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Prospects for nuclear power in Europe

Steve Thomas*

There is a common perception that the fortunes of nuclear power have been shaped by three major accidents at civil nuclear power plants: Three Mile Island (TMI) in 1978, Chernobyl in 1986 and Fukushima in 2011. These accidents were seen as triggering public opposition that made it politically difficult and sometimes impossible to proceed with nuclear power. The reality is more complex. Public opposition has been decisive in a few countries but in most, the outcome has been driven more by the connected problems of poor and deteriorating economics, finance and design issues.

In the developed world, the optimism of a decade ago – the 'Nuclear Renaissance' – that a new generation of nuclear power plant designs (so-called Generation III+[1]) could compete successfully on cost grounds had largely evaporated well before the Fukushima disaster. The claim for these new designs was that they would offer a cheaper, more reliable way than renewables to reduce greenhouse gas emissions and that nuclear power was a cost-effective way to reduce reliance on unreliable suppliers of fossil fuels, especially natural gas.

In the wake of the Fukushima disaster, the countries in Europe can be divided into five groups, each with rather different prospects:

1. Those in which nuclear power was never a serious option in recent decades. These include Denmark, Norway, Ireland, Austria and Portugal;
2. Those where governments are trying to proceed with nuclear power programmes, including UK, France and Finland;
3. Those where phase-out policies had previously been in place before Fukushima or where there had little prospect of new orders for a long time, including Netherlands, Sweden, Spain and Belgium;
4. Those which took decisive decisions against nuclear power in the wake of Fukushima, including Germany, Italy and Switzerland; and
5. Eastern Europe and Russia.

The first group of countries will not be considered further in this article, but they may be able to form new alliances with politically more powerful, now anti-nuclear countries, especially Germany and Italy, tipping the political balance in Europe against nuclear power.

Techno-economic issues

Before examining the prospects in each of these regions, it is useful to briefly identify the major techno-economic issues that nuclear power faces. The paradox with nuclear power is that despite more than half a century of commercial experience, real costs have only ever gone upwards. Even in France, where the huge programme of reactor orders from 1970–1990 should have given every opportunity to take advantage of 'learning', scale economies and technical progress, the real cost of reactors more than doubled (Cooper 2010). The last four of the 58 reactors ordered in that period took on average over 13 years from construction start (first structural concrete) to commercial operation. A former Chief Executive of the French utility, Electricité De France (Roussely 2010) has acknowledged that while the reliability of nuclear plants has improved in recent years, in France, it has deteriorated. So experience with nuclear power seems to fly in the face of that with most successful technologies, where costs would be expected to fall and performance would improve.

The selling point for Generation III+ designs was that they would take account of 'learning' from ear-

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[1] There is no clear set of technological characteristics that distinguishes one nuclear design generation from another. Generation I includes the demonstration plants built in the 1960s, Generation II includes most of the plants currently operating and covers designs completed from the mid-60s to about 1980, Generation III includes post TMI designs and accounts for a relatively small number of reactors, while Generation III+ covers designs evolved from Generation III but taking account of lessons from the Chernobyl disaster.

lier generations and this would mean that they could be safer, but simpler and therefore cheaper and easier to build. Greater safety was to be achieved by use of 'passive' safety features whereby reactors would be prevented from going out of control in an accident situation by natural processes, rather than the start-up of engineered systems.[2] Reduced complexity would make them cheaper and would lower the risk of construction delays and cost overruns because complex on-site installation work, seen as one of the factors contributing to construction problems, would be reduced.

This would mean finance was cheaper because financiers would see nuclear projects as less risky. In the UK and the USA, governments have decided to help reduce construction risk by requiring a full generic design assessment on new designs before construction starts. The rationale for this was that delays have, in the past, been caused by design changes or safety issues arising in mid-construction. It was hoped the generic reviews would mean all design issues would be resolved in advance once and for all so the full design was known and approved in advance of construction. It was assumed that because these were new designs with a clear view of regulatory requirements, the design reviews would be straightforward.

There are a number of Generation III+ designs now commercially on offer[3], but none of these is in operation yet and only two, the French European Pressurised Water Reactor (EPR) offered by Areva NP[4] and the AP1000 (Advanced Passive, also a Pressurised Water Reactor) offered by Westinghouse (based in the USA but owned by Toshiba) have firm orders, four for the EPR and six for the AP1000. However, two of the EPRs and four of the AP1000s are under construction in China and there is little reliable independent information on progress. Construction work on the other two AP1000s, both for the USA, had not started by August 2012. So the only substantial construction experience in the West is the EPRs in Finland (Olkiluoto 3) and France (Flamanville 3).

Both plants have been plagued with delays and cost overruns. In 2012, after seven years of construction, the Finnish Olkiluoto plant (scheduled to take four years to build) was still more than two years from completion[5] and about 100 percent over budget. Areva and the customer, TVO, were in conflict over who would pay the EUR three billion extra costs and this dispute was being resolved in the International Chamber of Commerce Court of Arbitration in Stockholm[6]. In 2012, the Flamanville project (scheduled to take five years to build) was still four years from completion after nearly five years of construction and also about 100 percent over budget.[7] Unlike the USA and the UK, France and Finland did not require full generic reviews of the designs before construction start and the designs are being reviewed during construction. Design issues have arisen during construction, for example the degree of redundancy in the Instrumentation and Control system (Thomas 2010). How far these issues have contributed to the delays is hard to determine.

The generic design reviews in the USA and the UK have also been problematic. The AP1000 received design approval in the USA in 2006, but soon after Westinghouse submitted design changes that reopened the reviews and these were not finally resolved until December 2011. The UK authorities issued an Interim Design Acceptance Certificate (IDAC) in December 2011 after a period of more than four years, but there are a number of significant issues still to be resolved.[9] Westinghouse has chosen not to proceed to sort out these issues until it has a customer for the AP1000.[10] The EPR also received an IDAC in the UK in December 2011 and in the summer of 2012, Areva was working on dealing with these issues. This process will not be complete before 2013.[11] In the USA, the EPR review has been consistently delayed and in summer 2012, was not expected to be completed before end 2014.[12] How far the need to take account of the lessons from Fukushima will cause new requirements and further delays to the regulatory process remains to be seen.

[2] For example, reactors would be cooled by natural convection rather than the by a mechanical cooling system.
[3] All are Pressurised Water Reactors (PWRs) or Boiling Water Reactors (BWRs) in which the reactor is cooled and 'moderated' by water.
[4] Areva is 92 percent owned by the French state. Its reactor division was a joint venture between Areva (66 percent) and Siemens (34 percent). Siemens announced it was exiting the joint venture in 2009 and completed its withdrawal in 2011.

[5] In July 2012, the plant owner, TVO, announced that it could no longer meet the 2014 completion date that had set a year earlier.
[6] Nucleonics Week 'Olkiluoto safety upgrades to be completed in 2012, TVO' March 8, 2012.
[7] Nucleonics Week 'ASN tells EDF to improve quality of Flamanville-3 concrete work', September 8, 2011.
[9] http://www.hse.gov.uk/newreactors/reports/ap1000-onr-gda-idac-11-002-issue-1-131211.pdf.
[10] http://www.nuclearpowerdeliveryuk.co.uk/news.php?subaction=showfull&id=1323863036&archive=&start_from=&ucat=&.
[11] Nucleonics Week 'UK regulators give interim approval to AP1000, EPR reactor designs' December 15, 2011.
[12] http://www.nrc.gov/reactors/new-reactors/design-cert/epr/review-schedule.html.

From a financial point of view, it is now clear that the cost of power from new nuclear power stations will be high, especially if the financial community continues to see nuclear as a risky investment and imposes a high real cost of capital. Ultimately the decision whether to build nuclear power plants will depend on whether the proposals are financeable. It is clear that if, as has been the case in the past, consumers implicitly guarantee to pay whatever costs are incurred, nuclear power will be seen by financiers as low-risk because the risk will fall entirely on consumers. However, such a guarantee is going to be difficult to sell to consumers given the very poor economic record of nuclear power to date.

Renaissance countries

Finland, UK and France have been the countries in Western Europe with the best prospects for nuclear orders for some time now. Finland and France were the first two countries to order Generation III+ designs, in both cases the European Pressurised Water Reactor (EPR) supplied by the French state-controlled company, Areva NP. As noted above, both projects have gone disastrously wrong, making further orders problematic.

France stands out as the one European country where its nuclear capabilities are seen as a key national capability. It has a controlling stake in the utility (EDF) and the vendor (Areva NP), so the option of not proceeding with its nuclear programme is not one it can easily contemplate. Nevertheless, a plan to start construction on a new EPR reactor (Penly) in 2011 has been quietly abandoned and the new Socialist government appears less committed to nuclear power than its predecessors.

France is now in a difficult position. The large number of reactors completed between 1977 and 1985[13] is coming up to the point where there will need to be major investment to life-extend them[14] or they will have to retire and replace them. Given the high level of EDF debts and the real cost escalation in construction costs since 1980, full-scale replacement is not an option because of the cost, especially given the remaining issues with EPR technology. However, full-scale life extension would close the door to new EPR orders in France and if the EPR was not bought by France, that would be a serious blow to its credibility and therefore its prospects elsewhere.

For Finland, there is a surprising determination to place further orders given how badly Olkiluoto 3 has gone and the Finnish government has approved the construction of two more reactors with construction expected to start in 2015, one of which would be built by TVO at the Olkiluoto site. It remains to be seen whether these reactors will go ahead, and in view of the poor experience with Olkiluoto 3 in particular, how willing financiers will be to provide the finance. One of the driving forces behind the Finnish government's support for the nuclear programme seems to be a strong objective not to increase dependence on supplies of Russian gas.

The UK programme has a special influence because of the UK's long history as a pioneer of nuclear power and because when it was announced in 2006, the government promised that no public subsidies would be offered for new reactors. The government's 2006 Review stated:

> 'Any new nuclear power stations would be proposed, developed, constructed and operated by the private sector, who would also meet full decommissioning costs and their full share of long-term waste management costs. The government does not take a view on the future relative costs of different generating technologies. It is for the private sector to make these judgements, within the market framework established by government. The actual costs and economics of new nuclear will depend on, amongst other things, the contracts into which developers enter, and their cost of capital for financing the project.' [15]

The implication was that nuclear reactors would be chosen on cost grounds by utilities and would compete with all other generation types, including gas, on equal terms. This never seemed a realistic prospect and by 2012, while the government was still asserting that no subsidies would be offered, the reality was very different. The formal position was (emphasis added):

> 'To be clear, this means that there will be no levy, direct payment or market support for electricity

[13] Between 1977 and 1985, 36 reactors were completed in France. If they are given a 40 year life, replacements would be needed from 2017 onwards.
[14] In the USA, most nuclear reactors have now been life-extended to give a life of 60 years.

[15] Department of Trade and Industry (2006) 'The Energy Challenge: Energy Review Report' Cm 6887, HMSO, p 113. http://www.berr.gov.uk/files/file31890.pdf.

supplied or capacity provided by a private sector new nuclear operator, *unless similar support is also made available more widely to other types of generation.*'[16]

The proviso makes the commitment not to offer subsidies meaningless and in 2010, the government announced the effective abandonment of price signals from the electricity market as the mechanism for stimulating construction of new power plants. The Energy Minister, Ed Miliband told the Times:

> 'The Neta system [the British wholesale market], in which electricity is traded via contracts between buyers and sellers or power exchanges, does not give sufficient guarantees to developers of wind turbines and nuclear plants. He said that one alternative would be a return to "capacity payments" – in which power station operators would be paid for the electricity they generate and also for capacity made available. The idea of such payments is to give greater certainty to investors in renewable and nuclear energy.'[17]

Under proposals published in a draft bill in May 2012,[18] there will be essentially a 'single buyer' to commission and provide long-term power purchase agreements in the form of Contracts for Differences (CfDs) for all forms of new capacity. The bill envisages three forms of support for new low carbon generating capacity in addition to the long-term CfDs:

- Capacity payments: these would be expected to be designed to give incentives for peaking plants to remain available;
- Emissions performance standards: these are expected to be set so that new coal-fired power stations would not be built unless they included carbon capture and storage;
- Guaranteed carbon price: this was already introduced in the 2011 Budget, which featured a carbon floor price rising from EUR 12/ton in 2013 to EUR 36/ton by 2020.

By August 2012, the terms of the CfDs were being discussed and while most public attention has focused on the initial price, of at least equal importance will be the detailed terms of the contract, particularly how the economic risks will be dealt with. If the contract does not allow pass-through of any construction cost escalation, financiers may well see the contract as too risky to finance. The British government will be reluctant to abandon the nuclear programme, but if EDF's demands are too high, the Treasury may veto the contract. For its part, EDF has a heavy investment programme to finance in France and may not be willing to undertake a risky investment.

Marginal countries

In these countries (Sweden, Belgium, Spain and the Netherlands), the process of planning for new nuclear capacity is much less advanced than in the countries above, so it is more difficult to evaluate prospects. Some projects have been announced, for example, in July 2012, the main Swedish utility, Vattenfall applied to the Swedish safety authority to replace one or two of its existing reactors with new ones. However, there are many hurdles to be crossed before a firm order can be placed in any of these countries. In the short-term, the main question is how long the existing plants can be kept in service. In Spain (eight operating reactors, 7.6GW) and Sweden (ten operating reactors, 9.4GW), there did not appear to be much pressure to close the existing plants and they may continue in service for 20 years or more. For the Netherlands, with only one small operating reactor (Borsselle, 482MW), the decision whether to keep it on-line is more of a symbolic than a real significance. For Belgium (seven operating reactors, 5.9GW), there is more controversy. In October 2011, Belgium's then coalition government decided to phase out nuclear power altogether from 2015, with full phase-out by 2030. Two small reactors at Doel (466MW each) are likely to be the first to be shut, but the timing of the closure of the other reactors, all about 1,000MW, is not clear. In all these countries, a significant element of the decision-making process for existing reactors will be how much compensation the utilities can extract from the government for what the utilities will claim is a premature closure of the plants.

Phase-out countries

Realistically, any proposals for new nuclear orders in Italy and Switzerland would have been bitterly opposed and the prospects for new orders were limited. However, from the pre-Fukushima position of a

[16] http://www.decc.gov.uk/en/content/cms/news/en_statement/.
[17] The Times (2010) 'Labour prepares to tear up 12 years of energy policy', February 1, 2010.
[18] http://www.decc.gov.uk/en/content/cms/legislation/energybill2012/energybill2012.aspx.

relaxation of the phase-out targets and the long-term possibility of new orders, Germany is now apparently irrevocably committed to phasing-out nuclear power by 2022 and in the immediate aftermath of Fukushima, eight of the 17 reactors operating before Fukushima were permanently closed with the rest to be shut by 2022. While this is effectively the policy that applied for more than a decade, apart from the six months before Fukushima, the phase-out is now seen as irrevocable, whereas before, some utilities harboured ambitions for new orders. The importance of Germany as an example for other countries is high. With nuclear no longer available as a fall-back if renewables and energy efficiency policies do not work and a return to fossil fuels implausible, the government must give full commitment to a non-nuclear future. If a low-carbon, non-nuclear electricity system can be achieved efficiently and at affordable cost, this will be a powerful example for other countries to emulate.

Russia and Eastern Europe

Russia and the countries of Eastern Europe are the most optimistic about the prospects for nuclear power. In some cases, such as Romania (Cernavoda), Slovakia (Mochovce) and Bulgaria (Belene) the policy is to complete orders dating back 25 years or more, while others (Russia, Poland, Hungary, Lithuania and Czech Republic) are trying to place new orders. Natural gas is an important issue in all cases. For Russia, new nuclear capacity will release gas for export, while for the Eastern European countries, new nuclear capacity will reduce or prevent future dependence on imports of natural gas from Russia.

For Eastern Europe, the ability to obtain finance is likely to be the limiting factor. The Bulgarian Belene project (completing two Russian design 1,000MW WWERs) was effectively abandoned in 2012 because of the high cost. The Romanian Cernavoda project (two Canadian design plants of 700MW) is also proving difficult to finance.

The Czech Republic had a call for tenders for two new reactors underway in 2012, with the winning bid to be selected in 2013. However, construction is not expected to start until 2019. So even if a winning bid is selected, there is ample scope for the project to be derailed before construction starts. Hungary and Poland are also carrying calls for tenders for nuclear capacity, while Lithuania appears to have selected Hitachi as its preferred supplier. As with the Czech Republic, it is far from certain that any of these projects will go ahead despite powerful political backing, because of the problems of obtaining finance.

For Russia, the situation is different as finance is much less a problem. After 20 years when the only construction activity was the completion of a handful of plants under construction at the time of the Chernobyl disaster, Russia began to move aggressively into home and export markets with a new design (VVER-1200)[19] that it claims can be seen in safety terms as Generation III+. Outside Europe, Russia is competing successfully in Vietnam, India and Turkey and in Europe, it will respond to tenders in Eastern Europe. It has also been reported to be considering building nuclear capacity in the UK. If it could win an order in the UK – the odds are against this – this would be seen as a strong endorsement of its technology that might open up new markets in the developed world to it.

After 25 years with no new orders for commercial reactors, Russia began ordering again in 2008 and has started construction on eight new reactors since then, six of which use the new design.

Conclusions

On several occasions, events in the energy markets seem to have provided the ideal opportunity for nuclear power to expand rapidly. These events include the energy crises of 1975 and 1979, the problem of acid rain, the strategic challenge provided by the highly concentrated supply structure for oil and gas and, most recently, the need to reduce emissions of greenhouse gases. However, on each occasion, and despite generally having strong political backing at the highest level, optimism about the prospects for nuclear power was short-lived.

However, the nuclear accidents at TMI, Chernobyl and Fukushima were not the defining events in the history of nuclear power that they are often seen as. They merely served to spotlight the already existing techno-economic issues that have prevented nuclear power from achieving the dominance of electricity markets that was expected when nuclear power was

[19] Most Russian plants use the Russian version of the PWR, known as the VVER. The Chernobyl design accounts for only a handful of operating reactors and is not an option for new reactors.

launched as a commercial technology. These accidents threw up design issues and dealing with these issues seems to have been one of the factors that have led to the intuitively unlikely outcome that the real cost of nuclear power has consistently risen throughout its life-time.

The 'Nuclear Renaissance' is just the latest of a number of forecast nuclear revivals and even before Fukushima the Renaissance appeared to be faltering badly. While climate change seemed to have provided the most compelling strategic reason to pursue nuclear power, the opening up of electricity markets to competition created a new hurdle to ordering. Until nuclear power has a solid record of projects being built to time and cost and operating reliably, ordering is clearly a risk that banks are not willing to take. The poor experience with the few Generation III+ plants under construction will only reinforce the banks' poor perception of nuclear power.

