework conditions for an investment are promising.
- Networks are characterised by significant externalities. The utility of a communication network depends on the number of accessible subscribers. At the moment of liberalisation all subscribers were still in the incumbent's network. Competitors only had a chance if they were granted access to this network.
- Significant asymmetries existed regarding the information of market participants. Bilateral contracts would probably have been incomplete, pricing agreements problematic.
- Telecommunication services imply non-economic objectives like universal service and the consideration of social interest.

These initial problems could not be solved by the application of general competition law, which is typically applied after a detection of abuse (ex post); they require sector specific "ex ante" regulation.

To solve these problems, independent regulatory authorities with the power to enact sector-specific regulations were set up in most countries for the purpose of overseeing the transition. In the Interconnection Directive, European authorities specified that sector-specific regulation would be a transitional measure: "When effective competition is achieved in the market the competition rules of the Treaty will in principle be sufficient to monitor fair competition ex-post."[1] In response to repeated allegations of excessive bureaucracy, the European Commission stressed in 1999 that they were working to create a regulatory regime "which can be rolled back as competition strengthens, with the ultimate objective of controlling market power through the application of Community competition law."[2] The current 2006 review of the telecommunications regulatory framework also adheres to the transitory character of regulation: "The regulatory regime is designed to phase out regulation progressively as effective competition is established."[3]

New developments and problems

In the meantime, general economic conditions have changed drastically from the initial situation at the end of the 1990s: intense competition in all telecom-

* In a prior study at the beginning of the European liberalisation process, the Ifo Institute analysed the organisation of selected regulatory authorities: The Ifo Institute and the Centre for European Integration Research published an initial study comparing the legal framework of regulation of telecommunications markets (*Liberalisierung der Telekommunikationsordnungen – Ein Rechtsvergleich* 2000). This report continues the earlier work and includes an international comparison of regulatory institutions. The complete study is available in German. The Ifo Institute is grateful to Deutsche Telekom AG for providing initial financing for this study.
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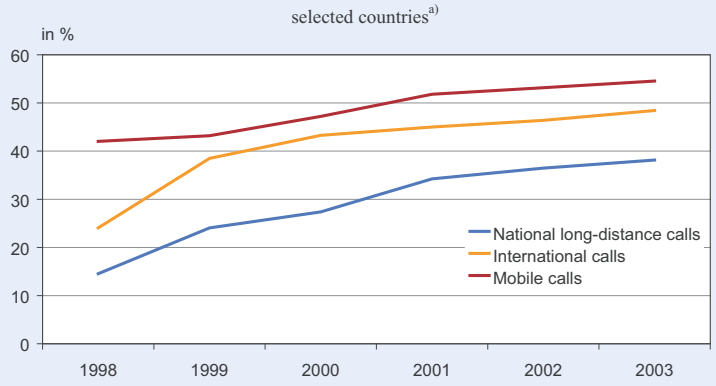
[1] 97/33/EC, Recital 25.
[2] COM (1999) 539 final, Section 4.7 (Specific Competition Issues).
[3] See COM (2006).

Figure 1

AVERAGE DEVELOPMENT OF MARKET SHARES OF NEW ENTRANTS
selected countries[a)]



a) Australia, Germany, Finland, France, the UK, Italy, the Netherlands, Sweden, Switzerland and Spain.
Source: OECD, Communications Outlook, (2005).

munication markets, rapid technological development with ever-shorter innovation cycles and amended laws now characterise the decision-making environment of national regulatory authorities. International markets have been marked by falling prices, an increasing number of competitors and the loss of market share by the former monopolist (incumbent; Figure 1).

New technologies (e.g., Next Generation Networks, IP, VDSL) are providing additional fuel for far-reaching changes in electronic communications. International analysts and market observers like Goldman Sachs predict that this trend will continue undiminished over the next few years, leading to additional business losses for the incumbents (Figure 2).

The influence of changing markets and increasing competition in telecommunications on the institutional structure of these authorities[4] are analysed in this article. The question arises as to whether these extremely dynamic and innovative processes in the telecommunications sector were accompanied by institutional adjustments of national regulatory authorities – adjustments that will eventually lead to market supervision by general competition authorities. The underlying study (Schedl and Sülzle 2007) explored that question empirically as part of a review of institutions in eleven countries (Australia, Germany, Finland, France, the UK, Italy, the Netherlands, Sweden, Switzerland, Spain and Hungary). It provides an overview of the current state of structures of international regulatory institutions for telecommunications markets against the background of competitive situation. The study examines the character of regulation and observable successes, e.g. the increasing number of competitors, market shares and falling prices. At the same time, it identifies new problem areas apparent in the regulated telecommunications sector: falling investment and lagging innovation in network infrastructure.

More than eighty annual reports were analysed for the study. Regulation experts were interviewed by telephone: employees of the regulatory authorities and ministries, as well as independent researchers well versed in matters of regulation. The interviews were based on a guideline developed by the Ifo Institute.

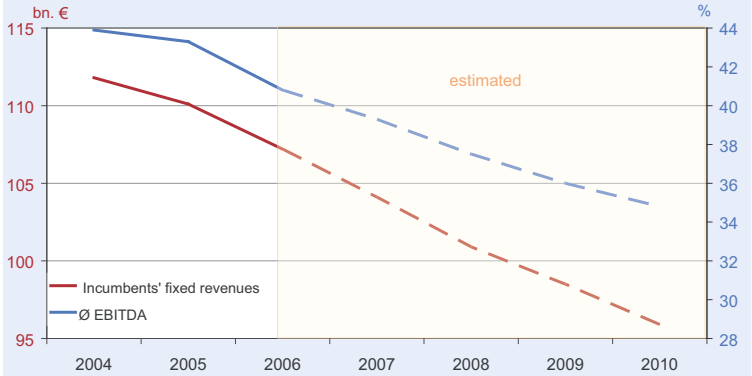
National regulatory agencies

Regulatory tasks

Among the eleven selected countries five different structures regarding regulatory tasks can be discerned (Table 1):

Figure 2

ESTIMATED DEVELOPMENT OF REVENUES AND EBITDA OF SIX EUROPEAN INCUMBENTS[a)] IN THE NATIONAL FIXED NETWORK



a) British Telecom, Deutsche Telekom, France Telecom, KPN, Telecom Italia, Telefónica.
Source: Goldman Sachs, European Telecoms, (2007), Credit Outlook.

[4] These authorities often have other, statistically inseparable, tasks.

Table 1

Regulatory tasks

	Telecommunication		Post	Broadcasting			Energy	Rail
	Fixed	Mobile		Frequencies	Competition	Content		
Australia	(X)*	(X)*		X	X	X		
UK	X	X		X	X	X		
Switzerland	X	X		X	X	X		
Italy	X	X		X	X	X		
Finland	X	X	X	X	X			
Netherlands	X	X	X	X				
France	X	X	X					
Sweden	X	X	X					
Hungary	X	X	X					
Germany	X	X	X				X	X
Spain	X	(X)**						

(X)* = Price- and access regulation in the competency of the competition authority; (X)** = not yet founded.

Source: Country reports of the NRAs.

- Telecommunication and broadcasting regulation exists in Australia, Italy, Switzerland and the UK.
- Telecommunication and postal regulation is practised in France, Sweden and Hungary.
- Finland and the Netherlands have a mixed form of these models with reduced regulation of broadcasting.
- In Germany energy and rail regulation have been added to the tasks of telecommunication and postal regulation.
- Regulation in Spain is limited to the fixed network.

During the last ten years there have been several task extensions: the merger of broadcasting and radio communication with telecommunication regulation in the UK (2003) and Australia (2005), the inclusion of postal regulation in France (2005) and of energy and rail regulation in Germany (2006).

Modifications were made as a result of increasing obligations for the review of EU member states regarding market analysis and the examination of significant market power. Organisational modifications and extensions make it difficult to compare telecommunication regulations. They have led to significant increases in employment.

Employment

The size and development of employment in national regulatory agencies differ considerably. Roughly three types of size can be discerned (Table 2):

- Agencies with very high employment in Germany and the UK.
- Those with employment figures between 300 and 500 (Switzerland, Netherlands, Australia and Hungary) and
- Agencies with comparably low employment (Sweden, Italy, Finland, France and Spain).

These figures may, in several cases, be misleading as some employees with regulatory influence have remained in ministries (e.g. in France, Italy or Spain).

The growth rates indicate a largely increasing trend in employment. A clear decrease was only evident for Germany, which, in our opinion, is linked to posts marked for no replacement due to the size of the

Table 2

Number of employees (2005) and their growth (1999–2005)

	Employment				Growth in per cent
	100–250	300–500	>500	>2,000	
Germany				2,358	–9.4
UK			776		+297.9
Switzerland		441			+6.5
Netherlands		433			+7.2
Australia		417			n.a.
Hungary		311			n.a.
Sweden	250				n.a.
Italy	240				+238.0
Finland	232				+20.2
France	168				+20.0
Spain	142				+25.7

Source: Country reports and OECD DSTI/ICCP/TISP(2005)6/FINAL.

Table 3

Institutionalised advisory boards

Orientation	Policy				Other	User			
	1	2	3	4		4	3	2	1
Australia						X	X	X	X
UK						X	X	X	X
Italy					X				X
France	X	X	X						X
Germany	X				X				
Spain					X				
Switzerland									
Finland									
Netherlands									
Sweden									
Hungary									

1, 2, 3, 4 = Number of boards. – X = Institutionalised boards.

Source: Country reports and NRA reports.

agency. For three countries growth rates could not be calculated.

Advisory boards

Organisation charts reflect, as expected, flat structures for most of the smaller agencies – an exception is the French agency. Typically, mid-sized and large agencies additionally resort to institutionalised external advisory boards. These boards provide additional expert knowledge and contribute to stabilising the institution (Table 3).

Financing

With respect to financing, the agencies can be grouped into roughly three categories. Agencies with

- Nearly complete funding provided by contributions and charges passed on to the industry: Finland, Germany, Hungary, Netherlands (OPTA) and Spain.
- Mixed funding provided by industry fees and appropriation: Italy, Netherlands (AT), Sweden, Switzerland and UK.
- Nearly complete funding provided by appropriation: Australia and France.

Measurement problems

The data collection revealed several problems in measuring telecommunication regulation. Observable were

- *Imprecise measurements:* The merger of parts of the Federal Post Ministry and the Agency of Post and Telecommunication as the national regulator in Germany resulted, compared internationally, in the creation of a large institution (about 2,500 employees). Only about 300 persons are actually involved in telecommunication regulation.
- *Other organisations that influence regulation:* In several countries ministerial departments with an influence on regulation continue to exist (e.g. France, Italy, Netherlands, Spain). In Australia the tasks of price and access control are under the competency of the competition authority. It was only possible to include in our data the figures for the Netherlands from the department of radiocommunication.
- *Missing information or missing details:* This applies to employment and budget information in several countries.
- *Conflicting information in different sources:* Information on price and market share showed significant differences between OECD and EU sources.

This underlines the necessity for further research.

Institutional theory is used to analyse the changes that have taken place. They impute a generally high level of inertia for public institutions and postulate that state institutions use increasingly detailed interpretations of their mission or additional areas of competence they have acquired as evidence of their necessity to exist. The objective of this long-term project is the description of the institutional character of regulatory authorities and their introduction into the debate on European regulatory requirements.

Working hypotheses

Institutional theory led us to the formulation of the following hypotheses:

- *Persistency:* Regulatory authorities are not different from other public institutions. Once established, they are not easily dismantled. The abolition of tasks is compensated by an expansion of remaining tasks or the creation of new ones.
- *Low adaptability:* Regulatory authorities are characterised by an inbuilt moment of inertia. The assimilation of changing general conditions (e.g., technology, innovations) occurs, if at all, with significant delay. Changing tasks lead to enlargement in the case of new tasks and limited transfers in the case of expanded ones. The develop-

ment of competition or a changing market environment has no repercussions on the development of personnel in regulation.

- *Limited influence on organisation:* The possibilities for influencing cutbacks or the organisational change of independent regulatory authorities are limited.

Figure 3

CHANGES IN EMPLOYMENT INDEX OF SELECTED REGULATORY AGENCIES[a] AND AVERAGE MARKET SHARES[b] OF THE INCUMBENT IN SELECTED COUNTRIES

a) Excluding Hungary. b) Unweighted averages from national long-distance and international calls (German trends show that these also apply to local call) of ten countries.

Source: Country Reports; OECD, Communications Outlook (2005); Estimation of the Ifo Institute.

Results

Despite a strong increase in the intensity of competition in telecommunications markets after ten years of complete liberalisation, sector-specific regulation has not been phased out in favour of general competition law in any of the European countries studied. Falling prices, an increasing number of competitors, and the incumbents' loss of market share have led to reduced regulation in some areas, but any definite renunciation of regulation tied to success factors remains to be seen. On the contrary, ten years after the "transitory" introduction of regulation, structure-preserving behaviour, e.g., an expansion in regulatory scope and responsibility, a boost in personnel, and higher budgets for the authorities in question (Figure 3), can be observed.

Current analysis in selected countries shows that new, increasingly sophisticated regulation mechanisms, e.g., the procedures for the determination of significant market power (SMP, Article 14) and market analysis (Article 16), have been introduced.[5] Both increasing specialisation and an increasing tendency for regulatory authorities to take their place next to existing supervisory organisations as equals with their own distinct identities were observed. These findings are consistent with institutional theory. Further observations are:

- Current trends show that personnel expansion at regulatory authorities predominates internationally. Measured by the number of employees, employment increased by an average of more than 60 percent between 1999 and 2005. This increase is largely due to the establishment and strengthening of the regulatory authorities in their institutional environments.
- On average, the selected European regulatory authorities employed about 518 employees in 2005. Although Germany authorities lost employees against the overall trend (– 9.4 percent), total employment was at 2,358 (2005) employees, more than 600 percent above the average employment level of the regulatory authorities in the other ten countries. Given this order of magnitude, it seems unlikely that the reduction in workforce is a result of a shrinking scope of regulatory duties.[6] It should be noted, however, that the employment figures may not reflect total employment in regulation.[7] It can be assumed that the figures would be modified if the authorities were to provide information on the number and qualifications of the employees who work specifically on telecom market regulation issues.[8]
- The theory of persistent institutions is equally supported by the development of the scope of activity of regulatory authorities.
- The analysis of eleven regulatory institutions leads us to the conclusion that the goal of a transitional, sector-specific regulation, which would be reassigned to general competition law, is not fixed in the objectives and/or the corresponding legal basis of regulatory institutions. There are no

[5] Directive 2002/21/EG of the European Parliament and of the Council dated 7 March 2002 on a common regulatory framework for electronic communications networks and services (Framework Directive).

[6] A much more likely scenario: this is an isolated effect of "limited-duration positions".

[7] In some countries, there are still ministry departments that have complete regulatory power (such as AT in the Netherlands) or affect regulation (such as STSI and MEN in France).

[8] E.g. at Germany's Federal Network Agency (Bundesnetzagentur), about 300 employees are estimated to be directly involved with telecommunications regulation.

concrete specifications for phasing out regulation de lege lata in the individual member states.

- The increased workload resulting from the EU regulatory framework has led to organisational adaptation on the part of the authorities, but there is still no sign that work is being shifted inside the regulatory authorities to new assignments.[9]
- In the face of a significant increase in competition, employment trends indicate that regulatory authorities have a low ability to adapt with respect to the gradual phasing out of regulation. However, one should keep in mind that different national regulatory institutions have varying amounts of freedom to act as they wish. The state's ability to shape and guide these institutions differs due to factors such as differing financing models for various authorities as well as differing civil service regulations and levels of protection from dismissal. The growing requirements of the EU Commission are probably a major factor as well.
- Generally it can be observed that regulatory institutions with a stronger element of self-financing (through fee revenue, etc.) have more leeway in their decision-making on organisational matters than authorities that depend predominantly on appropriation. Institutional theory would give the former authorities a better chance of breaking free and establishing themselves as separate entities over the long term than the latter group, which is more tightly controlled by government.
- Marked cross-relationships with institutionalised advisory bodies (as in Germany and France) or consumer organisations (as in Australia and the UK) support the regulators' ability to influence economic and competition-related policy. This creates an ever larger and closely-knit network of co-operation between the state and regulatory authorities, where network members sound the alarm for each other when structural intervention (e.g., in the form of budget cuts) threatens.

Undoubtedly, the competition sparked by regulation has created significant benefits for consumers. The initial goal of competing infrastructure providers was replaced by price competition within the existing telecommunications infrastructure. New broadband and next-generation network (NGN) technologies will further change the conditions of competition.[10]

Against this backdrop, the initial objective of self-supporting competition and supervisory agencies that restrict themselves to control and remedy abuse should not be abandoned. The currently observable degree of differentiation and the increasing scope of regulation, as well as the increasingly labour-intensive design of regulatory processes do not serve this objective. Given the results of this study, the latest call for centralisation of important regulatory functions at the European Commission is equally unconvincing, all the more so as competition and prices are pointing in the desired direction in the member states. It would be far better to focus again on the politically mandated transitory character of sector-specific regulation within a market economy regime.

This study was conceived as the first step towards a systematic status report. In the course of collecting and analysing the data, it became clear that more information is needed. In the hope that regulatory authorities will be willing to provide information, we will strive to describe more precisely their missions and structures in the future. With this pilot project, the Ifo Institute seeks to contribute to the discussion and provide an impetus for research papers that could, for example, empirically investigate the connection between market development and institutional change.

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[9] Such as a shift from telecommunications regulation to energy regulation: the German Federal Network Agency even received approval for 60 new positions.
[10] ARCEP, Rapport d'activité 2005, pp. 432–36.

The Severance Pay Reform in Austria ("Abfertigung Neu")*

Helmut Hofer**

Introduction

Various studies have examined the impact of labour market institutions, such as unemployment benefits, employment protection legislation (EPL), active labour market policy, labour union density, and taxation of labour income on unemployment in Europe (e.g., OECD 2006; Nickell and Layard 1999). The OECD Job Strategy has suggested reforming rigid labour market institutions to tackle the unemployment problem (OECD 1994). The European Commission recommends the "flexicurity" approach, more flexible labour markets combined with a satisfactory level of security for employees, to adapt to the challenges of globalisation and increased structural change. Denmark, Finland, and the Netherlands have been identified as successful countries, which have carried out consistent and comprehensive reform programs in the last few years (Brandt, Burniaux and Duval 2005).

Austria is a country with a comparatively favourable labour market performance. While fundamental reforms of the labour market have not taken place, smaller steps (intensified activation of the unemployed, efforts to raise the retirement age, tightening of the conditions under which job offers must be accepted, etc.) have been the hallmark of the Austrian policy. When compared to other countries, Austria distinguishes itself with its high-quality industrial relations. The strong involvement of the social partners, which is reflected particularly in wage policy as well as in labour market policy, is typical for Austria.

In 2002 Austria reformed its EPL regulations. The reform replaced a conventional severance payments system with a system of individual saving accounts. The system is funded by employers via a monthly untaxed payment of 1.53 percent of gross wages. In the event of dismissal, workers have the option of receiving severance payment drawn from their savings accounts or taking their accumulated balance to the next job. Upon retirement, employees can claim a cash payment or convert their entitlements into an annuity. This reform of the severance pay law has received international attention as an example for a labour law measure supportive for employment transitions (OECD 2006 and the European Commission 2006a).