In Europe, the balance between pro-nuclear and anti-nuclear countries has shifted with the move of Germany and Italy into the firmly anti-nuclear camp. In Western Europe, it is hard to see more than a handful of orders being placed in the next decade. In Eastern Europe, there appears to be more optimism and an additional strong reason – avoiding over-dependence on Russia for energy supplies – to pursue nuclear power. However, the issues of finance are even more serious in this region.

While it would be wrong to assume nuclear power will wither away, if the Generation III+ design generation is seen as a failure, it will be a long road back for nuclear power. The nuclear skills base is eroding rapidly. This may also be the last chance for reactor designs based on water as a coolant and moderator, which make up the vast majority of orders placed to date. Radical new designs have been proposed under the international Generation IV Forum,[20] but these are a long way from commercial deployment and it is hard to see where the vast funds will come from to turn designs that look attractive on paper into commercial technologies.

[20] http://www.gen-4.org/.

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Nuclear Energy in the European Union after Fukushima: Political and Economic Considerations

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Introduction

More than one year after the accident at the Fukushima Daiichi nuclear plant in March 2011 the future of nuclear energy is still under heated discussion in Japan – as well as in other parts of the world. After the meltdowns, the European Council (EC) decided to review the safety features of European nuclear power plants. This became known as the 'stress test' and applies to all 135 nuclear power plants in the European Union (EU). After an assessment of the seventeen national reports (including 15 EU countries plus Switzerland and the Ukraine), an Action Plan was published in August 2012 containing further activities to improve the safety of the European nuclear power plants.

This decisive action at the EC level belies unified action within the EU. Indeed, the European Union Member States have drawn very different conclusions regarding their national energy policy (Wittneben 2011). Even before Fukushima the role of nuclear energy in climate mitigation and the low carbon economy had been controversial. There was talk of a 'Nuclear Renaissance' that was to avert predicted shortcomings in energy supply, improve national energy security and mitigate climate change. This article explores whether such a renaissance has taken place or will take place in Europe, given the policy implications of Fukushima. We outline the status quo of the nuclear energy supply, give policy examples of the UK and Germany and finally discuss the corporate nuclear strategy examples of RWE and E.ON.

Status quo of nuclear energy within the European Union

Currently, nuclear energy contributes about 27 percent to the European electricity mix[1] and 14 out of 27 European member states run nuclear power plants (IAEA PRIS 2012). Within the Member States the share of nuclear energy in the electricity mix varies widely: the Netherlands only runs one reactor which contributes 3.4 percent to the national electricity mix, whereas France runs 58 reactors that amount to a share of 74.1 percent, making France the world's largest nuclear power generator on a per capita basis. Table 1 lists the fourteen European member states that currently use nuclear energy for power generation, plus Switzerland and Ukraine as they participated in the EU legislated nuclear stress test after Fukushima. As of August 2012, the current number of reactors in operation within the European Union (EU-27), after Germany decided to permanently shutdown eight of its reactors, is 135. There are currently four reactors under construction in the EU-27 after cancellation of the Bulgarian projects Belene 1 and Belene 2 (each 953 MW(e)) in March 2012 (IAEA PRIS 2012).

The differences in the electricity mix between EU countries are based on past decisions and remain a matter of national sovereignty. However, the European Union is becoming increasingly involved in this decision-making with, for example, EU-wide targets for renewable energies and carbon emission reduction. Since 2009, when the Treaty of Lisbon came into effect, the role of the European Union was strengthened as it is now entitled to ensure the "functioning of the energy market" and "ensure security of energy supply in the Union" (Article 194).[2]

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[1] EU-27: 27.8 percent in 2009, 27.3 percent in 2010, 27.4 percent in 2011 (Eurostat 2012).
[2] The Treaty on the Functioning of the European Union. Available online: http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2008:115:0047:0199:EN:PDF.
Further information on the 'Energy Policy for Europe': http://europa.eu/legislation_summaries/energy/european_energy_policy/l27067_en.htm.

Table 1

Nuclear power reactors in Europe, 2010

Country	Reactors in operation		Reactors under construction		Nuclear electricity supplied in 2010	
	No. of units	Total MW(e)	No. of units	Total MW(e)	TW (e).h	% of total
Belgium	7	5,926	-	-	45.73	51.16
Bulgaria	2	1,906	2	1,906	14.24	33.13
Czech Rep.	6	3,678	-	-	26.44	33.27
Finland	4	2,716	1	1,600	21.89	28.43
France	58	63,130	1	1,600	410.09	74.12
Germany	17	20,490	-	-	133.01	28.38
Hungary	4	1,889	-	-	14.66	42.10
Netherlands	1	482	-	-	3.75	3.38
Romania	2	1,300	-	-	10.70	19.48
Slovakia	4	1,816	2	782	13.54	51.80
Slovenia	1	666	-	-	5.38	37.30
Spain	8	7,514	-	-	59.26	20.09
Sweden	10	9,303	-	-	55.73	38.13
UK	19	10,137	-	-	56.85	15.66
EU-27	143	130,953	6	5,888	871.27	NA
Switzerland	5	3,238	-	-	25.34	38.01
Ukraine	15	13,107	2	1,900	83.95	48.11
Total	163	147,298	8	7,788	980.56	NA

Source: IAEA (2011).

With a view to nuclear energy, the European Union is involved through the Treaty establishing the European Atomic Energy Community (EAEC or Euratom), which was signed in 1957 and has not been revised since. Despite the fact that the treaty is the basis for nuclear safety and radiation protection within the European Union, it has been criticised for its tacit promotion of nuclear energy (Wegener 2007). For example, the treaty emphasises the importance of nuclear power for the European Union: "It shall be the task of the Community to contribute to the raising of the standard of living in the Member States and to the development of relations with the other countries by creating the conditions necessary for the speedy establishment and growth of nuclear industries" (Article 1) and "recognising that nuclear energy represents an essential resource for the development and invigoration of industry..." (Preamble) (Euratom Treaty 1957). Besides this "pro-nuclear" aim of the treaty, it has been criticised for its lack of democratic control.[3] Nuttall (2009) points to Euratom's unusual status as all member states of the European Union are parties to Euratom, but it still retains its own legal personality. With regard to criticisms and concerns over a democratic deficit, he points out that unanimity among the member states is needed for a Euratom reform – and this has been lacking in the past (Nuttall 2009). It remains to be seen whether the German phase-out decision and emerging discussions in the German Parliament about the future of the Euratom Treaty will alter the situation.[4]

On the one hand, nuclear energy remains part of the energy future for Europe – for several member states and for the utilities (EURELECTRIC Declaration of 2009[5]). On the other hand, the European Union's stress tests of its nuclear power plants showed that Fukushima has deeply shaken faith in nuclear energy, even although, arguably, the safety assessments lacked concrete detail and potential implications as the Commission has no sovereignty over nuclear reactors in its member states (Thomas 2012).

Nuclear Renaissance?

Prior to Fukushima several countries around the world had considered or already invested in new nuclear power plants – a nuclear renaissance was invoked, for example, by the World Nuclear Association. The main drivers were considered to be climate change, as nuclear is considered to have relatively low emission of carbon dioxide, energy security aspects, due to an unstable fossil fuel supply, and an impending electricity generation gap, not least because of upcoming shutdowns of existing nuclear power plants (Goodfellow et al. 2012; Hultman 2011; Greenhalgh and Azapagic 2009). It is questionable, however, whether new nuclear capacity, at least in Europe, can meet these challenges. Bradford compares the existing power plants and ongoing or most recently completed projects: "Most of the world's reactors are more than 20 years old, so plant completions will be largely offset by retirements" (Bradford

[3] See, for example, the contributions of Marc Johnston (Greenpeace) or Dörte Fouquet (Kuhbier lawyers) to the public hearing on "Assessing Euratom – 50 Years of European Nuclear Policy". February 2007. Programme available: http://www.europarl.europa.eu/hearings/20070201/itre/programme_en.pdf.

[4] Motion in the German Bundestag by the Green Party (November 2011), http://dipbt.bundestag.de/dip21/btd/17/076/1707670.pdf and the SPD in March 2012 http://dipbt.bundestag.de/dip21/btd/17/089/1708927.pdf.

[5] Available online: http://www.eurelectric.org/CEO/CEODeclaration.asp.

2012, 151). He recommends to include nuclear energy in a future electricity mix – but not to "burden it with unnecessary hopes and fears" (ibidem). Similarly, Lovins criticises nuclear energy as the least effective method to save carbon compared to end-use efficiency and renewables (Lovins 2010).

The often so-called 'Nuclear Renaissance', much discussed since about 2000, had already faltered prior to Fukushima – at least in the Western countries (Thomas 2012). Reduced investment potential due to the economic crises led to difficulties in attracting investment for nuclear power (Brumfiel 2008) and utilities reconsidered investment decisions because of pessimistic expectations about predicted revenues (Bradford 2012).

If there is a future for the nuclear industry, it is less likely to be in Europe and more likely to be in China, Russia and India (Thomas 2012; The Economist 2012b). In China the nuclear expansion plans are financed by the government and therefore less likely to be affected by economic crises (Brumfiel 2008), whereas in Europe the above mentioned drivers for a nuclear renaissance face an economic obstacle, which resulted in a drop in construction – "a result of the cost of building new plants and the refusal of investors to bear the risks of cancellation, cost overruns and the emergence of cheaper alternatives" (Bradford 2012, 152).

Nevertheless, the drivers for the nuclear renaissance cited above need to be addressed and combined with growing energy demands and it is critical to find answers soon. Furthermore, several states are considering becoming nuclear newcomers, for example, Turkey and the United Arab Emirates.

The impact of the Fukushima accident on European countries

Bradford claims that "Fukushima has shifted the political equation" (Bradford 2012, 152). Analysing the impact of the Fukushima disaster Thomas (2012) distinguishes between four types of reaction:

- Countries with a longstanding "strong anti-nuclear sentiment" like Germany, Switzerland and Italy, which decided to close the option of new reactors and, for Germany and Switzerland, to force the closure of existing plants (as Italy has already closed its nuclear power plants after a referendum in 1987);
- Countries with a nuclear phase-out policy like Spain and Belgium, which had long-term nuclear phase-out policies and which may now experience public pressure to accelerate closure of existing plants;
- Countries such as the Netherlands which may now not proceed with plans for new plants;
- Countries like the UK and France which seem determined to proceed as if the accident in Fukushima has little or no relevance at all.

Nevertheless, Italy, Germany and Sweden, which had already decided on a nuclear phase-out after Three Mile Island and Chernobyl, have reconsidered their decision in the past as concerns over climate change increased, although "the unfavourable economics did not change" (Bradford 2012). Sweden has annulled its Nuclear Phase-Out Act in 2009 and allows the construction of new plants at existing sites.[6] Germany altered its decommissioning plans and ensured a longer operation for an average of 12 years for its reactors with the Atomic Energy Act in October 2010. In Italy, the Berlusconi government planned to re-enter into nuclear generation and to generate a quarter of its electricity with French-built nuclear plants.

After Fukushima, the German government reversed its decision and after a moratorium, it decided to phase-out eight nuclear plants straightaway and the remaining plants by 2022; the Italian government's plans to build new nuclear power plants were rejected by a referendum in June 2011.[7] It remains to be seen how the pending energy supply challenges can be met in these G8 states without nuclear energy.

Example: Germany and the UK

Germany and the UK stand out as examples of the wide spread of policy reactions after Fukushima in March 2011 (Wittneben 2011). Both countries currently generate about one-sixth of their electricity from nuclear energy. The share of nuclear energy in gross electricity generation in Germany was 22.4 percent in 2010 and has now been lowered to 17.6 percent (2011) after the shutdown of eight reactors (AGEB 2012). The share of nuclear energy in net electricity supplied in the UK was 16 percent in 2010

[6] Regeringskansliet 5. February 2009. Available online: http://www.sweden.gov.se/content/1/c6/12/00/88/d353dca5.pdf.
[7] Further information: BBC News, 14. June 2011. Available online: http://www.bbc.co.uk/news/world-europe-13741105.

and 18 percent in 2011 (DECC 2011; DECC 2012) – the growth is due to maintenance outages at several stations in 2010 (DECC 2011).

Both countries have undergone a dramatic change in the last years. In 2003 the UK government was convinced that nuclear power was not economical and that nuclear plants should therefore no longer be built (Greenhalgh and Azapagic 2009). The turnaround came in 2005/2006 when the UK came "from a position of cautious neutrality and a belief that it was neither economically viable, nor ethical until a solution for dealing with radioactive waste was found, to a position of advocacy and encouragement" (Greenhalgh and Azapagic 2009, 1063). This change came with rising concerns about climate change and energy security. Nuclear energy was reframed as a low-carbon technology (Corner et al. 2011). The government in the UK is persevering with its decision that nuclear should be part of the UK's low-carbon energy mix (BERR 2008a). In 2007 the energy companies were able to register for developing new nuclear power sites (Corner et al. 2011) and in 2008 the government invited energy companies to propose plans for the construction and operation of new nuclear power plants (BERR 2008b).[8] The conservative UK government decided to build these plants without government subsidies[9]; however, it is not clear whether this will be possible (Bradford 2012; Energy Fair 2012).

In the wake of the Fukushima accident the German government, in August 2011 (Thirteenth act amending the Atomic Energy Act[10]), had decided to phase-out its nuclear energy power plants by 2022. The previous coalition of Social Democrats (SPD) and the Green Party had also already decided in 2000 to phase-out nuclear energy by 2023: the Atomic Act (2002) legally secured the agreement between the government and the four nuclear plants operators[11], in which the residual operating life of existing nuclear power plants was restricted to 32 years. However, in late 2010 the German government under Chancellor Angela Merkel and her coalition of Christian Democrats (CDU) and the Free Democratic Party (FDP) changed the course of nuclear energy in Germany and agreed on a lifetime expansion of its reactors by an average of 12 years. After Fukushima this decision was withdrawn and eight nuclear power plants were switched off immediately. The remaining nine reactors are still running for now, with the last one scheduled to be switched off by 2022.

Germany, in the centre of an interconnected European electricity system, has been criticised for this decision with a view to energy costs, energy safety aspects and an expected rise in CO_2 emissions due to fossil power stations – in Germany as well as in the neighbouring states – to fill in the gap. The extent to which this was a socio-political decision or one based on safety concerns is not clear. Nevertheless, it is certain that "Chancellor Angela Merkel faces significant public and political opposition on the issue of German nuclear power…" (Goodfellow et al. 2011, 6208).

Public attitude – the "renaissance of the anti-nuclear movement"[12]?

The political decisions after Fukushima cannot be understood without taking a wider look at different influences that interact with political decision makers. While Germany has a long anti-nuclear tradition (Wittneben 2011), public attitude towards nuclear energy in the UK has been deeply divided for a long time (Corner et al. 2011). While in some studies a "reluctant acceptance" is ascertained when nuclear energy is positioned as an answer to the climate change challenge (e.g. Bickerstaff et al. 2008), these findings have been put in perspective by other studies. The data supplied by Corner et al. (2011) suggest that public concerns about climate change and about energy security will only raise the acceptance of nuclear energy under very limited circumstances, more precisely if other – preferred – options have been exhausted. The British public is still "relatively divided and uncertain over nuclear power" (Corner et al. 2011, 4830). The research by polling firm Ipsos MORI (2011) supports these findings, showing that roughly half of Britons support (48 percent) and half oppose (51 percent) the use of nuclear energy; 20 percent of those who are against nuclear energy

[8] Greenhalgh and Azapagic 2009 give a comprehensive overview on the development of UK government policies on nuclear power since 1997. They summarise that within just a few years the government "has moved from a position of neutrality and a cautious 'let's wait and see if we need it to an overwhelming surge towards 'let's get it done as quickly as possible' (Greenhalgh and Azapagic 2009, 1055).
[9] Press Release "Proposals on Liabilities for Nuclear Operators Published". 24. January 2011, available online: http://www.decc.gov.uk/en/content/cms/news/pn11_007/pn11_007.aspx.
[10] Further information available: Federal Environment Ministry: http://www.bmu.de/english/nuclear_safety/information/doc/4300.php
[11] The agreement is available in German: http://www.bmu.de/files/pdfs/allgemein/application/pdf/atomkonsens.pdf.

[12] Jochen Stay, "X-Tausendmal quer" Der Spiegel October 2008. available online: http://www.spiegel.de/international/germany/the-world-from-berlin-the-renaissance-of-the-anti-nuclear-movement-a-589456.html.

state that their opinion has been influenced by the Fukushima accident (Ipsos MORI 2011).

Public support is one of the most important factors for future technology pathways – not only in the UK, but also in other societies (Corner et al. 2011). Most recently anti-nuclear campaigners have established Japan's first Green Party (Midori no Tö) to offer an alternative to the two main parties that still rely on nuclear power (McCurry 2012). International guests such as Bärbel Höhn (German Green Party) and Scott Ludlam (Australian Greens) took part in the Founding Congress. It remains to be seen what impact these developments will have on the use of nuclear energy in Japan.

Economic impact on energy companies

One driver for the invoked nuclear renaissance is energy security, defined as "the uninterrupted physical availability of energy at a price which is affordable, while respecting environment concerns" (IEA 2012). This shifts the focus to the economic aspects of energy production. Proponents of nuclear power claim it to be cost competitive compared to other forms of electricity generation, especially with regard to its relatively low fuel prices and taking high CO_2 prices into account.

Nevertheless, in recent years and due to the financial crisis, many utility companies have reconsidered new nuclear power plants in deregulated markets – as they have to raise billions from investors to build a new nuclear power plant (Brumfiel 2008). It can be expected that post-Fukushima safety measures might even further raise the price for a new nuclear power plant; Maria van der Hoeven, Executive Director of the IEA, therefore attests that "even with a supportive political attitude, the risk of lower nuclear investment is real" (van der Hoeven 2011).

Thomas (2012) argues that, in the past, high costs for building nuclear power plants were rarely a reason for the failure to obtain finance as electric utilities were monopolies and were thus able to pass the costs to their customers. Since the liberalisation of the electricity market, however, the situation has changed distinctly; since "no nuclear power plant has ever been ordered that would be exposed to a competitive electricity market…" (Thomas 2012, 14). Bradford therefore summarises that the most implacable enemy of nuclear power is not its risk to public health, but to investors' wallets (Bradford 2012). The Olkiluoto plant in Finland, "the first reactor ever built in a liberalised electricity market" (Thomas et.al. 2007, 5), was seen as a demonstration project to prove the feasibility of a construction in a liberalised electricity market. Initially scheduled to start in May 2009 with originally estimated costs of three billion EUR, the commissioning date was postponed several times; in July 2012 the Finnish utility TVO (Teollisuuden Voima Oyj) estimated that the start may be postponed to 2014 – five years behind schedule.[13] Based on different calculations the costs may be some two billion EUR (Bradford 2012) or even three to 3.3 billion EUR (Schneider and Froggatt 2012) over budget.