The Austrian labour market

In international comparison the Austrian labour market situation is favourable, although a gradual deterioration has occurred over the last 25 years. Unemployment is traditionally low, the unemployment rate amounted to 4.7 percent in 2006. The employment rate is 70 percent and above the EU average. The Austrian labour market, at first glance, exhibits a high rate of job turnover. In 2006 a total of 1,538 million dependent jobs were taken up and 1,469 million terminated (BMWA 2007). The average total dependent employment amounted to 3,161 million. This dynamic can be explained in large part by the comparatively high seasonality of employment in Austria (Del Bono and Weber 2006). The two dominating industries are construction and tourism, which also experience the most dramatic seasonal fluctuation in demand. This seasonal dynamic is strengthened even more by the design of the unemployment insurance system. In the absence of experience rating, unemployment insurance premiums are the same for every sector of the Austrian labour market. As a result seasonal industries are heavily subsidized with a corresponding increase in seasonal fluctuations and a higher job turnover. 35 percent (557,000) of all positions taken up in 2006 were reinstatements within the same company. Aggregate numbers also suggest that job turnover in Austria parallels American rates. If, however, the sectoral composition and the small establishment size are taken into account, the figures for Austria are much lower (Stiglbauer, Stahl, Winter-Ebmer and Zweimüller 2003). Measures of worker reallocations that do not consider short-term flows indicate that the Austrian labour market exhibits rather low dynamics in international comparison (Stiglbauer 2006).

EPL considers legal and administrative constraints on worker dismissals, as well as severance payments paid to dismissed employees. Figure 1 suggests that

* This paper draws heavily on Hofer (2006).
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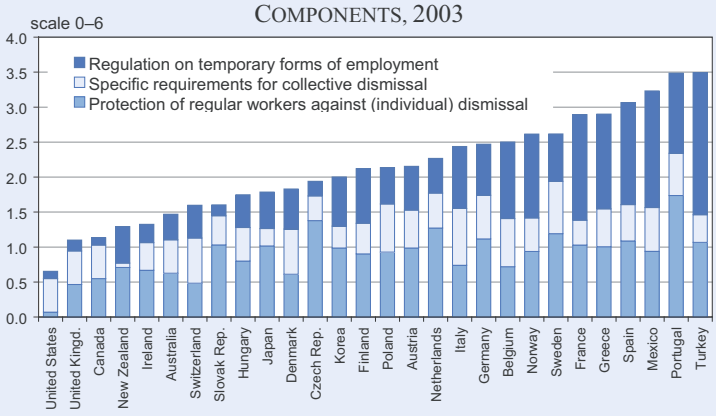
Figure 1

OVERALL SUMMARY INDEX OF EPL STRICTNESS AND ITS MAIN COMPONENTS, 2003



EPL: Employment protection legislation.
Countries are ranked from left to right in ascending order of the overall summary index.

Source: OECD Employment Outlook (2004).

Austria is ranked in the middle of the OECD member countries with respect to the overall strictness of employment protection.[1] Open-ended employment contracts are the norm in Austria. Dismissals can only be contested when the cause is either discriminatory (e.g., gender-specific terminations or because of union membership) or socially unfair, e.g., when the dismissed employee would be more negatively affected than a colleague in a similar position. The partial indicator for regular employment relationships measures the relevant notice periods, the amount of possible severance pay, the estimated court costs and indemnity expenses in the event of an unjustifiable termination, as well as any possible legal difficulties that would accompany the implementation of the termination. Due to the relatively long notice period for white-collar workers, Austria ranks in the middle of OECD members with respect to this indicator. Notice periods differ between blue- and white-collar workers. White-collar workers can be given notice at the end of every quarter, at which point the notice period can range from six weeks to five months, depending upon the length of job tenure. The notice period for blue-collar workers is regulated by collective contracts. If the period is not defined in the contract, it is 14 days by default. While employment protection regulations seem relatively strict on paper, actual practice is a different story (Hofer and Winter-Ebmer 2006). Only a relatively small number of cases are brought before a labour court – most of which end in a settlement consisting of severance pay. These kinds of appeals mainly occur when older employees at a firm with a works council are given notice of termination – besides these cases, appeals are very uncommon. Labour regulations seem flexible enough to keep the necessary processes of reallocation from being burdened with prohibitively high costs.

The OECD 2006 advocated making EPL regulations more predictable and minimising the extent to which EPL results in inefficient labour turnover. Severance payment can be a barrier to efficiency-enhancing labour reallocation by discouraging workers from quitting their current jobs to move to better jobs. The reform of severance pay in Austria has been addressing this problem by reducing obstacles for worker mobility.

Severance pay law in Austria

Severance pay was introduced in Austria for white-collar workers in 1921 and extended to all workers in 1979. Austria's previous employment legislation stipulated that employees in the private sector were entitled to severance pay if their employment spell lasted for at least three years without interruption and was not terminated by the employee.[2] Since the 1970s severance pay had to be paid to an employee who left the company voluntarily – after having

Table 1

Amount of severance pay in the old system

Years of continuous service in one company	Amount of severance pay (calculated from final salary)
Less than 3 years	No entitlement
From 3 to 5 years	2 months' pay
5 to 10 years	3 months' pay
10 to 15 years	4 months' pay
15 to 20 years	6 months' pay
20 to 25 years	9 months' pay
25 years and more	12 months' pay

Source: Compilation of the author.

[1] The OECD summary indicator of the overall stance of employment protection legislation is a weighted average of three sub-indicators on dismissal regulations, covering (1) regular employees, (2) temporary employees and (3) collective dismissals. The summary indicator ranges from 0 to 6 and increases with the strictness of EPL (OECD 2004).

[2] An exemption was made for construction workers. In order to qualify they had to be employed for only 92 weeks during the previous three years, and not necessarily with only one employer.

worked for at least ten years – to enter retirement. The payment amount was based on the last gross monthly salary and the length of job tenure. Starting with two monthly wages after three years of job tenure, payments increased with the duration of the job up to a maximum value of one year's income after 25 years (Table 1). It was taxed at a low rate (6 percent).

The payment had to be made as a lump sum directly out of the employer's cash flow. Within the book accounting system of the enterprises, severance payments were recorded as regular wage increases. Employers had to make provisions in their accounts (book reserve schemes) for at least half of the severance pay entitlements that could fall due. The yearly allocations to the position in the balance sheet reduced the taxable income of the company. Overall, the expenditures for severance payment in 1997 amounted to approximately 2.5 percent of the total wage bill (BMWA 2000).

Reforming the system of severance pay in Austria had been the focus of controversy for a long time (e.g., EIRO 2001; Klec 2007). The previous system was called into question for two main reasons. It was criticised because of its impact in terms of inhibiting mobility in the labour market and the restrictions on entitlement to severance pay. For employees the previous system of severance pay law reduced incentives to change employers as the employee lost the entitlement to severance pay in the case of self-termination of the employment contract. The second major problem of the old severance pay law was the distribution of the entitlements among employees. The Austrian Trade Union Federation has been demanding the extension of severance pay entitlement to cover not only dismissals but also voluntary resignations and seasonal employment. According to Kristen, Pinggera and Schön (2002) only one third of all workers became entitled to severance payments.

The previous system also involved some drawbacks for businesses, especially for small and medium-sized enterprises (Kristen et al. 2002). Liquidity problems could occur if the firms had to make simultaneous severance payments.

Certain policy makers were in favour of turning severance pay into occupational pensions. In the coalition program 2000 the federal government stated its intention to develop a three- pillar pension system in Austria. The government's intension was that the severance payment reform should contribute to the expansion of the underdeveloped second pension pillar.

A considerable amount of research has been carried out to evaluate the impact of EPL on aggregate labour market variables. EPL reduces the layoff rate and unemployment incidence by making firing more costly to employers and increases unemployment duration because higher labour costs tend to weaken job creation, the overall effect on unemployment is ambiguous and apparently minimal in practice. However, strict EPL tends to compromise the employment prospects for young workers, women and the long-term unemployed (e.g., OECD 2006; Young 2003; European Commission 2006b). High procedural costs as well as the associated higher insecurity among companies can have a negative effect on employment. Provisions for severance pay can, however, already be made for in the terms of wage negotiations (e.g., Leonardi and Pica 2007).

Most studies on the impact of the Austrian severance pay system are based on theoretical arguments (e.g., Walther 1999) or anecdotal evidence. For low-qualified jobs the system created incentives for employers to terminate employment spells early to avoid accumulating severance pay claims that are not matched by productivity gains. According to OECD (2001), the propensity of employers to terminate employment peaks prior to employment durations associated with discretionary hikes in accumulated claims for severance pay. Moreover, the system was biased against labour supply in industries with over-proportionate employment fluctuations due to structural change or seasonality as in tourism. Card, Chetty and Weber (2006) provide a profound empirical analysis of the impact of eligibility for severance payment on unemployment duration and subsequent job outcomes. They use a regression discontinuity design, comparing the search behaviour of individuals who were laid off just before and just after the 36-month cut-off for eligibility.

According to this study the hazard rate of finding a new job during the first 20 weeks of the unemployment spell is 8 to 12 percent lower for individuals eligible for severance pay. This longer unemployment spell is not compensated via the quality of the subsequent job. Mean wages, job duration and other measures of job quality are unaffected by entitlement to severance pay. Card et al. (2006) use a theoretical job search model to derive the welfare consequences of

severance pay. According to the model, a pure wealth effect causes the reduced search intensity without any efficiency costs. Furthermore, Card et al. (2006) find no evidence for selective firing prior to the 36-month-cutoff.