Aside from this difficult investment situation for electricity companies, recent figures for Germany and for the UK document the rising share of renewable energies – a rival low-carbon energy source. According to the latest figures from the Association of German Energy and Water Industries (BDEW), 2012 is another record-breaking year with regard to renewable energies. In the first half of 2012, energy from wind, biomass, solar, hydro, and other renewables amounted to 25.1 percent (BDEW 2012). Similarly impressive figures for the development of renewable energies were published by the Department of Energy and Climate Change (DECC) in July 2012 for the UK, where electricity generated from renewable sources increased in 2011 by 33 percent and accounted for 9.4 percent compared to 6.8 percent in 2010.

Examples RWE and E.ON

RWE and E.ON, Germany's largest electricity utilities, are active both in the German and the British electricity markets. They will thus "need to take a position or attempt to reconcile the different pathways" that the respective national policies are taking (Wittneben 2011, 2).

Before the Fukushima accident the two companies formed a joint venture, Horizon Nuclear Power, with the intention to build new nuclear power plants in the UK. Aside from this consortium two other joint ventures were set up in response to the UK Government's decision to allow for new nuclear power plants in the UK: NNBGenCo (NNB

[13] Further information available: http://www.tvo.fi/www/page/3697/.

Generation Company Limited, a consortium of EDF and Centrica Plc) and NuGen (owned by GDF Suez and Iberdrola). Initially, Scottish and Southern Energy (SSE) held a 25 percent stake in NuGen, but sold its stake to the partners GDF Suez and Iberdrola in February 2012 (NuGen 2012). In March 2012, RWE and E.ON declared their withdrawal from the project Horizon Nuclear Power. As SSE had done before them, the two companies explained that they will concentrate on renewable energies instead (BBC 2012).

RWE explained that it would continue to invest in low-carbon technologies in the UK, as the company already has done with a GBP 1.6 billion investment in gas-fired power stations. E.ON stated that it intends to concentrate on other projects with faster turnaround times than nuclear energy, which requires ten years to start generating power (BBC 2012). Furthermore, E.ON's CEO Johannes Teyssen explained that the company "came to the conclusion that investments in renewable, decentralised generation and energy efficiency are more attractive – both for us and for our British customers" (Windpower Monthly 2012). In June 2012, RWE's CEO Peter Terium stated that the company would not only end its activities in nuclear energy in the German and the UK markets, but also worldwide: "The nuclear power chapter has come to an end for us" (Der Spiegel 2012). He explained that this was due to the political decision by the German government. Combined with the rising share of renewables and the economic crisis, this resulted in a sharp decline in electricity prices (Der Spiegel 2012).

Rating agencies welcomed the decision by the German electricity companies. Moody's explained that investment in nuclear energy was risky and that the companies could now focus on less risky projects. The decision therefore was considered 'credit positive' (i-Nuclear 2012). It remains to be seen how the utilities' decisions to retract their bid for building new nuclear power plants will affect UK energy policy.

Renaissance or dead end? Nuclear power in Europe

After taking a look at the status quo of nuclear power in Europe, we concede that the often-cited 'nuclear renaissance' never actually took hold, even before the Fukushima disaster. Hesitant policy commitments to nuclear power were not only due to public concern and local opposition, but also to economic aspects, the 'self-limiting' factor. So far, no nuclear power plant has been completed in a liberalised market and examples, such as the continually delayed Olkiluoto plant in Finland, have a cautionary effect on power companies. The European and global economic crises are further intensifying the unwillingness of companies to invest in nuclear power.

Fukushima has exacerbated the problem of financing new nuclear power plants by highlighting the need for higher safety standards and creating a more critical public attitude. Decisions such as the German phase-out have implications on utilities that are operative in other countries as well, as our examples of RWE and E.ON show. At the same time the window of opportunity for a nuclear renaissance was already very limited – due to the rising market share of renewable energies and the declining costs for these technologies.

All eyes are now on Germany's Energiewende, as the Economist aptly writes: "The rest of the world watches with wonder, annoyance and anticipatory Schadenfreude" (The Economist 2012a). Will Germany have to rely on its lignite and coal power stations and thus face increased carbon emissions? Perhaps the mechanisms of the EU Emission Trading System can be trusted to ensure that other emissions are lowered. Germany is also at the forefront of increasing the share of renewables in its energy mix. The expertise acquired in renewable energy expansion, together with efforts towards gains in energy efficiency and applying combined heat and power generation, may stimulate the continued growth of these technologies.

That said, it will be equally interesting, or more so, to watch the UK policy situation unfold. Having been let down by three major power companies that had set out to build the new nuclear power facilities, the UK government will be in a poor bargaining position to keep its promise to the British taxpayer not to give concessions to future nuclear power providers. The three challenges that a nuclear renaissance was intended to address – climate change, energy security and rising energy demand – need to be taken seriously. Nuclear power has proven to be too fraught with political and economic barriers to provide an option. Other technologies will have to take its place in the energy mix, or even better, reduce the energy needed through improvements in energy efficiency, to tackle these concerns.

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Energiewende – a pricey challenge?

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Germany has set a goal to be the first major industrialized country to successfully transition to a new energy system based primarily on renewables and energy efficiency. The transformation of the country's energy system, known in German as the *"Energiewende"*, is unique not only because of the country's decision to move away from fossil fuels, but also because it has chosen to simultaneously phase out nuclear power. As a result, the electricity sector will face some of the most immediate and largest restructuring challenges. The last nuclear reactors will be shut down in 2022. Meanwhile, renewable energy is to constitute an increasingly central pillar of the country's supply system. By 2050, renewables are to supply at least 80 percent of total electricity consumption (Table 1). The technical feasibility of building an electricity system almost entirely based on renewable energy has been repeatedly studied and is today only rarely questioned (SRU 2011; Öko Institute and Prognos 2009; UBA 2010 ; DLR et al. 2012). Critics now focus instead on the perceived high costs of the Energiewende, often pointing to rising electricity prices. As a solution, they recommend fundamental changes to current renewable energy support structures. Many want to see an end to the current feed-in tariff scheme. This paper will argue that the costs of the Renewable Energy Sources Act (EEG) and the Energiewende are exaggerated, but that market support must nevertheless aim for a cost-efficient energy transition. This is best achieved by incremental reform maintaining some of the essential pillars of the current support scheme. We will evaluate the factors that have caused price increases in the past, discuss the true costs of electricity, assess assumptions for future cost projections, and analyze the role of policy. The following arguments will be developed:

a. While the costs of the EEG are growing, the majority of electricity price increases are a result of rising fossil fuel costs.
b. A successful transformation of the energy system initially demands incurring incremental costs greater than those required under a business-as-usual scenario. In the long term, however, investments can produce net savings as renewable energy technologies become cheaper and fossil fuel prices continue to rise.
c. If electricity markets were to account for the true costs of electricity, renewable energy would already be a cost-competitive option.

Table 1

Germany's main energy policy goals

Target Area	Goal
Greenhouse Gas Emissions	Reductions of 40% by 2020, 55% by 2030, 70% by 2040 and 80 to 95% by 2050 compared to reference year 1990
Primary Energy Consumption	Decline by 20% by 2020 and by 50% by 2050
Energy Productivity	Increase by 2.1% per year compared to final energy consumption
Electricity Consumption	Reduction of 10% by 2020 and 25% by 2050 compared to 2008
Heat Demand in Buildings	Reductions of 20% by 2020, while primary energy demand is to fall by 80% by 2050
Renewable Energy	18% share of gross final energy consumption by 2020, 30% by 2030, 45% by 2040, and 60% by 2050. At least 35% share of gross electricity consumption by 2020, 50% by 2030, 65% by 2040, 80% by 2050

Source: BMU (2012).

* Worldwatch Institute, Washington DC.
** German Advisory Council on the Environment.
*** Technical University of Munich (TUM).

d. The surcharge paid by electricity consumers to cover the costs of the EEG is artificially high due to industry exemptions.
e. Over the past few years, electricity suppliers have enjoyed reduced procurement costs, but have not passed on any savings to household consumers.
f. Nonetheless, current policy mechanisms have reached their limits in ensuring optimal management of the country's energy transformation. An incremental reform process is preferable to fundamental change.

Rising household electricity prices: Fossil fuel costs are the main cost driver

Electricity prices in Germany have risen consistently over the past 12 years (Figure 1). While a three-person household had to pay on average 13.94 ct/kWh in 2000, this amount has increased to 25.74ct/kWh today. These price increases are largely attributed to the costs of the EEG (BDEW 2012). The EEG levy is a surcharge added to energy users' bills to cover the cost of the feed-in tariffs. As the amount of renewable energy capacity – especially solar PV – has grown, the surcharge has increased from 0.2 cents per kWh in 2000, at the introduction of the EEG, to 3.59 cents per kWh in 2012. However, a closer look at past price developments shows that the surcharge is not the main driver of rising electricity prices.

Since 2000, consumer electricity prices have increased by almost 12 ct/kWh. While the costs of the EEG are indeed a contributing factor, they only account for about 3.39 ct/kWh (4.03 ct/kWh including VAT) or 28 percent (34 percent including VAT) of that increase. Price increases primarily reflect rising fuel costs for conventional power. The costs of electricity generation, transport, and distribution have risen by 5.43 ct/kWh (6.46 ct/kWh including VAT) over the same period, accounting for more than 45 percent (about 54 percent including VAT) of the entire price increase.

Figure 1

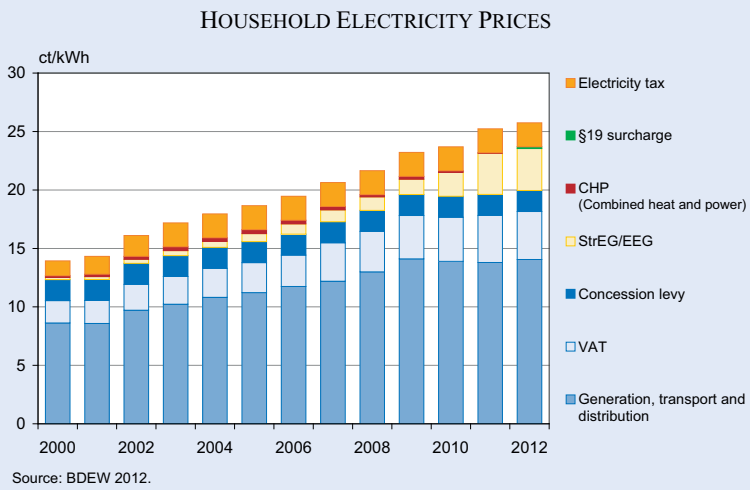


Figure 2

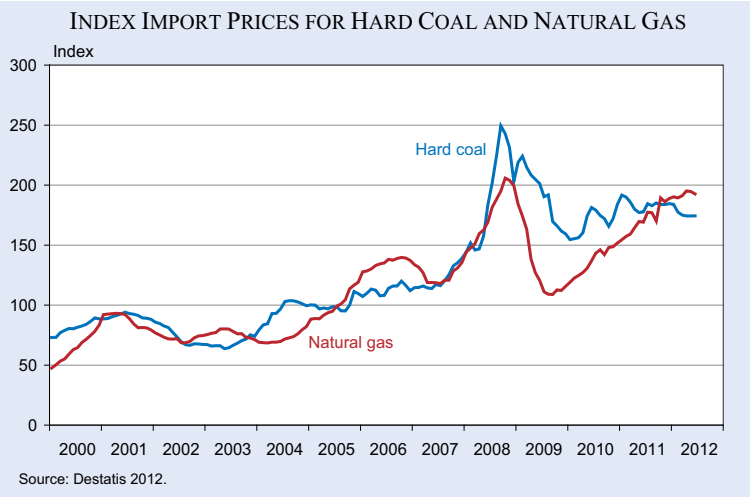


Figure 2 depicts the price indices for coal and gas imported into Germany. Both indices show a steady upward trend interrupted only by a steep increase in 2008, followed by a subsequent collapse in 2009 back to pre-financial crisis levels. Today, gas prices are once again close to their 2008 peak numbers. Coal prices have settled at levels slightly below their peak four years ago.

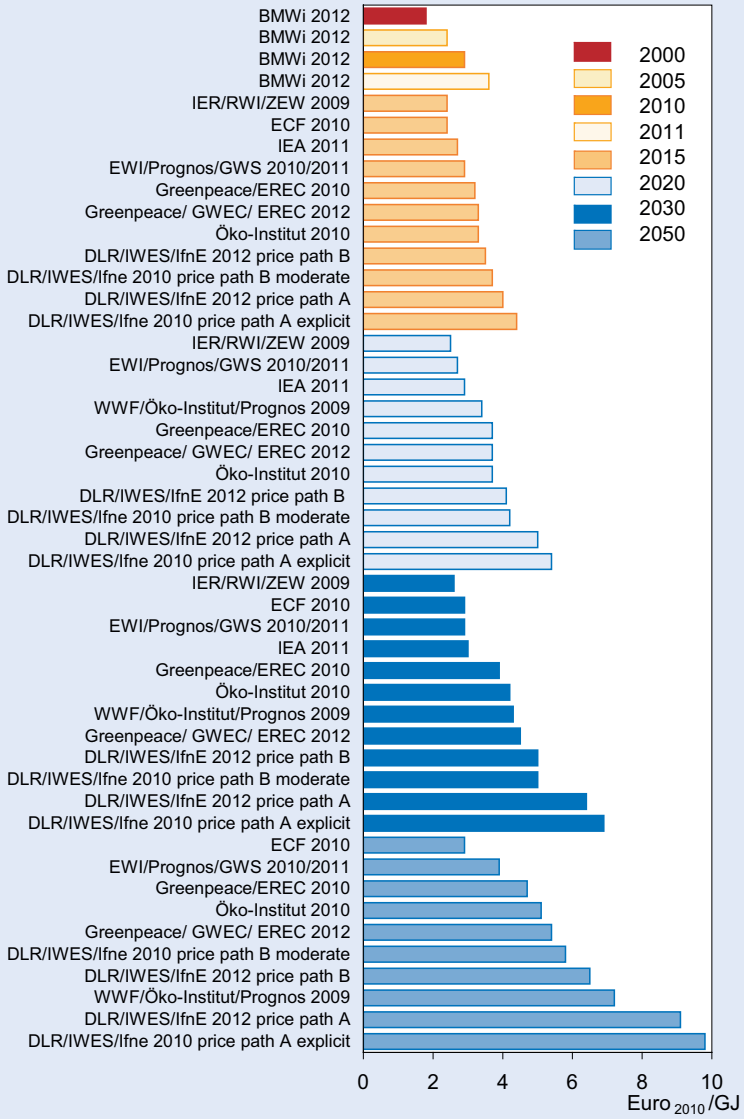
Renewable energy as a safeguard from future fossil fuel price increases

Fossil fuel costs are not only a central driver of recent electricity price increases; projections for future changes in cost also

play a decisive role. The costs of the energy transformation are considered to be much higher if stagnant or even falling fossil fuel prices are assumed. On the contrary, higher cost projections for fossil fuels translate into much lower costs of restructuring German's energy supply. Comparing a selection of recent studies shows the wide array of projections prevalent across scenario analyses (see Figure 3 for import prices of coal). To some degree these diverging assumptions reflect the unpredictability of fossil fuel costs. They are also, however, one of the main reasons for contrasting views on the costs of Germany's energy transformation.

Figure 3

PROJECTIONS OF IMPORT PRICES FOR HARD COAL IN DIFFERENT STUDIES



Source: Based on Agentur für Erneuerbare Energien 2012.

Given that scenario analyses have proven sensitive to assumed cost projections, they must be based on the best available knowledge. Increased public discussion and scrutiny of reasonable assumptions should therefore take place. For example, the assumption that the price of conventional energy will either remain stagnant or decrease must be questioned in the context of growing global demand for energy and limits to an easily available supply.

The costs of renewable energies, on the other hand, have been falling and are expected to continue to fall in the future (IRENA 2012; IPCC 2011; for Germany SRU 2011; UBA 2011). Technologies become cheaper as manufacturers accumulate experience, make improvements and enjoy economies of scale. The best wind farms in the world already produce electricity as economically as coal, gas and nuclear reactors; the average wind farm is expected to be fully competitive by 2016 (BNEF 2011; IRENA 2012). In Germany the life-cycle costs of new renewable energy generation sources are nearing those of new conventional power plants. Onshore wind energy in good locations can already compete with gas and coal plants (Fraunhofer ISE 2012).

The decrease in solar PV costs has been both unexpected and unprecedented. Crystalline silicon PV module costs have fallen by over 60 percent in the last two years (IRENA 2012) and are now competitive with residential electricity tariffs in many countries, including Germany. For example, the levelized costs of electricity (LCOE) for small PV systems in locations with solar radiation of 1300 kWh/m2/year, typical for southern Germany, range from 14 to 16 cents/kWh. LCOE for PV systems in northern Germany, with an average radiation of about 1100 kWh/m2/year, tend to be around 20 cents/kWh or lower (Fraunhofer ISE 2012). The life-cycle costs of

even the most expensive systems are therefore substantially below consumer electricity tariffs of 25 to 26 cents/kWh.

Further cost reductions are expected if capacity growth can be maintained. Scenario analyses for Germany have concluded that renewable electricity generation costs may be in the range of 6–7 cents/kWh by the year 2050 (DLR et al. 2012; SRU 2011). The Association for Electrical, Electronic and Information Technologies (VDE 2012) argued that generation cost increases in an electricity system where renewable energy accounts for 80 percent by 2050 do not exceed ten percent in comparison to 2010, even when accounting for the costs of electricity storage.

Initially, financing the *Energiewende* requires additional investments (DLR et al. 2012; SRU 2011, chapt. 4). However, these investments are likely to become net savings in the long-term. Future fossil fuel costs, along with the speed at which the cost reduction potentials of renewable energy technologies can be fulfilled, largely determine when this tipping point will be reached.

Questioning the economics of Germany's energy transformation neglects the dangers of continued reliance on fossil fuels, as well as the advantages renewable energy can bring in the future. The energy turnaround should be regarded as a safeguard capable of shielding Germany, an energy importer, from volatile global markets. Critics are, however, correct to call for careful management of the energy transformation in order to reduce initial costs and maximize long-term benefits. Effective and efficient policy design is crucial in this regard (see discussion below).

The true costs of conventional electricity: renewable energy as a competitive energy source today

Fossil-fueled electricity production constitutes the greatest source of GHG emissions in Germany and is therefore a major cause of global climate change. In addition to carbon dioxide, conventional power plants also emit nitrogen oxides (NOx), sulphur oxides (SOx), and particulate matter (PM), all of which damage human health, infrastructure and buildings, as well as ecosystems and biodiversity. They can also have negative impacts on crop yields; even so, conventional power has historically received significant government support.