The reform of severance pay law

In mid-2001 Austria's government announced its intention to reform the country's system of statutory severance pay law. The aim was to extend entitlement to a wider range of situations and to introduce an option of using payments to fund occupational pensions. Important details like required minimum length of service for entitlement had already been discussed at length. Finally, the government decided to delegate the drafting of a new severance scheme to the social partners. In October 2001, the social partners reached a compromise and in June 2002 the new severance pay law was adopted.

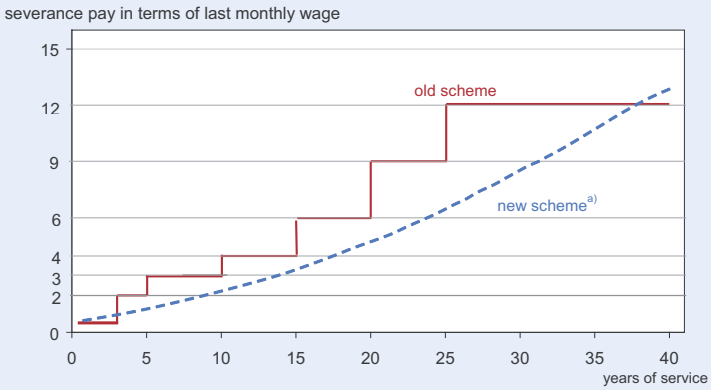
The severance pay system was changed by the Betriebliches Mitarbeitervorsorgegesetz, also known as the new severance pay law ("Abfertigung Neu"). The new system became effective in January 2003. It covers all employment contracts concluded after December 2002. Employment contracts already in place on the date remain, in principle, unaffected until the end of the employment relationship. However, the possibility of a transfer from the old to the new severance payment law is provided. Severance pay claims are shifted to and enforceable by the so-called employee provision funds ("Mitarbeitervorsorgekassen"), which are legally independent from the employers. The employer is obliged to pay a contribution amounting to 1.53 percent of gross wages every month. The contributions start in the second month of an employment relationship and end with its termination. Accumulated entitlements rest in the employee's account until retirement, unless the work contract has been terminated by the employer, which makes cash payments admissible. Employees may draw severance pay only under the same entitlement conditions as under the previous scheme, and provided money has been paid into the fund for three years. The contribution periods of different employers will be aggregated. Upon becoming eligible for payment, the employee can choose between cash, further investment at the same employee provision funds or at the employee provision funds of the new employer, or transferring the respective amount as a one-time payment to a pension insurance fund. Upon retirement, employees can either claim a cash payment or convert their entitlements into an annuity. While the former is taxed at a rate of 6 percent, annuities remain untaxed.

The reform extends the entitlement to severance pay considerably. Entitlement starts after one month and does not depend on how the contract was terminated or on job tenure. Instead of losing claim to severance pay in cases of self-termination, employees can carry over the balance to the new employment relationship.

While in the old system the maximum level of severance payment is reached after 25 years of employment with the same employer, under the new system the claim increases progressively. The employee provision funds invest the employers' contributions in the capital market, therefore the level of severance payment depends on the annual net yield. Figure 2 shows the evolution of severance pay claims in terms of the individual's last monthly wage in the old vs. the new scheme (Koman, Schuh and Weber 2005). While in the old system severance payments increased in stages and reached the maximum level after 25 years of employment with the same employer, in the new system the severance pay will rise continuously and reach the maximum

Figure 2

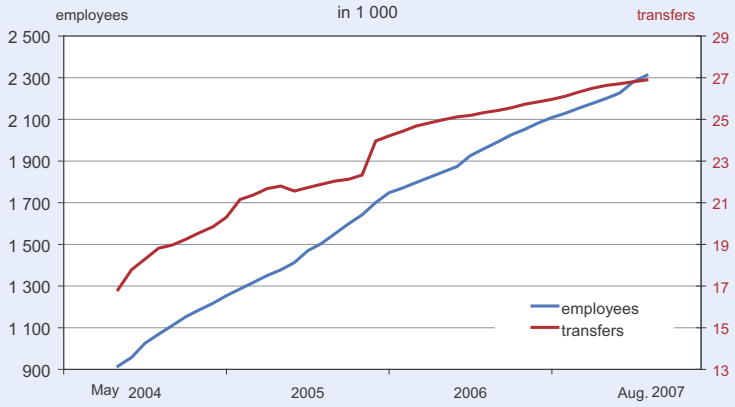
SEVERANCE PAY REFORM IN AUSTRIA
Old vs. new scheme



a) Calculation based on the assumption of 3% real wage growth and 6% real return on assets.
Source: Koman et al. (2005).

Figure 3

EMPLOYEES LINKED TO THE NEW SEVERANCE PAY LAW



Source: Main Association of Austrian Social Security Institutions; own calculations.

value of the old system after 37 years of contribution. Note, however, these calculations assume a rather high and unrealistic rate of net-return of 6 percent per annum.

For employment contracts concluded before January 2003 the possibility of arranging a transfer from the old to the new severance pay system has been provided for. Figure 3 illustrates that only 27,000 persons have changed into the new severance pay system.

Up to now 2.3 million persons acquired claims in the new severance pay system (Figure 3). Figure 4 shows the share of all employees in the new system by month. In August 2007 46 percent of the workers were already linked to the new severance pay system. 361,000 enterprises have concluded contracts with the employee provision funds.

Employee provision funds

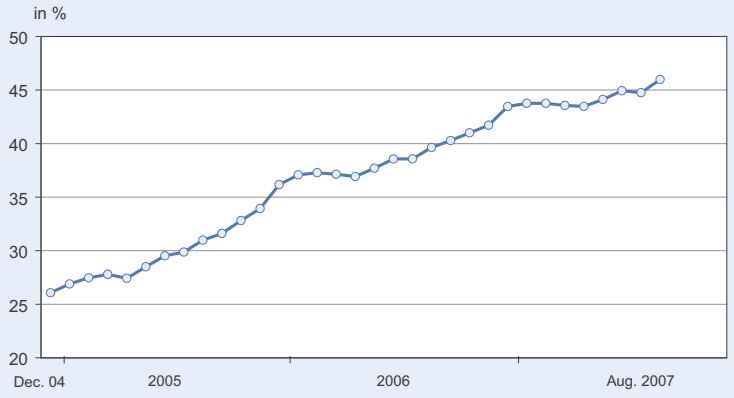
Nine privately managed companies were established to collect the monthly contributions, invest them on the capital market and make severance payments to employees who become eligible. The funds work on a for-profit base and are allowed to charge operating fees. Employee provision funds are entitled to retain an administrative fee of 1 percent up to 3.5 percent of annual severance pay contributions. Currently, actual fees charged are mainly in the range of 1.8 percent to 2.9 percent (GPA 2006). Additionally the employee provision funds can charge up to 0.8 percent of the invested capital as asset management fee.

The employer concludes a contract with one employee provision fund for all workers who are in the new severance pay system. The choice of the employee provision fund is decided via an employer/works council agreement. In enterprises without works council the employer decides in general. Changing the employee provision fund is possible. Between 2004 and 2006 the assets managed by employee provision funds increased from 365 million EUR to 1.13 billion EUR.

In the new system the level of severance payment depends on the performance of the employee provision funds on the capital market. Only the nominal contribution paid by the employer is guaranteed by law. The ministry of finance expected an average annual net yield of 6 percent on the investment of severance pay. In 2003 the employee provision funds did not promise an investment yield higher than between 3 percent and 4 percent. In order to compete, they promoted their investment capacities. In 2004, 2005, and 2006 the employee provision funds achieved an average annual net yield of 5 percent, 5.5 percent and 3.6 percent, respectively. The

Figure 4

SHARE OF EMPLOYEES COVERED BY THE NEW SEVERANCE PAY LAW



Source: Main Association of Austrian Social Security Institutions; own calculations.

Table 2

Asset allocation

Assets	in %
Bonds/EUR	82.1
Bonds/Non-EUR	1.2
Equities/EUR	9.4
Equities/Non-EUR	5.6
Real estate	1.7

Source: OeKB.

employee provision funds can invest in bank assets (at most 25 percent at the same group of credit institutes), loans and credits, bonds, equities (at most 40 percent) and share certificates of investment funds. In principle at most 50 percent can be invested in foreign currency and at most 10 percent in bonds and equities of the same company. Table 2 shows the asset allocation of the employee provision funds. In 2006 only 15 percent of the assets were invested in equities. The employee provision funds argue that a high return is only possible if the portfolio contains more equities. Due to the possibility of payouts, the investment horizon is relatively short. Almost every second employee eligible for payment opts currently for disbursement. Overall it is to be expected that the amount of severance payment will be lower compared to the old system.

Discussion

2.3 million employees have acquired entitlements in the new severance pay system. The reform extended the number of workers entitled to severance pay considerably. However, the average severance pay will be lower in the new system. Starting with 2008 the number of persons entitled to severance payment will further increase as the so-called Freie Dienstnehmer, a hybrid status between employed and self-employed, and the self-employed engaged in trade will be included. Farmers will also have the possibility to opt in the system.

The new severance pay system offers advantages for employers and employees. For employers liquidity problems due to simultaneous severance payments are prevented and there is no uncertainty related to the costs of severance pay at the time of hiring. For the workers, job mobility costs are reduced because they do not lose their entitlement to severance payment when quitting a job. The former severance pay system was heavily criticised for reducing labour mobility. The loss of entitlement to severance pay created a strong incentive for workers with long job tenures not to quit. The new severance pay system eliminates this disincentive with respect to labour mobility. Currently no study exists, which quantifies the impact on actual labour mobility. It is very likely that the impact is currently modest as almost all workers with long tenure are still covered by the old legislation. Furthermore, reducing labour mobility may be justified if it supports investment in firm specific human capital. However, it is questionable if the old system was an efficient tool for increasing the qualifications of the workers, given that there was no link between entitlement to severance pay and the costs and the degree of optimal company-based training.

Originally, the government did not wish to provide for the possibility of paying severance pay directly to employees on the termination of their employment relationship, but favoured a model in which severance pay entitlement went purely to fund occupational pensions. In the end, the social partners and the government agreed on a compromise where severance pay paid directly to employees on termination of their employment will be taxed at a flat rate of 6 percent, whereas severance payments saved towards a private pension will be tax-free. It was an explicit hope of the government that the severance payments reform would also contribute to the expansion of the underdeveloped second pension pillar in Austria. The reform replaces the former defined-benefit, final-salary severance payments scheme by a defined-contribution, fully funded system. According to Koman et al. (2005) the severance pay law reform is a first step toward the expansion of the underdeveloped second pension pillar in Austria. The contribution rate of 1.53 percent is, however, too low to generate a significant second pillar retirement income that could help to maintain current replacement rates. Based on retirement income projections and simulations of the pension reform for the blue and white collar workers' pension system, Koman et al. (2005) concluded that an increase of the contribution rate up to 5 percent could already be a major step toward a sufficient second pillar retirement income.

The reform improves the role of the capital market in Austria and helps to strengthen the funded pillar of the pension system. However, the possibility of claiming cash payments after job termination, which decreases the expected return on the capital market,

and the relative low contribution rate imply that the new system may not generate a sufficient second pillar retirement income. One should note, that the available evidence indicates that disbursement is preferred to acquiring pension claims by a considerable number of workers.

As a result of the new provisions, many more employees are now eligible for severance pay, in particular employees with short-term employment. One explicit aim of the Austrian reform was to create more fairness in the distribution of severance payments among employees. In order to evaluate the distributional effects of the Austrian reform Koman et al. (2005) performed an empirical analysis on a cross section of completed job spells of different durations for which they compared severance pay in the two schemes.

According to the simulations, severance payments will be 35 percent lower in the new system compared to the old scheme in the sample mean. Due to the more pronounced effects of the new scheme those groups who were disadvantaged in the old scheme will be even more so in the new (Koman et al. 2005). Mean payment according to both schemes differs mostly for women, young, and blue-collar workers. Note that Koman et al. (2005) had to make two crucial assumptions. First, they did not observe complete individual employment careers and hence cannot say anything about the accumulation of severance payments during an individual's working lifetime. Second, as Koman et al. (2005) had no information on the reason for ending the employment spell, they assumed no voluntary job terminations. Overall, there are clear hints that the level of severance payments in the new system will be lower than in the old system. This is, of course, only true for workers who did receive severance payments based the previous legislation. The reform unquestionably extends to a considerable degree the number of workers entitled to severance pay.

Conclusions

Overall, the reform of the severance pay system in Austria was successful. The new system provides advantages for employees and employers. From the viewpoint of the employers, the (expected) costs of dismissal – which are lower than with the previous regulations – are already known from the start of employment. For employees, the mobility-hampering loss of severance pay in cases of resignation is no longer relevant. The new severance pay system will enhance external flexibility. One can, however, criticize the fact that the manner in which the employment contract is ended has no influence on the amount and form of the employees' right to severance pay – in other words, the new severance pay system in Austria contains no elements of a layoff tax. The aim of a layoff tax is to make firms internalise the costs of excessive job turnover. Moreover, the possibility of early payouts implies that employee provision funds cannot place a high percentage of the capital in long-term investment schemes, therefore limiting potential yields.

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Goals on Climate Change

The international response to climate change dates back to 1979 when the first World Climate Conference highlighted concerns arising from the increased carbon dioxide in the atmosphere. In recognition of the global nature of the problem, the United Nations Framework Convention on Climate Change (UNFCCC) was agreed at the Earth Summit in Rio de Janeiro in 1992. 189 countries, including all major developed and developing countries, have ratified the Convention. The UNFCCC sets the overarching objective for multilateral action: to stabilise greenhouse gas (GHG) concentrations in the atmosphere at a level that avoids dangerous anthropogenic climate change. The Kyoto Protocol, agreed in December 1997, set out an approach for binding international action and agreed specific commitments up to 2012. It entered into force in February 2005 and has been ratified by 162 countries as of October 2006. However, the US and Australia have declined to join the Protocol, and the Canadian administration has signalled that it is likely to be unable to meet its commitments. Kyoto Protocol commitments of some large economies are documented in the Table. Climate change is now a regular part of the agenda for G8 Summits. G8 declarations are non-binding, but they have provided strong direction to a range of other international bodies.

National initiatives and policy measures designed to foster national and international co-operation in support of global environment issues are numerous, and rising in numbers. They can be found in countries at all stages of development. More than half of these policy measures flow from national policy choices.

Goals on climate change and clean energy adopted by 10 largest economies

Brazil	• National objective to increase the share of alternative renewable energy sources (biomass, wind and small hydro) to 10% by 2030 • Programmes to protect public forests from deforestation by designating some areas that must remain unaltered and others only for sustainable use
China	• The 11th Five Year Plan contains stringent national objectives including – 20% reduction in energy intensity of GDP from 2005 to 2010 – 10% reduction in emission of air pollutants – 15% of energy from renewables within the next ten years
France	• Kyoto Protocol commitment to cap GHG emissions at 1990 levels by the period 2008–12 • National objective for 25% reduction from 1990 levels of GHGs by 2020 and four fold reduction (75–80%) by 2050
Germany	• Kyoto Protocol commitment to reduce GHG emissions by 21% on 1990 levels by the period 2008–12 • Offered to set a target of 40% reduction below 1990 levels by 2020 if EU accepts a 30% reduction target • National objective to supply 20% of electricity from renewable sources by 2020
India	• The 11th Five Year Plan contains mandatory and voluntary measures to increase efficiency in power generation and distribution, increase the use of nuclear power and renewable energy, and encourage mass transit programmes. • The Integrated Energy Policy estimates that these initiatives could reduce the GHG intensity of the economy by as much as one third
Italy	• Kyoto Protocol commitment to reduce GHG emissions by 6.5% on 1990 levels by the period 2008–12 • National objective to increase share of electricity from renewable resources to 20% by 2010
Japan	• Kyoto Protocol commitment to reduce GHG emissions by 6% on 1990 levels by the period 2008–12 • National objective for 30% reduction in energy intensity of GDP from 2003 to 2030
Russian Federation	• Kyoto Protocol commitment to cap GHG emissions at 1990 levels by the period 2008–12
United Kingdom	• Kyoto Protocol commitment to reduce GHG emissions by 12.5% on 1990 levels by the period 2008–12 • National objectives to reduce CO_2 emissions by 20% on 1990 levels by 2010 and by 60% on 2000 levels by 2050
United States	• Voluntary federal objective to reduce GHG intensity level by 18% on 2002 levels by 2012 • California, the largest state, in the US, has an objective to reduce CO_2 emissions by 80% on 1990 levels by 2050 • States in the north-east and mid-Atlantic have set up the Regional Greenhouse Gas Initiative to cut emissions to 2005 levels between 2009 and 2015, and by a further 10% between 2015 and 2018

Source: Stern, N. (2006), The Economics of Climate Change: The Stern Review, Cambridge University Press, Cambridge.

The majority of the world's largest economies now have goals in place to reduce carbon emissions, or to decrease energy intensity, increase renewable energy and decrease deforestation. Countries have adopted a range of goals; if they can successfully deliver these, emissions will be reduced significantly below their "business as usual" path. The Table summarises some of the relevant goals adopted by countries that account for around two thirds of the global economy and emissions.

W.O.

Reference

Stern, N. (2006), *The Economics of Climate Change: The Stern Review,* Cambridge University Press, Cambridge, chapter 21.

Progressivity of Pension Entitlements

Pension systems around the world differ in their generosity and the way pension benefits are related to the income history of pensioners. The former characteristic refers to the size of the social security budget relative to the GDP of a country and is informative as to how important pension benefits are on average for financing old-age consumption. The latter characteristic describes how pension benefits are linked to pre-retirement income. Theoretically, when pensions are a fixed amount, independent of income history, the pension system is referred to as a pure flat-rate pension system. The polar system is one in which pension payments are proportional to the pre-retirement income. Such a system is called a pure earnings-related system. The latter system exists when pension contributions are proportional to income and the pension payment is proportional to contributions collected during the working career. The earnings-relatedness of a pension system has important implications for the size of the disincentive effects the pension system exerts on labour supply behaviour; an issue which has received attention in recent policy discussions. The reason is that the tighter pensions are linked to pre-retirement income the smaller the tax component of the social security contribution rate. As such, it is informative for policy discussion to quantify how strongly income history is tied to pension payments through existing pension formulas.

One approach to measure the earnings-relatedness of the pension system is to compute a Progressivity Index as suggested by the OECD. The index is constructed as follows: in a first step the Gini coefficient of pension income and of general earnings is computed. In the OECD calculations, pension income only includes the public pension system. Private occupational systems and personal pension provisions are excluded. In a second step, the Progressivity Index is calculated as 100 minus the ratio of the Gini coefficient of pension income divided by the Gini coefficient of earnings. The index is constructed so that a pure flat-rate system scores 100 percent and a pure earnings-related system scores 0 percent.

The Table shows the Pension Gini coefficient and the Progressivity Index for OECD countries. For countries with a pure flat-rate system such as New Zealand and Ireland the Progressivity Index is 100 percent. Countries with a pronounced flat-rate component include Canada, United Kingdom and Australia. Countries with a highly earnings-related pension system are, e.g., Finland, Italy, Netherlands, and Hungary. Their Progressivity Index is below 10 percent.