Debates over the costs of Germany's energy transition often neglect to take into full account the pollution and climate change costs of coal and gas power, the risks of nuclear energy, and the amount of public support different generation technologies have received. Electricity prices do not reflect these costs of electricity generation to society. The EU emissions trading scheme and the electricity tax internalize some of these costs. However, they only do so partially. The price of carbon is determined by the marginal cost of avoiding the last unit of carbon that allows a country or state to meet its short-term emissions target. It is not a measure of potential future damages due to climate change. The electricity tax is also at best a partial internalization of the environmental costs of electricity consumption (Breitschopf and Diekmann 2010). While it increases with consumption levels, several exemptions apply to industry. The tax rate is also independent of the energy source used to generate electricity.

To measure the true costs of electricity, Küchler and Meyer (2012) incorporated direct financial support, tax concessions, and currently un-priced environmental damage to wholesale electricity prices and compared these to average levels of EEG support given to various renewable technologies. Unpriced damages arising from pollution and climate change are the biggest factors changing the relative competitiveness of renewable and conventional electricity generation technologies (for an assessment of environmental costs see also Krewitt and Schlomann 2006 and Breitschopf et al. 2011). The societal costs of one kWh of wind energy amount on average to 8.1 cents, and those of hydropower to 7.6 cents. In comparison, one kWh of coal power costs on average 15.6 cents (lignite) or 14.8 cents (hard), of natural gas 9.0 cents, and of nuclear power 42 cents. Apart from the high average support given to solar PV (36.7 cents/kWh), renewable energies are therefore cheaper today than conventional power.

The competitiveness of renewable energies will also further improve with technical progress and innovation. If markets fully depicted the societal costs of electricity generation, investments decisions on new generation capacity would probably change dramatically. Wind energy would generally be a more attractive investment than coal power; and natural gas plants would be the only profitable conventional generation source.

The EEG levy: exceptions are driving up its costs

Critics tend to point to the EEG levy as proof of what are, in their opinion, uncontrolled increases in the cost of the energy transformation. In 2013 the surcharge is expected to take another big leap to between 4.8 and 5.3 ct/kWh. It is easy to point to Germany's solar power investment boom as the main culprit. However, a considerable proportion of the surcharge increase is also due to growing industry exemptions. The EEG levy should not be considered an adequate indicator of the costs of restructuring the electricity system, since a shrinking number of consumers carry the burden of paying for growing support for renewable energies.

Energy-intensive industries are largely exempt from the surcharge and pay only 0.05 ct/kWh. According to estimates by the Federal Network Agency (Bundesnetzagentur 2012), companies enjoying the reduced rate currently consume approximately 18 percent of electricity in Germany, but pay only 0.3 percent of the total amount collected by the surcharge. The burden of paying for the EEG consequently falls disproportionately on the remaining consumers, and especially on households and small and medium-sized companies. Instead of allocating the costs more fairly, the government has been further reducing the threshold that companies are required to meet to qualify for privileges, meaning that an increasing number is becoming exempt from paying for the costs of the EEG.

The exemptions for energy-intensive industries are justified mainly by reasons of international competitiveness. The criteria for qualifying for the reduced surcharge, however, include electricity consumption and the share of a company's electricity costs as part of its gross value added. A measure attempting to quantify exposure to international competition, however, is not included in these criteria.

Current criteria to qualify for exemption not only disregard a true measure of international competitiveness, but also create perverse incentives that might lead to increased overall electricity consumption. Companies that just barely clear the consumption threshold for exemption are encouraged not to invest in energy efficiency improvements. Companies close to the threshold are even encouraged to increase their electricity consumption in order to qualify for the exemption.

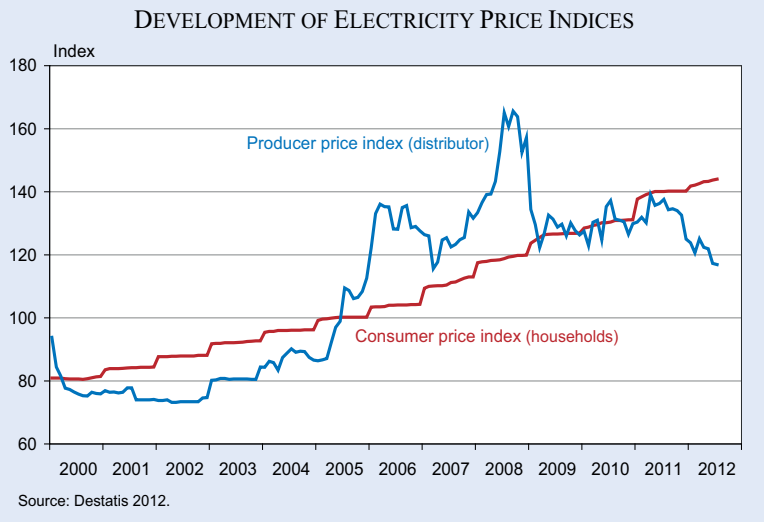
As concerns over rising household electricity rates grow, the extent of industry exemptions becomes harder to justify. Energy-intensive industries not exposed to international competition should pay a greater share of the EEG costs. This would reduce the current EEG levy of 3.59 ct/kWh paid by consumers by around 0.5 ct/kWh (Bundesnetzagentur 2012).

The rationale for granting privileges to industry should also be scrutinized in the context of current market developments. Wholesale electricity prices have fallen between 10 to 20 percent over the last year (Harms 2012), despite Germany's decision to retire 8 nuclear reactors. The price reductions have not only been visible in spot markets, but also in futures markets, which play a greater role in shaping the procurement strategies of electricity suppliers.

The so-called 'merit order effect' constitutes one of the primary causes of lower wholesale prices. In competitive wholesale electricity markets, available generation sources are ranked in ascending order of their marginal costs of production, such as fuel or operation and maintenance costs. Since sources with lower marginal costs are always able to outcompete generation technologies with higher marginal costs, they are the first to be brought online to meet demand. The plants with the highest marginal costs are last in the merit order and set the price all generation resources receive. Unlike producers of electricity from conventional power (who need to buy combustion fuel), wind and solar energy producers have marginal costs that are close to zero. While the lifecycle costs of electricity from wind and solar might be higher than those of some conventional power sources, they can produce electricity very cheaply once a plant is built. If electricity demand remains the same, a growing supply of electricity from renewable energy sources reduces wholesale electricity prices, as conventional plants with the highest marginal costs are pushed out the market. They are replaced by plants with lower marginal costs that consequently set a new, lower electricity price.

The EEG levy, however, does not take into account the benefits of lower wholesale electricity prices, especially for the energy-intensive companies that purchase their electricity directly on the exchange. On the contrary, as a result of how the surcharge is calculated, the merit order effect even leads to an increase in the EEG levy. Its amount is determined

Figure 4



by the additional costs that accrue after the profit from selling renewable electricity at the electricity exchange is subtracted from the total support costs of the feed-in tariffs. A lower electricity price at the exchange means less profit from selling renewable electricity, and the need for the surcharge to cover a greater share of the support costs. A better reflection of the EEG's costs would be to calculate a "net surcharge" by subtracting the extent of price reductions due to the merit order effect from the current amount of the EEG levy. Past studies have estimated the merit order effect to be approximately 0.5 ct/kWh (Sensfuß 2011). The effect is likely to grow with added renewable electricity production capacities. Like the EEG levy, it should be calculated annually.

Electricity price indices: rent seeking

Household electricity prices are not only unnecessarily high because of the artificially increased EEG levy; electricity suppliers are also failing to pass on the cost savings that result from lower procurement costs due to falling wholesale prices (see Harms 2012 for a discussion). A comparison of the price indices for household electricity and producer prices confirms this view. While household prices have been consistently increasing, the producer price index has been more volatile, but steadily decreasing since 2008 (Figure 4). Moreover, the trend of the price index for special-contract costumers, generally large industrial companies, also goes in the opposite direction. In comparison to its 2008 figures, prices have marginally declined.

Electricity consumers are advised to compare electricity rates of different suppliers and change their providers if necessary. The above analysis indicates that the EEG levy was used to push through unnecessary electricity price increases. Concessions were only made to large industrial companies, probably because they have significantly greater bargaining power than individual consumers.

Incremental versus fundamental change of the supporting policy mechanisms

Despite the exaggeration of the costs of the Energiewende in the form of the EEG, Germany's success in transforming its electricity sector, as well as its international replicability, will largely depend on reducing the costs to a minimum. Over the last few years the support for solar power has revealed the dynamic inefficiency of the EEG in adjusting its support levels to accommodate a rapidly changing market. The fact that the cost of photovoltaic (PV) modules fell rapidly while feed-in tariffs changed only slowly enabled investors to enjoy very attractive rates of return, which have channeled a great deal of money into PV development in Germany.

To some degree, the EEG has become the victim of its own success. It succeeded in attracting investments in PV and adding capacity to the market, both of which have been fundamental to achieving further technological development and subsequent cost reductions. However, the additions in PV capacity have far exceeded government targets. Solar power remains a more expensive renewable energy source when compared to wind or hydropower. The unprecedented capacity additions therefore also contributed to increasing the costs of the EEG. Additional tariff reductions were not sufficient to cool the overheated investment climate. Investments increased even further in the time between announcing and implementing tariff cuts because investors wanted to take advantage of the higher tariffs before they were reduced.

Critics of the EEG and the Energiewende consistently cite solar power as the reason for why fundamental change in the support of renewable energies is needed (Acatech 2012; Monopolkommission 2011; Sachverständigenrat für Begutachtung der gesamtwirtschaftlichen Entwicklung 2011). Many advocate a quota system, also referred to as a renewable portfolio standard (RPS) or renewable obligation, whereby utility companies are required to ensure that a certain percentage of their generation sold or capacity installed comes from renewable energies. However, practical experience with quota systems has been mixed at best (Hey and Weber 2012). In comparison to feed-in tariffs, they have been less successful in incentivizing deployment of renewables. Quota systems have also not been as cost-efficient as economic theory claims. Although they channel investments into the cheapest available resource, banks charge project developers a higher risk premium for their loans. The profitability of projects is less certain than under feed-in tariff schemes because income streams depend on volatile markets for tradeable credits.
Quota obligations have often meant that for a given region, investors favored the same technology. A successful integration of renewable energy, however, is much easier when it adds a mix of renewable energies that can complement each other. Most quota obligations have either been replaced by feed-in tariff schemes or supplemented by additional provisions to attract investments in a broader mix of technologies.

The current policy structure needs to be reformed to manage the challenges of an electricity system that relies on growing shares of renewable power. Renewable technologies have matured, going from being a niche market to becoming a central pillar of the electricity market. Adding further generation capacity can no longer be the sole aim of renewable energy support policies. The aim must also be to optimize the renewable energy mix and to make supply more responsive to demand, either directly or indirectly by incentivizing central or decentralized storage technologies and combining electricity, heat, and mobility markets (Schleicher-Tappeser 2012; Lund and Münster 2006; Münch et al 2012).

The latest reforms of PV feed-in tariffs are a step in the right direction to prevent the solar market from overheating again. Monthly adjustments of tariffs ensure greater flexibility of the system to respond to quickly changing deployment costs. Establishing a foreseeable end to fixed tariff-payments once installed PV capacity reaches 52 GW may be useful, as long as it creates pressure for improved system compatibility of high PV levels. Greater cost efficiency for large infrastructure projects, such as offshore wind farms, can also be ensured by combining feed-in tariffs with competitive tenders, in which project developers bid for the level of support they need to build a wind park in a predefined location (SRU 2011).

The demands of renewable energy policy, however, also need to be realistic. Restructuring Germany's energy supply system cannot be accomplished solely by implementing good renewable energy support policies. Adjustments must also be made in the conventional power sector. The conventional system must accommodate renewable energy through greater flexibility in its own production (see VDE 2012 on the need for greater flexibility). Current government plans to build additional coal plants, however, counteract these efforts.
Moreover, energy efficiency must be made a higher priority. Reduced electricity demand makes the energy transformation cheaper, easier, and faster. It prevents the creation of additional capacity requirements, minimizes Germany's reliance on imported and climate-damaging fossil fuels, and reduces the likelihood of potential electricity price increases.

Conclusion

Transitioning Germany's electricity production to renewable sources in the most effective and cost efficient way possible will remain a matter of concern for quite some time. During a transitional phase, production costs for renewable energy will be higher than those for conventional sources. A dynamic, more comprehensive perspective that takes into account future technological development, however, reveals the enormous potential of renewable energy to become the cheapest energy source. If the external costs of conventional power were accounted for, renewables would already be cost competitive.

Despite some overdramatized arguments, the real driver of increases in German electricity prices is not the cost of renewable electricity, but rather the rising cost of fossil fuels. In view of those facts, calls for a fundamental revision of the German feed-in-tariff system are unjustified and counterproductive. They only seem aimed at curbing the growth and innova-

tion trajectory of renewable energy technologies. Reforms of market design should offer a framework for stable growth, while ensuring the complementarity of generation sources, providing for dynamic efficiency, and improving market responsiveness of supply – including incentives for electricity storage and load balancing. Incremental reform of the feed-in-tariff system meets these criteria better than the frequently advocated quota system.

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Magnetic Fusion – an option for base-load electricity

Sybille Günter*

Energy can be gained through nuclear reactions either by splitting heavy nuclei, or by fusing light ones. The former is used in today's nuclear power stations. It works in the form of a chain reaction in which neutrons, liberated in the breaking-up of a nucleus split further ones. Active control measures are needed to ensure that the number of fission reactions remains constant in time and thus no unwanted power excursions occur. The new nuclei produced are radioactive. Those nuclei that decay fast produce a strong afterheat that needs active cooling even after the reactor has been shut down. Neutrons capture also produces nuclei heavier than U238. Some of the long-lasting nuclei have half-times of over 10,000 years, calling for geological storage of the radioactive waste generated.

Nuclear fusion offers a different path to the usage of nuclear energy. In the foreseeable future only one reaction type is likely to be exploited on a terrestrial scale. Two hydrogen isotopes – deuterium (2H) and tritium (3H) – combine to form a He-atom and set free a neutron, releasing energy in this process (Figure 1). Thus, the reaction product of a fusion reactor is helium, an inert gas, which is not radioactive and does not produce any afterheat. The fusion reaction is not a chain reaction, and there is no possibility of loss of control due to insufficient safety provisions in the design, or of re-criticality in case of a melt-down as occurred in Fukushima.

Nuclear fusion requires high energy on the part of both partners. This reaction is analogue to combustion, but the burn temperature is in the 100 million °C rather than the several 100 °C range, and the energy set free in a single reaction is correspondingly several million times larger. However, as with combustion we face the need to first obtain a sufficient temperature and to keep the reactants from cooling too much from contact with their cold surroundings.

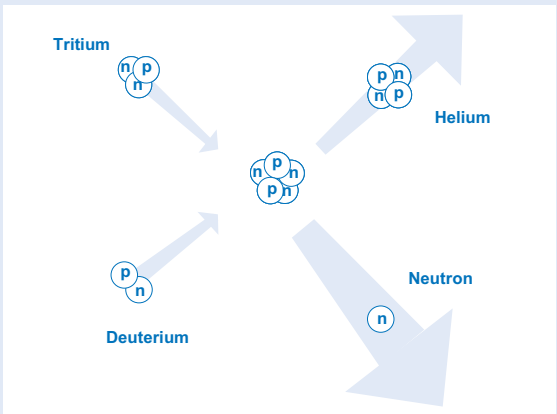
In principle there are two ways that a fusion reactor can operate: via so-called inertial fusion and via magnetic fusion. For inertial fusion a small pellet with frozen deuterium and tritium is heated up very fast so that a sufficient number of fusion reactions can occur before the pellet explodes. Research into inertial fusion energy will not be reported here as it is mainly performed outside Europe and – in the USA – driven to a large extent by military interests.

50 years of fusion research – what has been achieved?

Research into the field of magnetic fusion started as early as the 1960s. The long time-scale needed to develop fusion as an energy source is caused by the enormous challenges to be tackled on the way to creating a fusion reactor. One challenge is the high temperature: as discussed above, in the center of a fusion reactor it has to be 100 million °C, i.e., temperatures about ten times higher than in the solar core have to be reached.

Figure 1

Fusion Reaction



Fusion reaction: The two hydrogen isotopes – deuterium (2H) and tritium (3H) – fuse to a He-nucleus and set free a neutron, releasing in this process 17.6 MeV of energy. In a future power plant the energetic helium nuclei heat the plasma. The energetic neutrons heat up the walls and breed tritium out of lithium.

Source: Max Planck Institute for Plasma Physics.

* Max Planck Institute for Plasma Physics.

As a stationary fusion power plant is a system with inherently low power density – only about one hundredth of that of a fission plant – the heat insulation has to be very good (about 50 times better than polysterene). Fortunately, at these temperatures, a gas is fully ionised, and the motion of the particles of this so-called plasma can be influenced by electromagnetic fields. Only a strong and properly shaped magnetic field in combination with a very low plasma density can provide this exceptional insulation, but even then a large volume is required for self-sustaining burn.

The two magnetic configurations that have proven successful are called tokamak and stellarator. The tokamak is by far the most advanced configuration. For confinement it requires the continuous flow of an electric current in a donut-shaped plasma. In present devices this plasma current forms the secondary loop of a transformer, and can therefore be maintained only over a certain time, which – in a reactor – could, however, amount to several hours. Then the discharge would have to be stopped, and the transformer recharged. Thermal storage would provide for continuity of the electric power production during this short interval (on the scale of several minutes). An alternative to the tokamak is the stellarator. Both have in common their basic topology of a toroidal plasma, but the stellarator has a considerably more complex magnetic configuration. It is, however, intrinsically stationary.

Since its beginning, the progress of fusion research has been remarkable. Before the end of the last century temperatures of up to 400 Mio °C had been achieved in tokamaks. For stellarators sufficiently high temperatures can only be achieved if the complex magnetic geometry is carefully optimised to confine the energetic particles. Such an optimization was not possible before high-performance computers became available. Therefore, the stellarator is at least one machine generation behind the tokamak.

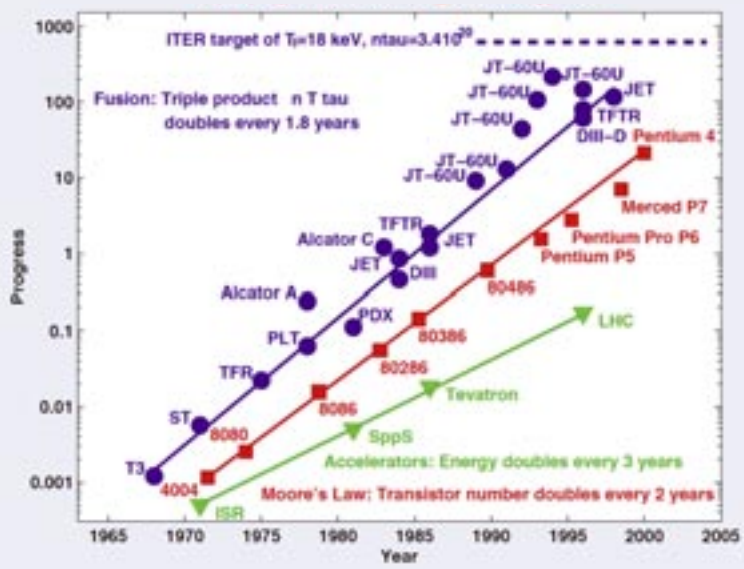
The universally accepted measure of progress in fusion is the product of pressure and the energy confinement time – the latter expressing the quality of thermal insulation. This quantity has been increased by about a factor of 100,000 since the beginning of tokamak research. This progress is impressive even if compared to the development in the performance of computers where the number of transistors on a chip roughly doubles within two years. From 1965 until 2000 progress in fusion was just as fast. It has only slowed down during the last ten years, as a machine of ITER-size (see below) is needed to improve heat insulation sufficiently to gain more energy from fusion reactions than is needed to heat the plasma (Figure 2). This remarkable progress in fusion research is unfortunately not reflected in public opinion. For fusion to become an energy source, a certain threshold in the above mentioned parameter has to be overcome. Unless this threshold is reached, the power needed to heat up the plasma to sufficiently high temperatures exceeds the power released by fusion reactions.

ITER – ten times more fusion power than power needed to heat up the plasma

All of today's existing devices are too small to achieve the required heat insulation. Therefore, more power than produced by fusion reactions is needed to heat up the plasma. The world record for fusion power has been established at the largest

Figure 2

RAPID PROGRESS IN DIFFERENT HIGH TECHNOLOGY FIELDS

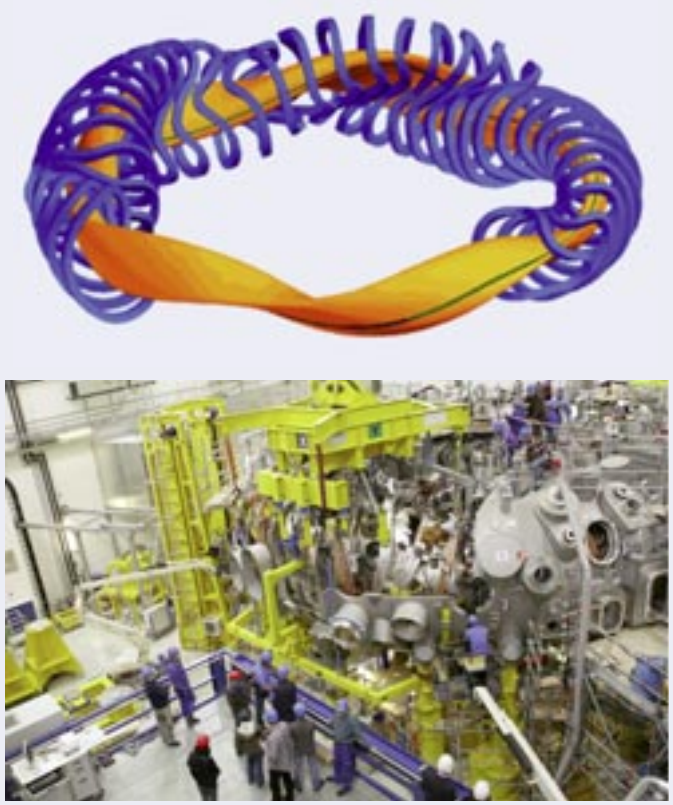


Source: Lister and Weisen (2005).

tokamak presently existing, JET (Culham, UK), where 16 MW of fusion power have been produced, corresponding to 60 percent of the heating power injected to the plasma. In order to demonstrate a positive power balance, the international experimental reactor ITER – a tokamak – is currently being built in Cadarache, France. ITER will be the first device to demonstrate power production exceeding the heat input to the plasma by an order of magnitude. ITER is a joint enterprise launched by seven partners: the EU, Japan, Russia, USA, China, the Korean Republic and India.

Figure 3

THE COIL SYSTEM OF THE STELLARATOR W7-X, UNDER CONSTRUCTION IN GREIFSWALD, GERMANY



Note: All superconducting coils are already manufactured and assembled. The device will go into operation in 2014.

Source: Max Planck Institute for Plasma Physics.

ITER will be larger in linear dimensions by about a factor of two compared to the largest presently existing tokamak – JET. Besides JET, several present-day tokamaks, among them the best-suited European tokamak ASDEX Upgrade in Garching, Germany, are already now preparing for ITER operation. They can provide a "step-ladder" approach to developing efficient ITER operational scenarios in a similar way to wind tunnel experiments. The flexibility of the smaller devices makes it possible to test novel ideas more rapidly and at a moderate cost. Subsequently those ideas can be tested on JET and afterwards extrapolated to ITER. In addition, these smaller tokamaks offer the opportunity to train the generation of physicists and engineers that will later operate ITER.

The stellarator Wendelstein 7-X

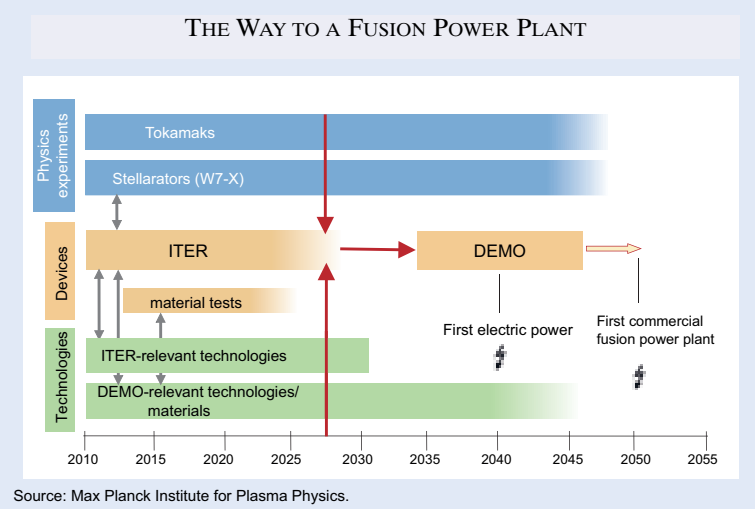
The stellarator Wendelstein 7-X, currently being built in Greifswald, Germany, will start operation in 2014. Just like ITER, it is a super-conducting device. The geometry of the magnetic field coils is given in Figure 3 together with a photograph taken during assembly. As the first optimised stellarator of sufficient size, W7-X shall provide the proof that such stellarators can achieve sufficiently high temperatures and heat insulation comparable to that of tokamaks. After commissioning, the first operational period (2015–2017) will allow for pulsed operation only. The completion phase (2017–2019) will enable the device for steady-state operation. Although the geometry of tokamaks and stellarators is quite different, the results of ITER will also be important for stellarators.

The way to a fusion reactor

Assuming that the ITER experiment is successful, there will be one final step to take on the road to setting up a commercial fusion power plant, namely building a demonstration reactor (DEMO). DEMO is expected to demonstrate all required technologies needed for a commercial power plant. It will provide electricity to the grid, but it is not expected to be economically competitive initially. Figure 4 presents a possible roadmap to a fusion power plant. In a fusion reactor the neutron fluences to the walls will be much larger than in ITER. Therefore, parallel to

ITER, a dedicated programme in materials research is needed. Such a material development programme is already part of the European fusion programme. It has resulted, for example, in the successful development of low activation steels like Eurofer. However, the fusion-generated neutrons have a different energy spectrum than those in fission reactors. Therefore, to allow for ultimate testing of the developed materials, a dedicated neutron source is needed that can generate a sufficient flux of neutrons with an energy spectrum similar to that of fusion.

Figure 4



Source: Max Planck Institute for Plasma Physics.

If the aim is to build the first demonstration reactor (DEMO) immediately following successful ITER results, the stellarator will not be ready in time. In that case DEMO would have to be a tokamak. According to the European roadmap to fusion energy, the first electricity to the grid is expected to be available around the year 2050. As the crucial ITER experiments are planned for 2027, one does not expect to start building DEMO before 2035. With a usual construction time of about ten years, DEMO could be ready by 2045. Some countries, however, have much more ambitious plans. China, for example, plans to start building a kind of a DEMO reactor in the near future (around 2016). This reactor would be ready prior to 2030 and could thus demonstrate provision of fusion power to the grid as early as then. China plans to replace part of its nuclear power stations with fusion power plants during this century with the aim of producing 100 GW of fusion-powered electricity by 2100.

In a future fusion reactor, the heating of the plasma will almost entirely be provided by fusion energy. The fusion-generated He-ions remain trapped in the magnetic field and keep the plasma hot, whereas the neutrons leave the vessel and are absorbed in a blanket. There they deposit their energy – which is subsequently further used for electricity generation in a steam or gas turbine – and react with lithium nuclei to produce tritium, which does not occur naturally. A Gigawatt power plant would only need a couple of hundred kgs of lithium and deuterium (which occurs naturally in water) per year, and on this scale the availability of the raw materials is not a constraint: they would be available worldwide and for several thousands of years, extending to millions of years, if we tapped the lithium in sea water.

No final storage of radioactive waste needed

Although no radioactive products result from the fusion reaction, radioactive isotopes are produced due to the neutron bombardment of components in the reactor core. The amount of radioactive elements and their half-time depend heavily on the choice of materials used. For example, steels (Eurofer) have been developed which could be fully recycled within a period of a hundred years. After this time, the radioactivity of such steels is comparable to that of coal ash produced in a coal power plant during its life-time. Further materials research is underway to reduce the half-time of the radioactive waste of a fusion power plant even further. It is thus to be expected that the radioactive waste of a fusion reactor will be recycled so that no final storage of any waste will be required.

Inherent safety of fusion reactors

Compared to a fission reactor the safety of a fusion reactor is not only a consequence of provisions taken in its construction and operation, but is simply due to the inherent absence of certain risk factors:

- In contrast to fission, fusion does not involve a chain reaction. The number of fusion reactions

remains constant in time. Hence, there is no need for an active control to avoid unwanted power increases.

- In fission reactors, the amount of radioactive fuel required for over a year is stored (a few hundred tons). In contrast, in fusion reactors, the only volatile, radioactive element is tritium, which is both produced and consumed in the reactor itself and the inventory required will therefore be kept very low (about 1 g in the plasma).
- The products of fission reactions are radioactive. They decay even after the shutdown of the reactor, which is accompanied by significant heat production. This afterheat needs to be controlled by cooling. If cooling completely breaks down, a meltdown as occurred in Fukushima is possible. The reaction products of fusion are not radioactive. A small afterheat only occurs due to the activation of the walls by the fusion neutrons. This afterheat, however, is about a hundred times smaller than in fission reactors. Therefore, even in case of a complete loss of cooling, the decay heat cannot lead to gross melting of structures.
- With fusion the energy per volume in the reactor core is about a hundred times smaller than it is in a fission reactor. Thus, no accidents driven by in-plant energies, not even the most severe accidents that can be conceived, could result in confinement failure.

The inherent safety properties, the crisis-proof availability of the fuel and the promise of small environmental impact make fusion an attractive alternative for CO_2-free electricity production, which is particularly well-suited to covering base-line loads. Given the remaining physics questions to be addressed and the need to further develop and characterize materials, fusion can only make a significant contribution to the electric energy supply in the second half of this century. However, even after 2050, electricity needs are still expected to rise (by a further factor of about three by 2100) and some of the shorter-term solutions to the CO_2-problem, like the enhanced usages of gas, nuclear fission and CO_2-sequestration, might face a shortage of suitable repositories by that time. A further growth of renewables will compete for space and fertilizers with other needs, and some of its associated technologies – like energy storage – still carry in themselves significant development risks. Fusion, which is available continuously and independently of location, promises to offer a significant complement to renewables.

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Smart grids – the answer to the new challenges of energy logistics?

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Christian Doetsch** and
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Introduction

The finite quantity of fossil energy resources, as well as global warming due to the greenhouse effect necessitates a massively increased utilization of renewable energies (RE). The shift to RE is a worldwide trend, although there are quite distinct regional differences. According to the IEA Energy World Outlook, the share of RE in the electricity sector, will increase three to fourfold from 2009 to 2020 (IEA 2011, 178), and will increase by a factor of six to 14 by 2035.[1] The EU regards itself as a pioneer in the use of RE and has committed itself to the "20-20-20" initiative in order to improve sustainability and energy safety while reducing the greenhouse effect. The plan is to lower greenhouse gas emissions by 20 percent, increase the share of RE by 20 percent and improve energy efficiency by 20 percent by 2020 (ECEEE 2011). The government of the Federal Republic of Germany has set itself even more ambitious goals of increasing the share of RE from 20 percent (2011) to at least 35 percent in 2020, and to generate over half of its electricity from RE (BMU 2011), increasing the latter's share of overall supply to 80 percent by 2050 (Nitsch et al. 2010). Even although such self-assigned, highly ambitious goals frequently cannot be fully achieved, they are sometimes even realized ahead of schedule. For example, the real expansion of RE in Germany – especially of photovoltaics (PV) – progressed considerably faster than anticipated by serious forecasts (Nitsch 2007) and has far exceeded those forecasts. The PV share, which had been forecast as 25 GW total capacity for the year 2050 in 2007, has already exceeded that level and stands at 28 GW (Bundenetzagentur 2012), higher than the objective at the time of writing, in just five years instead of 43 years. However, this extreme dynamic causes problems of both a technical and financial nature.

Technically, the problem of integrating the RE into the energy system has to be solved; financially, the unplanned high increase of the Renewable Energy Sources Act (EEG) levy is under discussion.

These dramatic changes in the supplier structure in many European countries and especially in Germany are illustrated in Figure 1. The trend is shifting – as illustrated by the example of Germany – away from base load power plants (nuclear power, lignite coal, mineral coal) to less plannable and controllable RE, especially electricity from wind power and photovoltaics. However, since an electric grid – as opposed to other grids (gas, water, etc.) has to be balanced at any given point in time and does not feature any intrinsic storage capabilities, all fluctuations – which had been virtually unheard of on the supplier side previously – now have to be compensated for at any given time.

Beyond this country-specific overall view, the regional disparities that exist between generation and consumption – especially between the North and the South of Germany – still pose a huge problem. The newly added decentralized feeding-in of energy, through decentralized, roof-mounted PV systems or decentralized combined heat and power plants for instance, poses completely new challenges for the previously strictly uni-directional electric grid.

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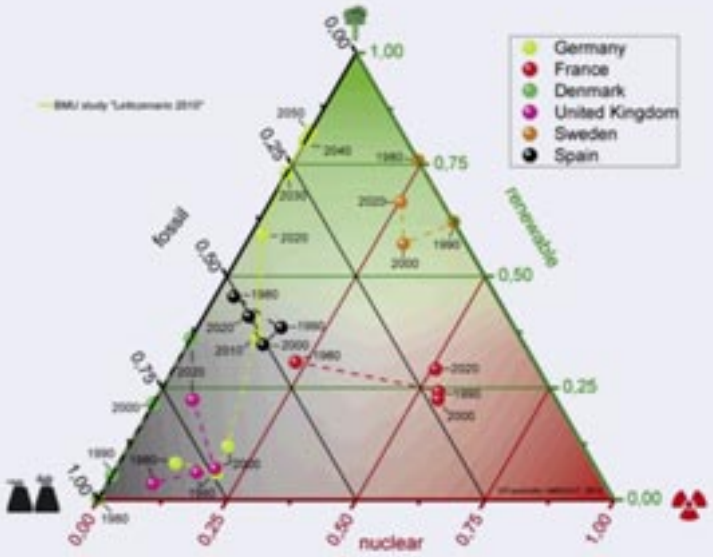
*** Fraunhofer IOSB-AST.
[1] Increase in "Non-Hydro Renewables" from 650 TWh (2009) to 2000–2700 TWh/a in 2020 or to 4000–9000 TWh/a in 2035 – depending on different scenarios.

Figure 1

INSTALLED ELECTRICITY GENERATION POWER IN DIFFERENT EUROPEAN COUNTRIES



Note: Share of the installed supply load from nuclear power, fossil and renewable energies, their development to date and expansion planning (dotted lines).
In this instance, nuclear power is prototypical of the base load, whereas the fossil energies are primarily for controllable and plannable energy and the RE primarily for uncontrolled, fluctuating energies, although there are exceptions in each of these fields.

Source: Statistics and prospects for the European electricity sector (1980-1990, 2000-2020), 2005, BMWi (1990), BMU Study "Leitszeario 2010" Basiszenario A, and EIA International Energy Outlook 2011.

Spatial energy balancing demand

Unlike with conventional power plants, which are often located near conurbations and thereby near consumers, wind power and photovoltaics systems are predominantly installed at advantageous locations with high yield. Resulting from this is a considerable electricity surplus through onshore and, in the future, offshore wind systems in Northern Germany, as well as a very high feeding-in of electricity into the low voltage grid due to PV system in rural regions in the South of Germany.

In Figure 2 (Fraunhofer 2012), 146 regions and their annual energy balancing needs for the year 2030 are depicted in a map of Germany. Clearly visible are multiple regions in the North with an annualized surplus in electricity, regions with a very high load, e. g., conurbations in the West, as well as in Berlin and Hamburg, although there are also, especially around conurbations, areas with an electricity surplus (also including power plant locations) and where connecting electricity routes affords a balancing, here. This map clearly shows that there is a balancing need between generation (blue) and load centers (red) that cannot be covered by the storage of electricity since storage for more than a year would not make any sense whatsoever. Here, an expansion of the grid is almost the only sensible option.

At the same time there are also more or less balanced regions, in the South of Germany and all over the country. Moreover, a more in-depth review shows that even these areas with a balanced balance sheet are subject to considerable fluctuations within a year and therefore also need to be temporally compensated. These time spans for balancing may amount to minutes, hours, days, or even weeks. Here, grid expansion offers only a very limited potential for balancing.

Energy logistics - energy balancing measurements

In the easiest, but not necessarily cheapest case, the spatial and temporal disparity between generation and consumption can be realized through energy storage systems (temporal disparity) and grid expansion (spatial disparity). However, in reality, there is a much broader bundle of intelligent technical solution options that each can solve part of the grid balancing (Figure 3).