Although the index is helpful in gauging the disincentive effects which are generated by the public pension system, it does not fully capture differences in the earnings-relatedness of the pension system for different income groups. For instance, a pension formula may well entail that at the bottom of the income distribution the system is highly income related, but is a pure flat-rate system for high income earners. As such, labour supply disincentives vary significantly across the income distribution. A more in-depth analysis along this line is provided in

Gini coefficients on pension entitlements and earnings
OECD average distribution data

	Pension Gini	Progressive index
Australia	7.3	73.1
Austria	18.9	30.4
Belgium	11.2	58.8
Canada	3.7	86.6
Czech Republic	8.7	68.0
Denmark	11.1	59.3
Finland	25.1	7.6
France	20.5	24.6
Germany	20.0	26.7
Greece	26.5	2.6
Hungary	26.9	1.3
Iceland	18.0	33.9
Ireland	0.0	100.0
Italy	26.4	3.1
Japan	14.4	46.9
Korea	12.3	54.8
Luxembourg	22.2	18.6
Mexico	19.0	30.3
Netherlands	26.9	0.0
New Zealand	0.0	100.0
Norway	17.1	37.4
Poland	25.4	6.5
Portugal	22.1	18.8
Slovak Republic	26.5	2.7
Spain	22.1	18.8
Sweden	23.7	12.9
Switzerland	12.7	53.3
Turkey	25.1	7.8
United Kingdom	5.1	81.1
United States	16.1	40.9
OECD average	17.2	36.9
OECD 18	17.0	37.5

Note: OECD 18 refers to the 18 countries for which national earnings-distribution data are available.

Source: OECD.

OECD (2007). Also, the data in the Table does not include other public welfare programmes. Even in a pure earnings-related system, low income earners may receive a complementary transfer income which is financed out of general tax revenues. Including these welfare programmes would yield an even more comprehensive measure of how progressive old-age social security policies are.

M.K.

Reference

OECD (2007), *Pensions at a Glance,* Paris, 44–45.

Job-search Requirements

Job-search assistance and monitoring of jobseekers may be required to ensure that they search actively for work. This feature is definitely on the rise in OECD member countries, and a clear majority now seem to have explicit regulations for job-search reporting and monitoring. Such a policy can have a considerable impact on re-employment rates. However, there remains a risk that too-rigid requirements may generate perverse effects, such as employer cynicism about too many solicitations or pressure on jobseekers to quickly accept job matches that do not maximise their individual productivity.

As shown in the Table, column 1, half of OECD countries require reporting of job search (in most cases) every two weeks or at least monthly: these are Australia, Austria, the Czech Republic, Finland, Hungary, Japan, Korea, the Netherlands, the Slovak Republic, Switzerland, the United Kingdom and the United States. Most of these countries use relatively standardised procedures for reporting and verification: for example, requiring employer confirmation of applications, or handing out standard forms where individual job applications should be listed.

Other countries verify job search within the context of intensive interviews: France once a month (starting at the fourth month of an unemployment spell), New Zealand every six weeks, Spain on average six times a year, Denmark and Norway every three months.

The placement agencies in Belgium, Canada, Germany, Ireland and Sweden describe procedures

Job-search requirements

	Frequency at which unemployed have to report their job-search activities	Number of actions to be reported in a month
Australia	Every two weeks	From 8 to 20
Austria	Once a month	Not specified
Belgium	Variable requirements at placement agencies; after 15/21 months at ONEM (benefit agency)	Not specified
Canada	Variable requirements	"Reasonable" efforts expected
Czech Republic	Every two weeks	Not specified
Denmark	At least once every three months	Variable requirements (depending on IAP)
Finland	From one week to one month	Variable requirements (depending on IAP)
France	Once a month (after fourth month)	Variable requirements
Germany	Depends on profiling category: on average six times per year	Not specified
Greece	No specific requirements	Not specified
Hungary	Monthly for regular benefit recipients	Variable requirements (depending on IAP)
Ireland	Variable requirements	Not specified
Italy	Job-search monitoring is rare, despite a legal requirement	Not specified
Japan	Once every four weeks	Two
Korea	Variable, from once a week to once every four weeks	Two
Luxembourg	No specific requirements up to 2006; variable requirements starting in 2007	Not specified
Netherlands	Every four weeks	Four
New Zealand	Every six weeks	Variable requirements (depending on IAP)
Norway	Every three months	Not specified
Poland	No requirements	No requirements
Portugal	No specific requirements up to 2006; variable requirements starting in 2007	Variable requirements (depending on IAP)
Slovak Republic	Variable, from once a week to once every four weeks	One action per contact
Spain	Every two months (estimated average)	Not specified
Sweden	Every six weeks on average (adults six to eight weeks; youth two to three weeks)	Not specified
Switzerland	Once a month	From four to ten
Turkey	No requirements	No requirements
United Kingdom	Every two weeks	Ten
United States	Every two weeks	Ten

IAP = individual action plan.

Source: Compendium of national replies to the OECD Secretariat questionnaire on "Interventions in the Unemployment Spell".

for reporting or verification of job search, but do not state how frequently such reporting takes place.

Greece, Poland and Turkey do not require reporting of job-search activities, while Italy in principle requires active job search, but does not currently monitor it in a concrete way. Finally, Luxembourg and Portugal which did not require job search in the past, have introduced respective requirements in 2007.

As to the minimum number of job-search actions to be undertaken by the registered unemployed (Table, column 2), many countries report that this is determined in an individual action plan or by a placement officer on the basis of client characteristics and the local labour market. In Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, New Zealand, Norway, Sweden and Spain usually no information about a typical or average required number of actions is available.

Typical numbers of required job-search actions per month are between eight and twenty in Australia, ten in the United States and the United Kingdom, between four and ten in Switzerland, four in the Netherlands, and about two in Japan, Korea and the Slovak Republic. At the other end of the scale, the number of actions that have to be reported is or approaches zero in countries with no reporting requirements or little monitoring, i.e. Greece, Italy, Poland and Turkey, as well as (up to 2007) Luxembourg and Portugal.

W.O.

Reference

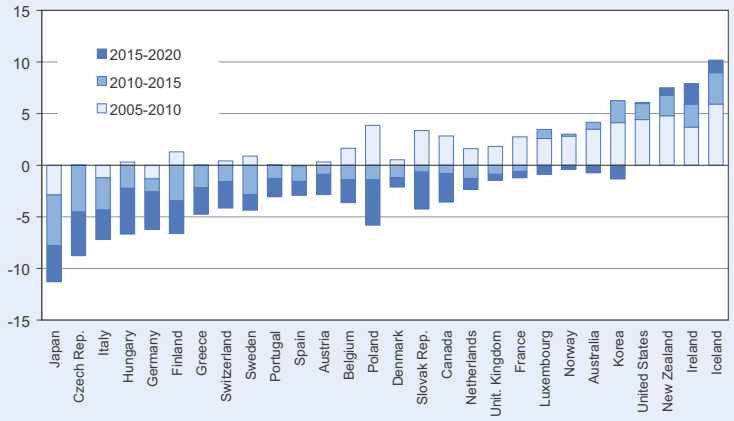
OECD Employment Outlook 2007, Paris, chapter 5.

Population Aging

Following different baby-boom episodes many developed countries face a severe change in the age structure of the population. Population aging poses economic problems. Social security systems depend on a well-balanced ratio of the working-age population over pensioners. In order to cope with population aging, changes in the level of pension payments and entitlement age are inevitable. Even with these counteracting measures, overall pension payment will still rise and limit the fiscal capacity available for other items, such as education and innovation policies. Given the fiscal problems inherent in population aging, it is vital to quantify the extent to which population aging occurs, to quantify the economic consequences of this development and to develop appropriate policy responses.

Expected Change in the Working-Age Population

as a percent of the 2005 population



Source: Eurostat; Belgium, Italy and non-European countries: United Nations Population Divison.

The OECD's International Migration Outlook reports these changes. The Figure lists the change in the age structure of the population as a percent of the 2005 population for three different time spans, making it possible to infer how acute population aging is in different countries and how it will change over time. For the period 2005–10 population aging does not appear to be a problem in most countries. It is only in Germany, Italy and, most notably, in Japan that the working-age population is declining in size. In other countries it will stay constant or even increase. Countries that are facing an increase include Finland, Poland, the Netherlands, France and the US. However, in some of these countries the problem of population aging is only being postponed. For the period 2010–15 countries like Finland, Poland, the Netherlands, and France will likewise experience a drop in the size of the working-age population relative to the size in 2005, which will become even larger between 2015 and 2020. For the latter period, the only European countries included in the Figure which will have a growing working-age population relative to 2005 are Ireland and Iceland. Interestingly, the US still faces a rise in the working-age population over the period 2015–20, again in relation to the figure in 2005.

The implicit assumption underlying the data is that net migration is zero so that the data only reflect population aging due to changes in fertility rates. The question of utmost policy relevance is whether migration can neutralise the change in the age structure of the population. Nevertheless, many countries have imposed tight immigration restrictions which, however, have already been relaxed in some countries, possibly in response to the anticipated aging process. The OECD's International Migration Outlook provides a more in-depth discussion of policy options. However, immigration is not the only instrument to cope with population aging. Unutilised sources of labour supply may be mobilised and production outsourcing can be helpful in counteracting the drop in the labour force in response to population aging. It is likely that most countries will adopt a mix of these responses to population aging.

M.K.

Reference

OECD (2007), *International Migration Outlook,* Paris, 30–33.