In addition to energy storage systems that balance the temporal disparity and grid expansion, which compensates for the spatial disparity, there are another four options. The first option is producer management, i. e., the curtailment especially of wind power and/or photovoltaic systems; the advantage of this option is the minimal investment required while the disadvantage is that practically free energy is given away. A second option is demand side management whereby dispatchable electric loads are turned on or off on short notice, which also allows for load balancing in the grid. Here, the challenge is primarily in creating these options through additional thermal storage systems that can be intelligently controlled and economically/technically integrated. Further options are controlled decentralized providers (virtual power plants) and addi-

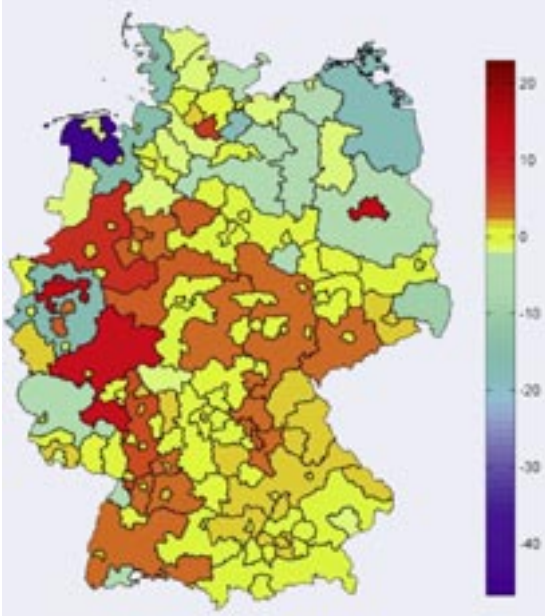
tional controllable loads. The virtual power plants allow for grid-oriented operation as long as the generated heat can be stored at the same time. The additional loads may, for instance, be the generation of hydrogen as raw material for further process steps.

Electric energy storages

At present, over 99 percent of electric energy storage worldwide takes place via pump storage power plants (PH - pumped hydro) (Doetsch 2009). In addition, there are currently two large compressed-air energy storage (CAES) plants in operation (Figure 4). Above and beyond these two central storage systems, there are also decentralized battery storage systems under development and/or in being introduced in the market. These electrochemical storage systems are at present in the test phase in the kW to double-digit MW class (NaS battery, redox flow battery, Lithium ion battery) and/or in use (lead acid battery). In this case, the main obstacles remain the investment costs, as well as the service life of the batteries. Other storage systems (e. g. flywheel, double layer capacitor and SMES) do not plan any relevant role for the integration of the RE since the storage capacity is limited to seconds or a maximum of a few minutes (Wietschel et al. 2010).

Figure 2

Energy balancing requirement of the 146 regions in Germany for the 2030 scenario



Source: Fraunhofer-Institute UMSICHT and IOSB-AST.

Electric grid enhancement

To assess the grid expansion required in Germany, the dena Grid Study II (DENA 2010) was conducted. The objective is the complete integration of the RE for 2020 and 2025.

The model calculations show[2], for example, that in 2020 it will not be possible to transfer the necessary output at 70 percent of all connections between neighboring model regions. One of the study variants, in which the non-transferable outputs are fully integrated through grid expansion without using storage systems, shows that an expansion of the transmission grid of 3,600 km will be needed by 2020. In view of the rather slow grid expansion to date (Der Spiegel 2012), and the partly low acceptance level among the population, this objective will not be easy to achieve.

Potentials for Demand Side Management

In urban areas that have a high demand for electricity, the option exists to temporally displace the demand for electricity in order to react to an intermittent feed-in from wind power and photovoltaic. If there is a lot of electricity from wind and solar power in the grid at a given time, the power consumption is then temporally shifted ahead, in case of a power deficit, it is shifted back. This concept – referred to as demand side management – provides a cost-efficient option for load balancing and thereby realizes the system integration of fluctuating RE.

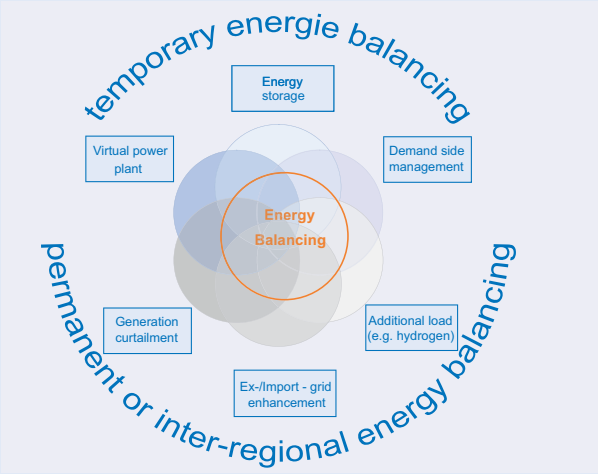
Yet, not all devices consuming electric power are suitable for participation in demand side management (Klobasa 2007). Electric consumers without final thermal energy utilization such as lighting, consumer electronics and kitchen appliances in particular could only be included in load management with a high loss of comfort for the end user. Consumers connected to thermal storage such as hot water heaters, freezers and heat pumps, on the other hand, can be integrated into the load management without

[2] To address the regional differences in consumption and provider potential, Germany was split into 18 regions and the following assumptions were made: exit from nuclear power by 2022, as well as achieving, by 2020, a combined heat and power plant share in electricity generation of 25 percent, a reduction of the power demand by eight percent, and an expansion of photovoltaics to 17.9 GWp by 2020. In fact, today 28.2 GWp has already been installed (Bundenetzagentur 2012). Therefore, it can be assumed that the problems in the integration of RE and the grid expansion derived from it will occur to a considerably greater extent and/or sooner than determined by the study.

a recognizable loss of comfort. Furthermore, thermal storage is comparatively cost-effective. This cost difference makes thermal storage systems highly attractive with respect to the system integration of solar and wind power. However, the utilization of thermal storage systems for load management is not without its challenges. This is primarily due to the dual utilization of the storage system: On the one hand, it is intended to cover fluctuating demand in thermal energy, on the other, it is intended to provide as much flexibility as possible on the electric side. Both objectives are contrary in nature and the effectively usable load shifting potential fluctuates considerably from day to day – depending on consumer behavior.

Figure 3

OPTIONS FOR SPATIAL/TEMPORAL GRID BALANCING THROUGH DIFFERENT, IN PART COMPETING, IN PART COMPLEMENTARY MEASURES



Source: Fraunhofer-Institute UMSICHT.

Smart grids

However, all energy-logistical measures mentioned are only possible if these are acting intelligently coordinated or intelligently controlled, which requires a "Smart Grid". In total, the Smart Grid is a holistic intelligent energy supply system that includes the networking and control of power generation, stationary and mobile storage systems (Schwerdfeger et al. 2011), consumers and grid equipment in transfer and distribution grids with the help of ICT (Westermann and Kratz 2010). Private households are connected via intelligent meters, which present the current usage history via an interface and influence electricity consumption in case of time or load variable tariffs (VDEETG 2012). In case of disruptions, the intelligent networking of all equipment allows for an automatic grid reconfiguration, and the reestablishing of the grid in case of global/local blackouts.

Worldwide research activities are underway to develop the Smart Grid technology. The German E-Energy-Initiative is one of the most important research funding programs which is, in the six model regions eTelligence, RegModHarz, E-DeMa, Smart W@TTS, Model City Mannheim (Nestle, Ringelstein and Waldschmidt 2009) and MeREGIO (Hillemacher, Eßner-Frey and Fichtner 2011), researching the impacts of intelligent power grids and their practical implementation in real energy supply systems (see also http://www.e-energy.de/). The focus of these programs is on economic implementation through market places, for example, (Leprich et al. 2010; Joe Wong et al. 2012), decentralized hardware as well as controlling concepts.

The *eTelligence* project, for example, researches the bringing together of power producers, consumers, energy suppliers and grid operators on a regional energy market place in the model region Cuxhaven (Krause et al. 2009). In the project, the electric power consumption of major consumers of electricity and private households are intelligently coordinated with power generation from decentralized sources.

In the *RegModHarz* project "Regenerative Model Region Harz", on the other hand, different renewable energy producers, controllable consumers and energy storage systems are linked into a virtual power plant to demonstrate that through the coordination of generation, storage and consumption, a stable, reliable and consumer-oriented supply with electrical energy is possible – even with a high share of renewable energy producers RE (Hochloff et al. 2011).

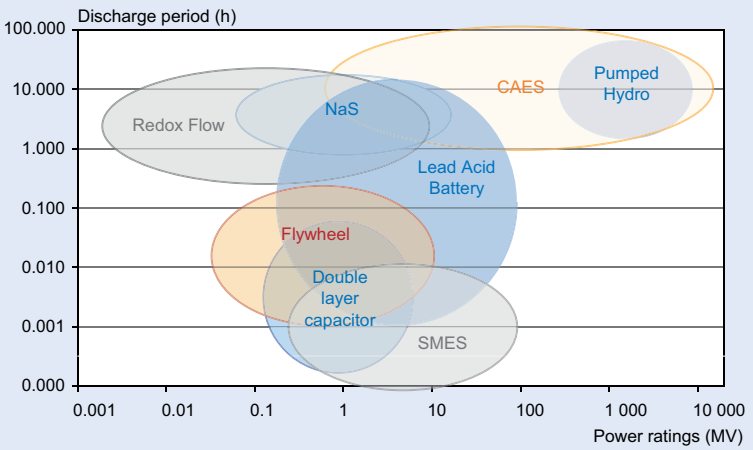
The *Smart Watts* project, on the other hand, investigates increasing the self-regulating ability of the energy system. Its objective is to ensure that household appliances primarily consume power when it is

available cheaply (e. g. during strong wind or sunshine), without limiting comfort (Quadt 2009).

This short overview shows that the development of the necessary technologies is progressing, but that the energy management system, i. e., the control and operating concept, as well as the economic and legal integration of a Smart Grid, are still unclear.

Figure 4

Types of Energy Storage Systems



Note: Overview, as well as the installed output (MW) and installed storeage capacity (GWh) to date.
Source: Doetsch (2011).

Energy management systems

The developments to date regarding energy management can be separated into three categories, based on their application:

1. Virtual power plants / load balancing power plants
2. Virtual marketplaces
3. Grid operations support

A *virtual power plant* represents a multitude of decentralized energy systems. It aggregates their generating capacities and creates an overall load profile for the portfolio. This way, the different systems appear to the outside as a single large power plant (Pudjianto, Ramsay and Strbac 2007). The objective of a virtual power plant is to control decentralized systems such that at any given point in time a specific amount of electricity is produced. Typical of such systems is the use of prognoses for load development and feed-in development of fluctuating energy production systems.

The *virtual marketplace* is pursuing a different approach. Here, future market activity is based on a volatile supply situation in which all stakeholders react flexibly. Market price mechanisms, price signals in particular, are expected to govern the behavioral control of consumers. This approach is mostly based on local markets, with the objective of achieving a regional balancing of electric power supply and demand (Bundenetzagentur 2011). The implementation then takes place in accordance with free market principles, whereby every producer and consumer participates in the market, and the resulting pricing varies over the course of time and is the result of supply and demand. This way, consumers in private households are also intended to be incentivized to shift their power consumption towards times of high renewable energy production. Therefore, generation-oriented consumption is to be promoted.

An objective more strongly pursued recently is *grid operations support* through decentralized energy systems by means of an energy management system. The purpose of such systems is to optimally use the capacity of grids and/or grid sections through the targeted load and generation management of decentralized energy systems. This means that such systems are more suitable for solving local problems and less appropriate for central problems through superordinated planning. They can therefore be organized in a more decentralized way, so that systems at certain points of the grid, for example, are switched automatically when required by the local voltage, without instructions from a superordinated instance. The target function when switching systems and in case of any optimization also differs from the systems mentioned above since economic optimization is not in the foreground in this instance, but solely the locally existing technical restrictions are decisive.

Hybrid urban energy storage

Since not only the creation of large central storage systems, but also grid expansion are both progressing rather slowly, in the short and medium-term, the biggest viable potential for energy balancing is found in cities. These large central storage systems have an

enormous, partly indirect, and as yet undeveloped potential available, since they are load centers and often also feature numerous decentralized, controllable producers.

This approach is pursued by the Fraunhofer-Gesellschaft with its future project "Hybrid urban energy storage" (see also www.hybrider-stadtspeicher.de). In the framework of this project, buildings in which electricity is converted into heat (e.g. heat pump, domestic hot water) or in which electricity and heat are produced jointly (mini combined heat and power plant) are operated electricity-controlled through additional thermal storage systems and are used as buffers for the electric grid. Additional components of hybrid urban energy storage are also real electric storage systems. These may consist of larger, centralized batteries or smaller ones at individual homes. What they have in common is the fact that they can be combined, just like the aforementioned options, as balancing systems for the electric grid, and can act as hybrid storage in the grid through intelligent control. For very short consumption or production spikes in the grid, for which the use of storage systems is not economical and/or which time-wise are outside the framework of shiftable production and loads, emergency generators, such as at hospitals and computing centers, may fill in on short notice and/or on the consumer side, the electricity may be used for heating local and district heating grids.

The essential advantage of hybrid urban energy storage in this is that many systems are already installed (e. g. heat pumps, CHP, potable warm water systems), which with small measures (e. g. additional heat storage) and therefore lower costs can be used for the storage of electrical energy.

Conclusions

The addition of renewable, quite often non-plannable energies, which are desirable from a resource protection and CO2 point of view, requires a massive conversion of the energy system. This necessary conversion is well illustrated by the example of Germany since the changes in the energy system here are among the most dynamic in Europe. The focus in this instance has to be on the main problem, namely the spatial and temporal balancing of energy. For economic reasons, this balancing can only occur through synergetic utilization of almost all balancing potentials such as storage systems, grids, intelligent control of decentralized systems, etc. The backbone required to achieve this is an intelligent grid, a Smart Grid, to tap into all options. However, above and beyond the smart grid approaches to date, the energy and IT technologies for this have to be developed, as well as the market and legislative frameworks. It is only this way that all options can be utilized, using optimization algorithms and taking into consideration efficiency, costs and acceptance. The Fraunhofer-Gesellschaft wants to provide its contribution to this concept with its "Hybrid urban energy storage" project.

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European currency union and rule of law[1]

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Currency union as a common destiny

The introduction of the euro did not transform the European Union (EU) into an indissoluble community of fate. In the history of monetary and currency policy there have been no cases in which the introduction of a common currency has decided the political fate of a nation or family of nations.[2] The common market as a legal regulatory system is restricted to the realisation of the four so-called basic freedoms, it constitutes an anti-trust supervisory authority for business to ensure intra-community competition, as well as a subsidisation authority for member states and is based on a customs union. It has not, to date at least, merged the economies of the member states into an integrated economy; and even if it were to lead to the development of a European economy, this would not necessitate a common currency economically or legally.

Contrary to expectations, responsibility for a common monetary policy signed over to the EU in Maastricht has not led to a convergence of economic developments in the member states. Indeed, the introduction of the euro has led to growing economic divergence among member states, resulting in the currency union's present malaise. The introduction of the common currency was no qualitative leap forward in terms of political integration with a view to creating an inalienable unity. This is proven both by the tireless overhasty efforts on the part of the currency zone's member states to prevent its disintegration, and by the growing disinclination to join the currency zone as a "community of fate" on the part of the ten member states that do not yet belong to the common currency. The establishment of a currency union without the parallel establishment of a real economic union, due to a lack of willingness to relinquish state sovereignty at the Maastricht conference, led to a certainty from the outset on the part of two member states, not to mention a large number of private highly critical observers, that the Maastricht economic and monetary union had too many constitutional weaknesses to link the member states and their peoples any more closely than the common market and the other policies of the European Union already had done.

Crisis of the currency union and the European Union as a community of law

Assistance for Greece and the euro bailout package – violations of the law

The currency union crisis has now engulfed the EU as a community of law. To preserve the currency union and the euro as a status symbol of integration, the EU bodies of the European Union and its member states, in cooperation with the European Central Bank (ECB), are trying to master the crisis by offering expensive financial support conditional to their compliance with draconian austerity measures that are difficult for the member states to implement; instead of the legally viable and economically sensible option of letting economically weak members states with excessive levels of debt take some time out. There is little awareness of the effects of these measures on the EU as a community of law.

The financial support for Greece, or the so-called European bailout package (ESFS) and – to an even greater degree – the announced set-up of a permanent stability mechanism (ESM) as well as various "first aid" measures on the part of the ECB aim to provide relief for member states that are already hopelessly indebted and slow their accumulation of

[1] Forthcoming in "Basic issues related to the European Union – Symposiums, 20 years of the Centre for European Business Law at the University of Bonn", 2012.

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[2] See Plumpe (2011). Feuilleton background ("It is said that peace in Europe would be in danger if the euro were to fail. However, Europe's fate does not depend on its monetary system. Not once has the break-up of a currency union led to an economic catastrophe in the past. A plea against mutterings about a crisis.").

further debts. Regardless of whether they are considered legal instruments or legally equivalent actions on the part of the EU, or whether they are classified as bundled in the framework of the bilateral support measures taken by member states and coordinated by the EU, these measures violate the "No bailout clause" of article 125 TFEU as a constitutional supporting pillar of the Maastricht currency union. The so-called "No bailout clause" is not merely a disclaimer, as this would not make any sense within a confederation of states, since the member states of a confederation are not liable for each other in any case; it serves to safeguard the currency union and the stability of the euro as a common standard currency for the member states just like the three percent annual debt ceiling and the 60 percent upper debt ceiling. The Council could have at most deviated from the no bailout clause to a limited extent based on article 352 of the TFEU – the successor of the more well-known article 235 of the EC Treaty and/or 308 EC; but it would have needed the European Parliament's consent to do so, which it was not certain to receive.

The authorisation to financially support member states in cases of natural catastrophes and catastrophe-like events embodied in article 122 paragraph 2 TFEU, which the Council resorted to, does not justify a suspension of the no bailout clause. The government debt crisis is a governance crisis, not an event resembling a natural catastrophe; and it was caused by misconduct on the part of state leaders which individual states must accept responsibility for. The comprehensive authority that a state takes upon itself is sufficient from a legal point of view both to tax its citizens and to reduce or to cut activities of the state which have financial effects. A member state that has agreed to the EU's value system on joining the union has to be held responsible for misconduct in terms of its economic and budgetary policy. The no bailout clause does not even justify action if the threat of state bankruptcy is caused by a global economic crisis. Economic crises are events that governments should be able to handle. The regulation (EU) Nr. 407/2010 "on the introduction of a European financial stability mechanism", which is based on article 122 paragraph 2 TFEU, or the so-called first part of the euro bailout package, represents a flagrant violation of EU law. The Council's authorisation of action of article 122 TFEU in the case of catastrophes and similar situations does not imply and justify an authorisation to take out loans on the capital market any more than the Council's authorisation to take action in the field of agricultural policy, customs policy or other areas. Any support provided in catastrophes and other similar cases must be financed by the EU's budget set up by the European Parliament and Council as a common budgetary authority, and if necessary from a supplementary budget.