Tuition Fees in Europe 2007/2008

Two years ago, when this issue was first discussed in *CESifo DICE Report* (2005/2, 55–57), of the 27 selected countries (the then EU countries plus Norway and Switzerland) 15 had tuition fees. Now this number has increased to 18 out of 29 (present EU countries plus Norway and Switzerland). In the meantime Cyprus has eliminated tuition fees for Cypriots and EU citizens, but universities in some German federal states and in Luxembourg have introduced tuition fees. In the new member countries, Bulgaria and Romania are also charging tuition fees. As in the past there are no fees in the Scandinavian countries and for state universities in France, Ireland, Poland, the Czech Republic, Slovakia and Malta. In Slovenia there are no fees for undergraduate studies. Denmark (since August 2006), Ireland, Malta, Sweden, Slovakia and Cyprus charge tuition fees for foreign students. In the Czech Republic students taking courses held in English have to pay fees.

The regulations for tuition fees in Europe vary considerably. While students pay the same countrywide fee in Luxembourg, the Netherlands, Austria and Portugal, in Belgium, Switzerland, Greece and Italy

Tuition fees in Europe 2007/08

	Tuition fees	Remarks/exemptions
Austria	EUR 363 per semester for home students and citizens of the EU, the EEA[a)] and Switzerland (for foreigners: EUR 726 per semester). Higher fees for some private universities.	Grants are offered. Dependent on social factors. Students who qualify for public scholarship (Studienbeihilfe) also receive the grant. The grant only has to be paid back if the course of studies is not completed.
Belgium	EUR 500–800 p.a. (dependent on university and course of studies).	Flanders: Scholarships offered by government, scholarships and loans offered by universities. Walloon: Scholarships and low-interest loans are offered by government.
Bulgaria	Public universities: Every year the government sets a maximum number of students' places. A portion of them are allocated to the students who do not pay fees ("state quota"). For the remaining places tuition fees range between EUR 50–200 p.a. Foreigners: EUR 2,200–5,500 p.a. (depending on university and course of studies). Private universities set their own fees.	The government determines who and how many students will receive scholarships or student loans for public universities. The government does not offer student loans for private universities.
Cyprus	None (foreigners max. EUR 6,850).	
Czech Republic	None (for foreigners in courses in English USD 3,000–10,000 p.a.).	
Denmark	None (non-EU foreigners: EUR 9,000–16,000 p.a.)	
Estonia[b)]	EUR 420–1,200 per semester (non-EU foreigners: EUR 960–1,500 per semester).	A student loan of EUR 960 guaranteed by the government is offered.
Finland	None.	
France	Public universities: None. Private universities: Up to EUR 7,500 p.a.	Enrolment fees between EUR 150 and 420 p.a.
Germany	None in some Länder, in others between EUR 100 and 500 per semester.	In Länder with tuition fees a low-interest loan offered that is paid back after completion of the course of studies. Tuition fees have no effect on Bafög (federally funded scholarship).
Greece	Universities set the fees.	Grants offered.
Hungary	EUR 16–48 per month (foreigners pay more).	Students who are particularly gifted or particularly needy do not have to pay the fees.
Ireland	None (non-EU foreigners: Up to EUR 36,000 p.a.).	
Italy	Minimum EUR 750 p.a., universities set the fees.	Students who receive a public loan based on need or a performance-related scholarship are exempt from the fees.
Latvia	EUR 700–5,811 p.a. (foreigners pay EUR 750–5,000 p.a.).	Loans and scholarships are available.

(Table continued)

	Tuition fees	Remarks/exemptions
Lithuania	EUR 0–3,475 p.a. (foreigners: EUR 1,000–5,000 per semester).	Grants offered by the government.
Luxembourg	EUR 100 per semester.	
Malta	None (foreigners: EUR 1,250–1,500 per semester).	
Netherlands	EUR 1,538 p.a. (less for part-time students).	The payment of the fee is either at start of the academic year or in instalments during the year. Loan to pay for tuition fees is offered. Payments based on earnings after completion of studies.
Norway	None.	
Poland	Public universities: None. Private universities: EUR 4,000–10,000 p.a.	
Portugal	EUR 500 p.a. Private universities: EUR 150 per month.	
Romania	USD 350–650 p.a. for public and private universities. Foreigners: Depending on course of studies between USD 3,200 and 8,000 p.a.	Government scholarships for students with good academic performance and in cases of need.
Slovak Republic	None (foreigners without a scholarship from Slovakian government: USD 2,000–8,000 p.a.).	
Slovenia	Undergraduates: No. Graduates: Up to EUR 1,500 p.a.	Scholarships and grants available.
Spain	Public universities: Dependent on region and course of studies between EUR 550 and 900 p.a. Private universities: Up to EUR 6,000 p.a.	Fees are reduced for students from large families.
Sweden	None (fees for foreigners at some universities).	
Switzerland	EUR 1,230–2,900 p.a.	The universities set the fees. Some universities require fees of foreigners. The cantons set the requirements for grants.
United Kingdom	Public universities in England/Wales: Up to GBP 3,070 p.a. (Up to GDP 3,145 p.a. 2008/2009). Private universities and graduate programmes: Up to GBP 16,000 p.a. Scotland: No.	England/Wales: Universities set fees. The government initially pays the tuition fees for every student. After completing the course of studies and taking up work the graduate pays the fees back to the government (HMRC[c]). This is done only after earning an income of GBP 15,000 p.a. The amount paid monthly depends on the income of the graduate. Scotland: Tuition fees are paid by the Student Awards Agency. For Scottish students and EU-foreigners the fees are paid in full (depending on income) and in part (depending on income) in the other parts of the United Kingdom.
Russia	15% of students at public universities pay fees (those who are working towards a second degree or did not quite fulfil the entry requirements). The amount is geared to the market value of a program and the prestige of the institution rather than to the actual costs. Fees vary depending on university and course of studies between USD 2,500 and 8,000 p.a.	Government scholarships and student loans are available.
United States	Universities and colleges set the fees. These vary from USD 2,000 p.a. (community college) to over USD 37,000 p.a. (graduate programmes in Harvard). The average amount is between USD 12,000 and 16,000 p.a.	A broad range of loans and scholarships are available.

[a] EEA: European Economic Area (EU-25 and Norway, Iceland, Liechtenstein). – [b] Academic year 2001/2002.
[c] Her Majesty's Revenue and Customs.

Sources: www.studieren-in-holland.de/index.php?idcat=25&idlang=1. – www.daad.de. – www.bmbwk.gv.at. – Department for Education and Skills. – Student Awards Agency of Scotland. – EBS, Estonian Business School (www.ebs.ee/index.php?id=3167). – Latvijas Universitate. – Schweizerische Rektorenkonferenz (CRUS) (www.crus.ch/ navig/d/pulldown_frameset/studinfos_schweiz/). – Eurydice (www.eurydice.org). – www.educationireland.ie/htm/ why_ ireland/main.htm. – www.harvard.edu. – www.studyindenmark.dk. – CIRIUS (www.ciriusonline.dk/). – www.study-in-romania.ro/annualbudg.htm. – www.college-contact.com/wissen/studienfuehrer/bulgarien.htm. –Education in Russia (www.russia.org.my/education/).

the universities set the fees themselves. In Spain the fees are regional and in some cases staggered according to subject. In Britain students in England and Wales are required to pay up to GBP 3,070 p.a. in tuition fees. Scottish students on the other hand can study free of charge – only if they study in Scotland, however. In Hungary the government has eliminated the regulation according to which it proscribed the number of students who were able to study a certain subject at a specific university without paying tuition fees. If there were more students who wanted to study this subject, they had to pay tuition fees that the universities set. As of 2006 all students are required to pay tuition fees. The fees are between EUR 16 and 48 per month.

Tuition fees in Europe are considerably lower than in the U.S. In the Netherlands, for example, fees amount to EUR 1,538 (2005: EUR 1,476) and for private universities in France around EUR 7,500 per year, the tuition fees in the U.S. average between USD 12,000 and 16,000 p.a. In Harvard graduate studies cost USD 37,000 p.a. The range in Europe is, however, also very large from just under EUR 200 per study year for some subjects in Hungary to more than GBP 16,000 (EUR 23,000) for graduate programmes at Britain's top universities, Oxford and Cambridge. A course of studies in the new EU member countries is not necessarily more reasonable than in the old. In Latvia tuition fees range from at least EUR 700 p.a. to a maximum of EUR 5,811 p.a., the highest in the new member states of the EU. The tuition fees for students who are not from EU member states are considerably higher than those for nationals and EU citizens. Thus in Austria twice the normal fee (EUR 363, the same amount as in 2005) must be paid (EUR 726) by non-EU foreigners. Ireland, which as of 1996 no longer charges tuition fees, requires non-EU students to pay up to EUR 36,000 p.a., the highest fees in Europe.

As a rule countries offer loans to help finance tuition fees, which are generally paid back after the course of studies has been completed. In the United Kingdom, for example, the graduate is required to pay back the loan once his/her income has reached a certain level. The Netherlands no longer provide scholarships for needy students. Instead all students can receive a student loan to pay for tuition fees (see the Table).

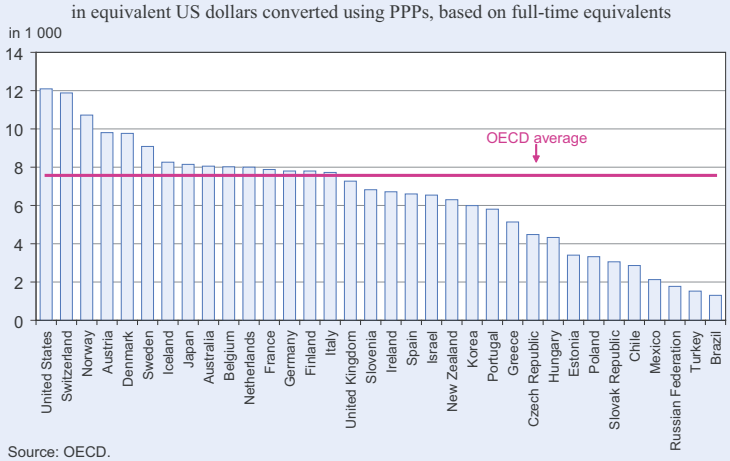
N.H.

Financial Resources Invested in Education

Figure 1

ANNUAL EXPENDITURE ON EDUCATIONAL INSTITUTIONS PER STUDENT IN PRIMARY THROUGH TERTIARY EDUCATION, 2004

in equivalent US dollars converted using PPPs, based on full-time equivalents



Source: OECD.

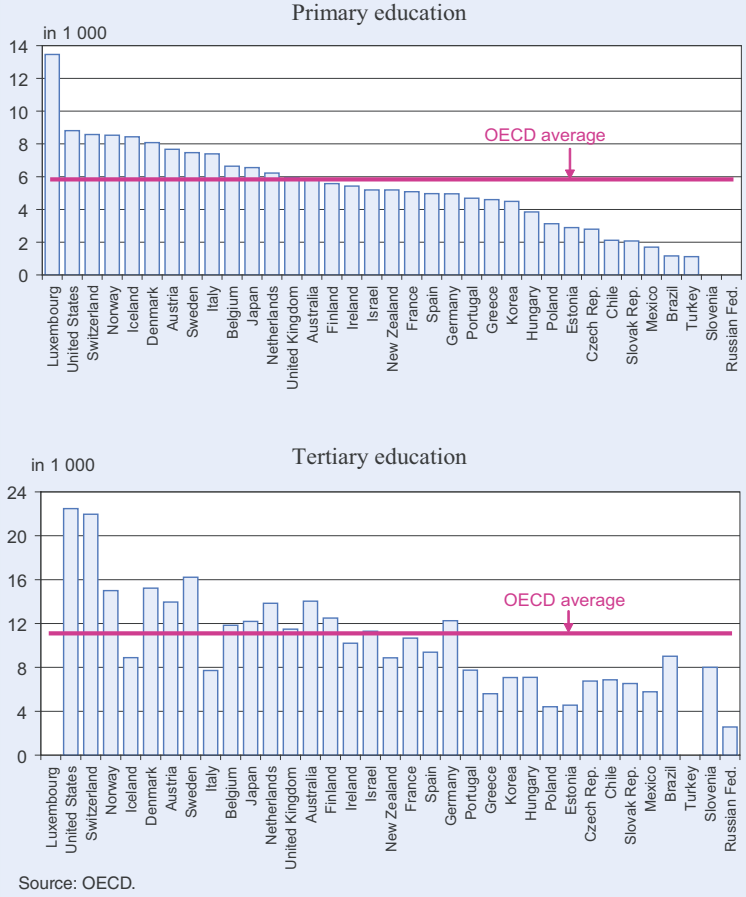
Education is one of the major determinants of the economic performance of countries. Policy makers and academics alike are intensively searching for improvements in the education system, not least because of the increased competition for well-educated workers and because of the latest comparison of education policies based on various student performance tests. The search for effective policies requires evaluating a country's education system in the light of other countries' policies. The comparison should include publicly and privately provided education systems which co-exist in most countries. The OECD project "Education at a Glance" has contributed significantly to this objective. As part of the project, Figure 1 shows the expenditure on primary, secondary and tertiary education in relation to the number of full-time equivalent students, all expressed in US dollars. Most notably of importance for tertiary education, the data does not include subsidies for student living expenditures as including expenditures on these programmes would undermine the comparability of the expenditure data. As shown in Figure 1, OECD countries spend on average USD 7,572 per student as of 2004. Country expenditure levels differ remarkably. Per-student expenditure is highest in the US while being lowest in Brazil. More specifically, countries like the US, Switzerland, Norway, Denmark, Austria, and Sweden spend more than the average amount per student, while countries like Italy, France, Japan, the UK, and Germany spend only slightly more or less on education than the average OECD expenditure level.

Figure 2

ANNUAL EXPENDITURE ON EDUCATIONAL INSTITUTIONS PER STUDENT FOR ALL SERVICES

by level of education, 2004

in equivalent US dollars converted using PPPs, based on full-time equivalents



Source: OECD.

A partial break-down of the data according to the type of education (primary and tertiary) is provided in Figure 2. The upper panel depicts the per-student expenditure on primary education. Expenditures are above average in most countries which have above average total per-student expenditures such as the US, Switzerland, Norway, and Denmark. The most notable exception is Iceland which also belongs to the "top" group for primary education. Turning to tertiary education (see the lower panel in Figure 2), Iceland, however, drops sharply below the average value. A similar pattern can be observed for Italy, which spends above average on primary education, but below average on tertiary education. The OECD data for Italy only includes public institutions for tertiary education which, given the dominant role of the public sector for tertiary education in Italy, should not undermine the comparison significantly. A common conclusion which can be drawn from both panels in Figure 2 is that per-student expenditure on tertiary education exceeds that of primary education in all OECD countries. The finding may not be too surprising since "input factors" used in primary education are mostly teachers, who typically have lower wages than university professors or researchers.

One should note that the expenditure data in Figures 1 and 2 have their limitations. No inferences can be drawn about the working conditions of school teachers and university professors, nor do they provide insight into the structure of spending, i.e. whether resources are spent on salaries, buildings or on research and development. Also, the data are uninformative as to how the educational spending relates to the wealth of a country. For instance, education expenditure as a percentage of GDP is above the OECD average of 6.2 percent (as of 2004), e.g., in Israel, Iceland, the US and Denmark. Below average values can be found in Italy, Japan, Spain and Greece. A more disaggregated view on the financial resources invested in education is provided in OECD (2007).

M.K.

Reference

OECD (2007), *Education at a Glance,* Paris, 167–254.

New at DICE Database

In the fourth quarter of 2007 the DICE Database () received about 140 new entries, consisting partly of updates of existing entries and partly of new topics. One special point was the enlargement of our topic "Natural Environment" with new subfolders and further tables and graphs on the regulation of environmentally related topics and the state of the natural environment. Some further topics are mentioned below:

- Anti-discrimination Regulation
- Characteristics of International Corporate Governance Systems
- Fiscal Rules
- Mandatory Public Old-age Pension Schemes
- Migration Programmes for Health Workers
- Monetary Unions
- Pension Contribution Rates
- Public Procurement Structures in EU Member Countries
- The Economic Weight of Nations (1–3)
- Vocational Education and Training Systems: Role of the Social Partners
- Wage Replacement in Case of Sickness

Forthcoming Conferences

Global Economy
25–26 January 2008, in Munich

CESifo will hold the fourth area meeting for the Global Economy group. The focus of this group will be to explore how the gains from globalisation differ from the gains from trade (accelerated technical progress, global tournaments, increased speed of transactions), the effects of marginalisation and how it operates, the role of culture and local identity, new forms of global institutions and arrangements, and other matters under the globalisation label.
Scientific organiser: John Whalley

Delphi conference
30–31 May 2008, in Munich

CESifo and the Department of International and European Economic Studies (DIEES) at the Athens University of Economics and Business (AUEB) will organise a conference on the question of "Government, Institutions, and Macroeconomic Performance". Relevant topics include issues such as: measures of institutional quality; bureaucracy, property rights, corruption and political stability; institutions, investment and growth; economic policy and institutions; sclerosis and reforms; the role of economic integration; globalization and institutional choice; determinants of institutions; and other topics along these lines.
Scientific organisers: Thomas Moutos, George Economides and Peter Egger

European Economic Association
27–31 August 2008, in Milan

Deadline for paper submission: 15 February 2008

International Institute of Public Finance (IIPF)
22–25 August 2008, in Maastricht

Deadline for paper submission: 31 January 2008

American Economic Association Meetings
3–5 January 2009, in San Francisco

Deadline for paper submission: 1 February 2008

New Books on Institutions

Handbook of European Financial Markets and Institutions
Xavier Freixas, Philipp Hartmann and Colin Mayer
Oxford University Press, 2008

Institutions and Organizations: Ideas and Interests
W. Richard Scott
Sage Publications, 2008

Controlling Governments: Voters, Institutions, and Accountability
José Maria Maravall and Ignacio Sanchez-Cuenca (eds.)
Cambridge University Press, 2008

How Institutions Evolve: The Political Economy of Skills in Germany, Britain, the United States, and Japan
Kathleen Thelen
Cambridge University Press, 2007

Online information services of the CESifo Group, Munich

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DICE

Database for Institutional Comparisons in Europe

www.cesifo.de/DICE

The database DICE was created to stimulate the political and academic discussion on institutional and economic policy reforms. For this purpose, DICE provides country-comparative information on institutions, regulations and the conduct of economic policy.

To date, the following main topics are covered: Labour Market, Public Finances, Social Policy, Pensions, Health, Business Environment, Natural Environment, Capital Market and Education. Recently chapters on Experts' Assessments of Governance Characteristics and on Social Values have been added. Information about Basic Macro Indicators is provided for the convenience of the user.

The information of the database comes mainly in the form of tables – with countries as the first column – but DICE contains also several graphs and short reports. In most tables, all 27 EU and some important non-EU countries are covered.

DICE consists primarily of information which is – in principle – also available elsewhere but often not easily attainable. We provide a very convenient access for the user, the presentation is systematic and the main focus is truly on institutions, regulations and economic policy conduct. Some tables are based on empirical institutional research by Ifo and CESifo colleagues as well as the DICE staff.

DICE is a free access database.

Critical remarks and recommendations are always welcome.
Please address them to
ochel@ifo.de
or
hoffmann@ifo.de