In 2010, the EU budget did not provide enough financial resources (– i.e., up to the amount of 60 billion Euro-) for aiding member states being that are confronted with a natural catastrophe or a similarly severe situation. To raise the wanted amount of 60 billion Euros, the member states had no other choice than to breach the EU law and raise the money on the capital market.

ECB and the European system of central banks (Eurosystem) – legal infringements

The measures taken by the ECB and - acting within the European system of central banks - by some national central banks in the context of the currency union crisis are not consistently in line with EU law. The ECB and the European system of central banks are responsible for a monetary policy that is primarily obliged to guarantee the stability of the euro as a common currency of the member states.[3] Although these measures cannot be justified in terms of monetary policy, they offer relief via purchasing or accepting as securities when granting central banking money on the strength the bonds of economically underperforming member states that are rated as junk bonds by the rating agencies According to the regulations of the Maastricht Treaty, it is explicitly prohibited for the ECB and the national central banks acting within the European system of central banks to directly purchase government bonds.[4] The purchase of government bonds on the so-called secondary market, which is not explicitly forbidden in the same way, should not facilitate the sale or issue of new bonds on the part of economically weakened member states. With their ill-advised monetary policy measures the ECB and the European system of central banks are subsidizing individual banks and protecting them from insolvency. In cases where the banks with which they share the power to create money are threatened by illiquidity, central banks can come to the latter's aid for monetary policy reasons through the general or

[3] See critical articles by Seidel (2012) and Rill (2011).
[4] Art. 123 TFEU

special allocation of central bank funds. However, they cannot protect insolvent banks from bankruptcy, even if the latter can prove that they are "system-relevant" or "systemic".[5] Insofar as the ECB and the central banks within the European system illegally buy, or even lend against government bonds from states that have accumulated excessive debts due to their higher inflation rates and long-term current account deficits and are threatened by insolvency, they are violating the no bailout clause of article 125 TFEU, which also applies to them. Neither the ECB, the national central banks, the Council, the Commission and nor the member states can invoke a derogation. The "stabilisation of the financial markets" may be considered a secondary task of the central bank according to the economic and currency law of other states by virtue of its close links to monetary policy, but despite the fact that the financial market occasionally behave in a dysfunctional way and are capable of torpedoing a central bank's monetary policy, the stabilisation of the financial markets is not generally accepted as a secondary task to the ECB or the European system of central banks. The "stabilization of the financial markets", especially saving banks from a payment default, is an area of economic policy attributed to member states in Maastricht and it was not explicitly transferred at any point, and especially not in Maastricht or later Lisbon, to the EU or the European Parliament and the Council as the European Union's co-legislators, or directly to the ECB or the European system of central banks.

According to the principle of conferred powers as a key constitutional principle of the EU, which precludes a gradual transfer of sovereignty to the EU, a specific transfer act would have been required to transfer responsibility for this area of economic policy to the EU. According to article 127, paragraph 5 TFEU, which outlines the tasks of the ECB and/or the European system of central banks, responsibility for stabilising the financial system lies with other, currently still national "authorities", which are also responsible for supervising the financial markets. The ECB and/or the European system of central banks are only authorised to a limited degree to contribute to "the smooth implementation of the measures taken by the authorities responsible to stabilise the financial system". The relevant regulation of paragraph 6 of article 127 TFEU does not empower the EU legislator to entrust the ECB with sole supervision of the credit institutions; on the contrary the ECB, alongside the national supervisory authorities and a union supervisory authority if necessary in the future, is only entrusted "with special tasks related to the supervision of credit institutions".[6]

In addition to violation of the no bailout clause, the ECB can also therefore be charged with breaching its competences. The national central banks, on the other hand, have only breached their competences if they have acted in the framework of the European central bank system, but not if they have exercised the competences explicitly attributed to them in Maastricht. In addition to previous actions, the Council and the Commission can be charged with breaching their competences in providing financial assistance to Greece and the bail-out package, insofar as the latter represent legal acts or their equivalent on the part of the EU. The member states, on the other hand, cannot be reproached for breaching their competences insofar as they have acted autonomously.

Finally, the ECB can be charged with violating the prohibition of the so-called monetary financing of national budgets[7], another main pillar of European currency union. Though this was not necessary in monetary terms, the ECB purchased government bonds of member states prone to insolvency and it directly or indirectly did so by using the central bank money.

The ECB and/or the European system of central banks – which is really responsible for currency policy[8] - is only a so-called lender of last resort for financial institutes, and not for member states or other private businesses. Whether or not the legislator gave them this role in Maastricht or later on, and whether it has indeed given them the facilities

[5] See recently Radtke (2010).

[6] This interpretation of article 126, 127 TFEU – formerly article 105 EC – corresponds to its origins. In the draft of statutes for the European Central Bank System produced by the central bank presidents as members of the so-called Delors Committee, the ECB's fourth task is outlined in article 3 as follows:
- To participate as necessary in the formulation, co-ordination and execution of policies relating to prudential supervission and the stability of the financial system.
The Maastricht conference did not approve this proposal and reduced the fourth task of the "system" to:
- Supporting the smooth functioning of the payment system (article 105)
The weakened regulations of paragraphs 5 and 6 of article 105 were added at the Maastricht conference.

[7] Article 123, 124 TFEU.

[8] Contrary to widespread false assumptions, monetary policy was signed over to the European system of central banks in Maastricht, not to the ECB; see article 127 TFEU.

required to fulfill this role. It is no question that the constitutional legislator of the EU has not even incidentally in Maastricht or later assigned the function of a "lender of last resort" to the European Central Bank or to the European system of central banks and that the legislator has endowed the European central bank and the European system of central banks with appropriate instruments to master their additional function. In the case that the European central bank and the European system of central banks would have been entrusted with the function of a "lender of last resort" they would not be authorised, to independently extend this principle to other areas, simply with a view to the regulations in other states.[9]

European Stability Mechanism (ESM) – an infringement?

With the permanent ESM, which is still to be set up, the EU and its participant member states would violate the no bail out clause of article 125 TFEU in a similar way as they did when helping Greece and setting up the euro rescue umbrella in the case that the no bailout clause was not to be considered as repealed with the amendment to the Lisbon Treaty decided upon by the EU in the form of the insertion of e a new paragraph in article 136 TFEU relating to the treaty on the ESM. Similarly, the EU would exceed its competences with measures to implement the stability mechanism, insofar as these regulations were not to give it responsibility for stabilizing the financial markets. The same would apply to several infringements by the ECB and the national central banks acting in the framework of the European system of central banks, insofar as ratification of the proposed regulations on the ESM does not fundamentally redesign the Maastricht currency union, and specifically does not remove the no bailout clause, does not address the competency deficit as far as stabilizing the financial markets is concerned, and above all, does not at least restrict the ban on the ECB and the European system of central banks financing state budgets. The suspension of the no bailout clause, the remedying of the competence deficit and the limitation of the ban on the financing of state budgets are not explicitly covered by the regulations, but are expressly desired by member states. It merely remains questionable whether such regulations can retroactively legitimize the violations already committed by EU bodies, the ECB and the member states in their provision of financial assistance for Greece and their approval of the euro bailout package at the legislator's whim, i.e. whether the redesign of the Maastricht Treaty should take effect retroactively.

The two tier regulations for setting up a permanent ESM consist of an amendment agreement in the framework of EU treaty law, which takes the form of the insertion of a third paragraph in article 136 TFEU of the authorisation of the seventeen states of the currency area obliging them to sign a parallel, fully negotiated and purely international treaty on the set up of the ESM. After the adoption of the amendment to the Lisbon Treaty and thus the setting up of an authorisation to adopt the stipulations of the ESM Treaty as they are (tel quel), which is linked to a legal obligation for the seventeen member states to take action, member states could no longer dispose on the stipulations of the ESM Treaty. By virtue of the way that they are linked, both treaties represent a unified body of regulation, which, regardless of the artificial divisions within it, must raise the question of whether it changes the contractual statutes of the Maastricht currency union in an acceptable way.

The EU assumes that the amendment to article 136 TFEU, which is reduced to a mere authorisation to conclude a contract, should not be subject to the normal process of changing union treaty law, which involves establishing a convention, holding an intergovernmental conference and the participation of the European Parliament, which presupposes public attention, but will be applied according to the so-called simplified amendment process outlined in article 48 paragraph 6 TEU. The simplified amendment process merely requires a unanimous decision by the Council and its acceptance by the member states in accordance with their constitutional requirements. However, this process should not be applied in an unrestricted manner, especially not for an "amendment to provisions of the third part of the Treaty on the Functioning of the European Union - which includes the regulations on economic and currency union - insofar as an intended amendment of union treaty law will lead to an "extension of the responsibilities" of the EU "in the framework of Treaties on transferred responsibilities (article 48 paragraph 6 sentence 1 TEU). The planned addition of a third paragraph to article 136 TFEU through its link to the treaty via the ESM and its incorporation as a binding authorisation

[9] See Heinsohn and Steiger (1999).

aims at and will achieve an amendment to union law to that effect. Should the rules of the international treaty on the set-up of the ESM, which amount to an extension of the European Union's competences and a partial suspension of the Maastricht currency union rules, be integrated into a single rather than a divided project to amend treaty law, there would be no doubt that the simplified amendment process could not be used. The simplified amendment process will ensure that the constitution of the currency union is changed as quickly and discretely as possible, and will ensure the legitimization of the violations already committed. However, the Council and member states are not entirely free to decide which one of the two processes of amending union treaty law is to be applied, Fears that the contract to amend article 136 TFEU and its ties with the ESM Treaty as the subject of the member states´ and the Councils` authorisation to act are not in line with union law are unfounded insofar as the ESM treaty changes the EU's structure in such a way that the ban on accepting liability for the debts of other member states is lifted, the no bailout clause for the budgets of other member states is at least limited, the competence deficit is removed and the self-responsibility of member states as one of the main principles of the Maastricht Currency Union is replaced by a system of reciprocal fiscal support. The Council and the member states have committed a violation of the Treaty, which the planned inclusion of the rules of the international ESM treaty in union treaty law does not warrant, and thus renders the ESM ineffective.

For the German Parliament and the German Bundesrat as ratifying legislators, the artificially divided treaty as a unified planned regulation represents a case of article 23 paragraph 1 sentence 1 of the German Constitution. The EU will be fundamentally changed by the regulation. The provisions of article 79 paragraph 2 of the Constitution are also fulfilled. Through the treaty, which provides for Germany's permanent participation in the ESM and involves Germany to a large extent giving up its control over taxing and spending without any possibility of withdrawal, Germany's Constitution as a sovereign state will be changed from a material point of view and its Constitution will thus be changed. The ratification of the regulation, i.e. of both treaties, requires a two thirds majority vote in the Bundestag and the Bundesrat.

Exiting the currency union

A member state cannot be forced to leave the currency union against its will. That is true even if its economy is suffering from excessively high inflation rates, recurring current account deficits and has accumulated high debt levels and can only return to efficiency and competitiveness by reintroducing its own currency, performing an absolute haircut and with support on the part of the EU in the form of financial assistance mechanisms and economic aid.[10] Union law makes no explicit provision for either the expulsion or the voluntary exit of member states. At the same time, membership of the currency union is not compulsory and does not deny a member state the option of voluntarily or temporarily exiting the union if this is the only way for it to recover economically. A voluntary exit from the currency union, which is now widely seen as an admissible and unwritten EU law, does not depend on the agreement of the other member states. Nor can the other member states refuse an exiting state help with measures designed to implement its exit such as, for example, the temporary closure of stock markets to prevent speculation resulting from the reintroduction of its own currency, the then legally permissible provision of financial assistance or support in the form of capital flow controls.

From a strictly legal point of view, a member state can neither "exit" not "join" a currency union. The currency union is no association of states that a state can "join" and "enter". Behind the currency union lies the EU's responsibility to shape a common monetary policy for the member states. Like fishing policy, for example, monetary policy is a so-called exclusive competence of the EU, which, unlike agricultural policy, for example, is not accompanied by any policy-making at a national level. Regardless of this classification, however, the scope of monetary policy can be territorially expanded or limited by an act passed by the legislator. This kind of territorial restriction was applied, for example, when Greenland as a part of territory of Denmark as a member state of the EU was retroactively, i. e., after the adoption of the fishing policy - a so-called exclusive policy like the monetary policy – by Denmark for its whole territory, Greenland included, has later been excluded from the European Union's exclu-

[10] Moreover, in view of the situation of the interests of the member states in the Council a qualified majority vote in favour of exclusion could not be reckoned with. The conditions for a majority decision do not exist.

sive policy. There was never any talk of Denmark's partial exit from the "fishing union" of the European Economic Community.

Regardless of the fact that member states are represented on the board of governors of the European System of central banks, the euro is a foreign currency for them. Unlike a national currency, the euro as a foreign currency is not an economic accounting device tailor-made for an individual member state; in other words unlike a national currency, it is no "measurement and assessment system" that measures the economic competitiveness of an economy compared to that of all other economies competing with it. Unlike a national currency, the monetary policy of the ECB and/or the European System of European central banks is not exclusively oriented towards the economy of a specific country. Since it can only be designed uniformly, the EU's monetary policy can only reflect the diverging economic concerns of individual member states to a very limited degree. For the individual member states are not territorial parts of an integrated European economy that can be compared to one of the national economic bodies. The economic bodies of the member states have neither given up their different structure related to their national sovereignty not lost their involvement in the Common Market to date.

In spite of several joint responsibilities borne by the EU in the field of so-called economic and social cohesion (fund policy), economic policy remains the responsibility of the member states, even after Maastricht and Lisbon. The ECB and/or European system of central banks thus shapes monetary policy - understood as a conceptually designed state policy tailored to support an economy - for an economy that does not exist. Regardless of the expectations that were falsely placed in it at the Maastricht conference, the EU's monetary policy has not led ipso facto to converging economic development in all member states, as shown by the government debt crisis afflicting several members of some member states. On the contrary, the currency union has tended to increase economic divergence and has proven counter-productive for the Common Market rather than having an integrative effect. The community currency is increasingly having the economic effect of a "foreign currency" in individual member states, albeit to differing degrees.

According to union law, a member state of the currency zone that can only survive economically outside the currency zone, has a right to demand that the Council - composed of heads of state and government - remove the country from the territorial scope of monetary policy. The member state does not need to take the complicated detour of exiting the EU as such and rejoining it without belonging to the currency union, which is deemed as the only legally correct way by an ECB Advisory Opinion. The member state wishing to take time out can demand that the other member states do not prevent it from realizing its desire to exit, do not withhold their approval of the legal acts required and after it has reintroduced its own currency and an indispensable haircut, cannot deny it the potentially differentiated financial assistance and economic development assistance according to the treaties of Rome and Maastricht. If necessary, the member state can reintroduce its own currency independently by exercising its legislative sovereignty and view the related violation of union law that should have primacy as legitimized by the emergency situation. In the face of another member's desire to leave the euro the other member states cannot declare that the euro as a worldwide trade, investment and reserve currency can only be saved if that state continues to remain a member and by accepting their fiscal financial assistance.

A gap in legal protection at a European level – the highest national courts as guardians of the European legal and constitutional structure

A large number of treaty violations have been committed by EU bodies and member states in the course of efforts to control the European currency crisis. If infringements of treaties that were committed upon the founding of the currency union, i.e. related to the admission of new members to the currency zone, are added to this figure, then it is even higher. Not only the Council's decision regarding Greece's admission to the currency union, but also its decisions regarding one or two other admissions would not have stood up to an examination in court. At the time that the admission decisions were taken the so-called Maastricht criteria (or whether the candidates for admission fulfilled them) were not at the Council's disposition, meaning that the decisions taken by heads of state and government, even if within a limited period of time and only by EU bodies and its member states, and not by private persons, could not have been challenged in the European Court of Justice.

The fact that no appeal was made did not compensate for several legal deficits; the decisions taken at the time merely became no more challengeable). In the future, these decisions could only be checked in the course of an so-called nearby-control procedure before the European Court of Justice according to article 277 TFEU and declared illegal, with highly limited implications, in such cases before the European Court of Justice, which are unlikely to be initiated, or at least there are no signs of this at present. There were no rescission actions at the time because all of the EU's bodies, as well as all member states with a right of action supported the admissions decisions for political reasons. The limited legal protection provided by union law is still far from effective against the treaty violations committed in the course of the currency crisis. It suffers from the fact that in cases of violation of so-called objective union law, which includes laws on economic and currency union, only EU bodies as well as member states have the right to take legal action, and not private individuals. The interaction of all bodies with the right to take legal action results in no recourse to the European Court of Justice. With regard to the treaty violations that occurred in the context of the EU's bailout measures, the European Parliament, which has the right to take legal action, did not participate as far as possible and/or did not need to participate. Moreover, in one case where it believed its right to participate had been violated, the European Parliament consciously refrained from bringing any action via a majority vote out of loyalty to the other bodies and member states.

In the member states legal protection in comparable cases is also limited by the fact that private individuals quite simply do not have any right to take action against the public authorities by asserting the breach of so-called objective law by the public authorities. They must prove that they are affected by the infringement of a subjective law or in terms of a legally protected individual interest, if they wish, for instance, to have a court examine an objective legal violation on the part of the central bank in a monetary decision. At a member state level, however, not all of the institutions, bodies and political powers with the right to take legal action are consistently involved in decisions that should be challenged. A system of political competition ensures the verification of objective law violated by the public authorities in a large number of cases. Additional rights to take legal action held by associations and ombudsmen, as well as individual cases brought before the Constitutional Court in Germany, in particular and the favourable case law of the German Constitutional Court, complete legal protection. The "Convention for the future of Europe" drawn up in the drafting of the treaty "on a Constitution for Europe" - subsequently abandoned - and later in the drafting of the Lisbon Treaty, the intergovernmental conference deliberately refused to grant EU citizens the right to lodge individual constitutional appeals before the European Court of Justice following the example of the Strasbourg convention for human rights and basic freedoms and German individual cases brought before the Constitutional Court. There is no basic right to currency and price stability enshrined in either EU law or national constitutional law.

The gap in legal protection arising from the interaction of all bodies of the European does not materially remove the violations, as the legal principle "nullum ius sine actore" - without rights to action there is not law – and national law is not recognised by Union law. However, the de facto gap in legal protection that arises creates a loss in trust in the EU as a community based on the rule of law. The complete overthrow of the European Court of Justice as a born "guardian of EU law", which is to be feared from the perpetual interaction of EU bodies, will negatively impact the rule of law in the European Union. It may have implications that are difficult to assess on the process of European integration should citizens turn to their highest national courts as the guardians of the EU's legal and constitutional structure.

Since its ruling in 1993 the German Constitutional Court is now exercising its right to examine the EU's legal instruments (regulations, Directives and decisions), as well as the case-law of the European Court of Justice to see whether they remain within the EU's regulatory competences. In cases where these competences are breached and there are so-called "ultra vires" or "transgressing legal instruments" ("ausbrechende Rechtsakte" in German), the German Constitutional Court considers itself empowered to declare these instruments as ineffective in Germany. The highest courts of other member states have already sympathized for some time with the case law of Germany's Constitutional Court, which has been condemned by EU bodies and member states in various crises, because it does not respect the basic principle of the absolute primacy of Union law over national law, including

national jurisdiction and thus does not respect the uniform application of EU law. In addition to EU-wide recourse to constitutional courts and/or highest national courts in member states, following the example of Germany's Constitutional Court, the possibility of greater recourse to Germany's Constitutional Court resulting from the debacle of the currency union cannot be ruled out in the future.

After the ratification of the Treaty on the establishment of a permanent ESM by the Bundestag and the Bundesrat, Germany's Constitutional Court will soon be faced with the question of whether it should once again define the "hard core" of state jurisdiction considered as "not accessible to integration" in its decision on the Lisbon Treaty, which should not be hollowed out by the transfer of rights to the European Union. The Bundestag's "responsibility for integration" emphasised by Germany's Constitutional Court but only effective nationally and only constraining the independent contribution of the German government at a European level offers no protection from "ultra vires" action on the part of EU bodies. Germany´s Constitutional Court could not attribute monetary policy to the hard core of state functions being not accessible to integration in its last judgment on the Lisbon Treaty, because earlier in its judgment on the Maastricht Treaty the Court has declared the transfer of the currency policy to the European level to be in line with German Basic Law, but only under certain conditions.

However, with this decision Germany's Constitutional Court did not rule out the option of reviewing currency policy instruments and monetary policy action taken by the EU to ascertain whether it respects the limits of this responsibility transfer. While the ECB violates the ban on financing the public budgets of member states with central bank loans and on financing assistance for member states with liquidity problems by buying both the sovereign bonds of these members and lending against the expenditure of central bank money, without monetary policy reasons to justify its actions, a long-term devaluation related to these measures could lead to income transfers between population groups within individual member states, that are not controllable and could have socio-politically unacceptable consequences that damage democracy.

Decisions of this scope do not constitutionally rest with a currency and central bank, but should be taken by a parliamentary legislator. In the context of the impending case to be brought before Germany´s Constitutional Court by the expected claim of an "Organ" of Germany´s constitutional system as well as by claims of individuals which both probably would challenge the constitutionality of the measures in question taken by the European central bank and some national banks, the question may arise of whether these measures, i.e. the ECB´s purchases and the acquisition of such bonds by the central banks involved in this initiative, can be classified as "ultra vires", and whether it can be rendered ineffective in Germany. According to the traditional attitude of Germany´s Constitutional Court it will not come to recourse to the European Court of Justice by way of a preliminary ruling by Germany´s Constitutional Court.

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Trade and Climate Change: Leaking Pledges

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EU Climate Policy and Trade

International climate policy is rapidly approaching the end of the first period of emission reduction commitments agreed upon in the Kyoto Protocol in 1997. This protocol aimed to reduce global greenhouse gas (GHG) emissions. In particular, the so-called Annex I countries (most OECD countries and the former Soviet Union) agreed upon a reduction of their GHG emissions by five percent in 2012, compared to 1990 emissions. The Protocol did not impose reductions outside Annex I and the coverage of worldwide emissions was reduced to an even lower level than agreed upon in Kyoto, when the United States refused to ratify it. At the time of its negotiation the Kyoto protocol made a lot of sense. Back in 1997 Annex I countries were collectively responsible for 76 percent of global GDP, 71 percent of the world's trade flows and 60 percent of global CO_2 emissions.

Today the world is a very different place. The global economy has changed considerably since 1997. National economies have become increasingly integrated in the international economy through increased trade, foreign investment and capital flows. Over the past decade fast developing countries such as China and India have contributed to export driven GDP growth at a pace that is almost unparalleled in economic history. As a consequence Annex I countries were responsible for 65 percent of global GDP, 61 percent of the world's trade flows and only for 44 percent of global CO_2 emissions in 2009. These changes in the world economy have complicated negotiations on a successor to the Kyoto Protocol enormously. This became very clear when the world gathered together to negotiate this successor in Copenhagen in 2009 and again in Durban in 2011, where agreement was reached to draw up a legal framework by 2015 for climate action by all countries.

Thus the world seems to be left with pledges made by countries around the Copenhagen meeting about the emission reductions they are willing to implement. For instance, the EU offered to reduce its GHG emissions by up to 30 percent if other countries would be willing to contribute their share. Otherwise the EU declared itself willing to stick to its current commitment of 20 percent. Other countries also expressed their willingness to reduce emissions, but whether they will actually do so or not remains to be seen. This is illustrated by the difficult process of introducing CO_2 emission trading in the US, where the Kerry-Lieberman bill on emission trading stranded in the US senate. In Copenhagen, several non-Annex I countries have also indicated emission reduction targets. For China and India, there are, however, intensity targets that cap emissions per unit of GDP. Therefore their amount of absolute emissions depends on economic growth. Moreover, these objectives are set at such levels that it remains to be seen whether these intensity targets will become binding at all. Without binding targets outside Annex I, climate policies will only comprise less than half of worldwide emissions.

This lack of a comprehensive global climate change agreement raises concerns regarding the competitiveness and environmental effectiveness of unilateral climate change policies. Competitiveness can be affected because firms from countries with binding targets face higher costs due to climate change policies, while firms in countries without comparable policies face no or lower cost increases. The magnitude of the cost increase depends mainly on the CO_2 intensity of production, which is directly related to

* CPB - Netherlands Bureau for Economic Policy Analysis.
** PBL - Netherlands Environmental Assessment Agency.
*** ECN - Netherlands Energy Research Foundation.

energy intensity. Firms in energy intensive sectors such as the iron and steel sector, aluminum, cement and fertilizer are therefore more at risk than firms in other sectors. Whether the cost increase will reduce sales also depends on the openness of the sector to trade with countries outside Annex I. Iron and steel and aluminum are sectors that operate in a global market, with ample competition from countries without binding limits. Such firms find it harder to pass on their higher costs. Electricity markets, on the other hand, are almost completely sheltered, with very limited connections to producers in countries without binding limits. Power companies can therefore pass on their carbon costs more easily to their customers. The power generators within the EU, for example, simply included the price of the CO_2 allowances in the electricity price.

In this policy brief we quantify the concerns about competitiveness and trade by analyzing the welfare impacts of current 'unilateral' pledges, i.e. the emission reductions that countries are willing to implement without a global agreement, as well as some complementary measures to reduce potential adverse impacts. Our focus is on the EU in particular because the EU has pledged the largest reductions of GHG even in the absence of a global agreement. We use the applied general equilibrium model of the world economy WorldScan, which is calibrated to the most recent data and to a post-crisis baseline.

Our findings are remarkable. This study shows the relocation concerns of energy-intensive production to be exaggerated. In fact, we find only limited leakage due to relocation of these sectors or to shifts in the carbon intensity of imports and exports. Nevertheless, we still find considerable leakage reducing the effectiveness of the pledged reductions in Annex I and these carbon leakage rates are considerably higher compared with earlier studies. This leakage arises from the indirect effect of lower fossil fuel prices due to the carbon constraint in the countries imposing pledges. Accordingly fossil fuel usage in countries without absolute emission ceilings will rise due to the pledged reduction in Annex I and this impact is remarkably large. Moreover, some of the complementary measures to prevent leakage, such as Border Measures, only have a limited effect. Carbon border measures do not noticeably affect overall carbon leakage because they do not affect the fossil fuel price channel, which is the main cause for the overall leakage.

Background

Differences in climate change policies not only have an impact on competitiveness and trade, but may also increase emissions in regions with no or less ambitious climate change policies. Three main reasons explain this so-called carbon leakage. Firstly, imports of carbon intensive products from countries without carbon policies are likely to increase, whereas exports of these products will suffer in countries with carbon policies. Secondly, carbon leakage might occur due to relocation of production from countries with high carbon costs to countries with low or no carbon costs. In the longer run, investments in new or replacement plants may move to low carbon cost countries. Thirdly, climate policies will reduce global demand for fossil fuel, which will cause fossil fuel prices to fall. This, in turn, should increase demand for fossil fuels and raise CO_2-emissions in those countries that do not have a binding limit on those emissions. These different types of carbon leakage reduce the global effectiveness of emission reductions in those countries that impose CO_2controls unilaterally.

Competitiveness and trade effects strongly depend on the extent to which carbon costs increase, which, in turn, also depends on the design of the policy instrument used to reduce greenhouse gases. The main carbon policy initiative in the world to date is the European Union Emission Trading Scheme (EU ETS) for CO_2 emissions in the energy intensive sectors within the EU. This EU ETS caps CO_2 emissions and thereby creates a pricing scheme for CO_2 emissions. Firms within the EU ETS need allowances to cover their emissions. Such allowances could either be auctioned or handed out for free based on historic emissions. In the last case, called grandfathering, firms do not have to pay for the allowances. Even if the allowances are received for free, however, opportunity costs arise because firms might also sell the allowances in the market instead of using them. Therefore costs also increase with grandfathering. While grandfathering reduces the out-of-pocket costs compared to auctioning or a tax, it does not alter a firm's decision at the margin. Marginal costs increase, whether allowances are allocated for free or auctioned. Firms which maximize profits will still pass-through much of the opportunity costs, realizing profits at the expense of some loss of market share (Smale et al. 2006). Grandfathering is therefore of limited use in protecting firms from foreign competition, because

marginal costs still increase (Grubb and Neuhoff 2006).

Several complementary measures can be imposed to alleviate the impact of unilateral action, like EU ETS, on competitiveness and leakage. We evaluate output based allowance allocation (OBA), the use of the clean development mechanism (CDM) and Border Measures (BM). If allowances are allocated on the basis of the output produced by a firm, the allocation also has a subsidy effect equal to the value of the number of allowances allocated per unit of output. This subsidy partly offsets the cost increase due to the allowance price. The entrance and closure provisions in the EU ETS, with free allocation to new firms and the obligation to surrender allowances received for free in case of plant closure, has a comparable effect. This provides an incentive to expand production capacity in order to obtain additional, valuable emission rights. The additional capacity results in additional pollution, which must be reduced by other, less efficient measures. Furthermore, companies that invest in additional capacity for a coal fired power plant receive valuable emission rights whereas companies investing in wind power do not. These rules induce excessive investment in relatively dirty capacity.

Another option to alleviate the cost of unilateral action is to allow the use of emissions reduction credits generated by CDM projects. CDM projects are emission reduction projects in countries without emission targets. Under the Kyoto protocol emission reductions credits produced by CDM projects can be used by Annex I countries to meet their emission targets and by firms in the EU ETS to cover their emissions instead of using ETS allowances. Emission reduction credits are attractive for these firms because of the relatively low costs of reducing emissions in non-Annex I countries. EU use of CDM credits reduces the costs of emission reduction and therefore also diminishes the effect of EU ETS on competitiveness and carbon leakage. The drawback of CDM, however, is a subsidy effect in the host countries, where dirty sectors may expand because of the CDM transfer. This effect is similar to the effect of output based allocation of allowances in the EU ETS.

Finally, the use of border measures (BM) also helps to shelter firms from non-Annex I competition. BM impose a carbon levy on imports and may also provide a rebate on exports. Such a levy or rebate will be based upon the carbon emissions released in the production process of the dirty products. Determining the exact emissions brought about in producing a specific product can be daunting, especially for imported goods. Instead, estimates can be used based, for example, on emission benchmarks which are being developed by the EU for the allocation of ETS allowances. Making the lifting of BM conditional to participation into the international agreement means that they can also be used as a strategic instrument to encourage this participation.

Baseline and policy scenarios

To assess the effects of the pledges and different policy instruments on economic welfare, carbon and production leakage and emissions in 2020 we measure policy impacts relative to a baseline scenario. Our business-as-usual scenario does not assume new climate and energy policies and follows the World Energy Outlook (WEO) (IEA 2009). However, we remove the ETS-caps from the WEO in order to establish a level playing field for our assessments of the mitigation pledges in an international context. So we simply assume in our baseline that there is no emission trading in the EU after 2012 and no renewable energy target that increases the use of renewable energy above the level to be expected with current policies.

According to our baseline, global population will continue to expand. Combined with worldwide economic growth of 2.7 percent per year global demand for energy will be almost 30 percent higher in 2020 compared to 2004. This expansion predominantly takes place in non-Annex I, thus partially reducing the gap in energy consumption per capita with the industrialized countries.

In the baseline, energy- and GHG-intensities are declining worldwide, and especially in non-Annex I. Fossil fuel prices are expected to rise with oil reaching a price of $100 per barrel in 2020. In Europe the gas price is expected to lag behind the oil price. Regional coal prices are expected to remain constant at their 2009 level. This baseline takes into account the consequences of the financial crisis and the subsequent recession for the level of economic activity, and also reflects continuing globalization of the world economy.

To assess the impact of EU climate policy on competitiveness and trade we have analyzed two main variants of pledges. The first variant refers to the pledges that were made at negotiations up to and after the summit in Copenhagen, see Table 1. These so called AMBITIOUS PLEDGES are conditional to other countries also implementing sufficiently ambitious emission reductions, such as the EU target of 30 percent emission reduction compared to 1990 emissions. For this variant we assume emission trading to be allowed between all Annex I countries and between all sectors in these countries. As a result, one common CO_2 price will exist in all sectors of all Annex I countries. Within the EU the distinction between ETS and non-ETS sectors will no longer prevail.

The second variant, simply labeled PLEDGES, reflects the emission reduction targets that countries have indicated that they will adopt even when they judge the reduction targets of the other major emitting countries to be insufficient. China and India have also announced national climate change policies. However, according to our baseline analysis, these targets will largely be met even without climate policies and will therefore not become binding. Moreover, emission trading is restricted in the PLEDGES scenario because of the assumption that no permit trade between countries will occur. In the EU, however, trade in CO_2 allowances is possible among firms within the EU ETS sectors, and governments can trade their emission reductions from sectors not covered by the EU ETS. Accordingly, two different carbon prices exist within the EU, one for the EU ETS sectors and one for households and the non-ETS sectors. Table 1 summarizes the emission reduction targets for both the ambitious and modest pledges of the major Annex I countries.

Table 1
Pledged emission reduction targets for selected countries (in %)

	Ambitious pledges Emissions 2020 compared to baseline 2020	Pledges Emissions 2020 compared to baseline 2020
Annex I	-14	-7
EU-27	-29	-21
Russia	3	17
USA	-12	-12
Japan	-18	-18
Australia	-37	-20

Source: Bollen, Koutstaal and Veenendaal (2011).

To study the impact of optional complementary measures, like OBA, CDM and BM, we take the PLEDGES scenario as point of departure. In the scenario PLEDGES WITH OBA we simulate a variant where free allocation of allowances amounts to a subsidy being given on production costs of five percent of the value of the grandfathered allowances. This subsidy more or less reflects the effect of the entry provision in the ETS, which is equal to a reserve of five percent of all allowances that is marked for free allocation to new firms. In PLEDGES WITH CDM firms within the ETS are allowed to use CDM emission reduction credits up to one third of their reduction effort. We have assumed that this limit also applies to other non-Annex I countries. The non-ETS sectors have a ceiling of three percent of their 2005 emissions for the use of CDM-credits. Finally, the PLEDGES WITH BM variant includes a carbon levy on imports and a refund on exports for the energy intensive manufacturing sector. The levy and rebate are based on direct and indirect CO_2 emissions of EU production and the level of the carbon price.

Results: costs and welfare

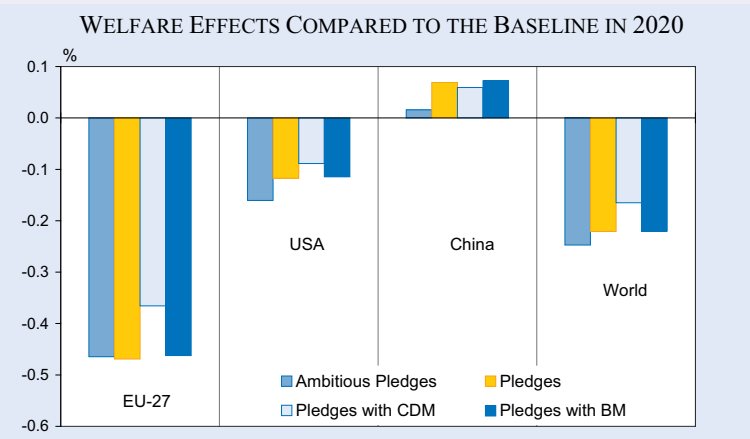
The carbon emission reductions pledged by Annex I countries (as shown in Table 1) put a burden on the economy. Figure 1 presents the welfare effects[1] for the different policy scenarios compared to the baseline scenario. As expected, the welfare effects for the world are largest for the AMBITIOUS PLEDGES scenario. Interestingly, the difference with the PLEDGES scenario is very small. Although the emission reduction target of PLEDGES is only half of the reduction target of AMBITIOUS PLEDGES, the extra loss of global economic welfare is only 0.03 percent of national income in the baseline.

Apparently the possibility for global emission trading reduces abatement cost for CO_2 to the extent that it is possible to double the reduction in worldwide emissions for the same welfare burden. Indeed, the CO_2 price in AMBITIOUS PLEDGES is only EUR nine per ton CO_2 in

[1] Measured in terms of equivalent variation as percent of national income in the baseline.

2020, whereas the (differentiated) CO_2 prices in the PLEDGES case are (much) higher. In the PLEDGES scenario emission trading is restricted to the EU countries, separately within the EU ETS and between governments that can trade in non-ETS targets. We find that the ETS price for this scenario is EUR 31 per ton CO_2 versus EUR 11 per ton CO_2 in the non-ETS sectors. Other Annex I countries face CO_2 prices that range from EUR 12 to EUR 51 per ton CO_2.

Figure 1



CMD = Clean Development Mechanism, BM = Border Measures.
Source: Bollen, Koutstaal and Veenendaal (2011).

In terms of global distribution of welfare costs it is hardly surprising that the EU welfare loss is considerably higher compared to other regions like the USA in both scenarios, as the EU pledge is much more stringent. With its non-binding pledge China even benefits from the binding commitments in the Annex I regions. Whereas the welfare gain is small in the AMBITIOUS PLEDGES variant, China faces considerably larger welfare gains in the unilateral policy scenario. Looking at the welfare effects for the complementary policy variants, the PLEDGES WITH CDM scenario clearly offers a welfare improving alternative for the Annex I countries relative to the unilateral PLEDGES scenario. As explained before, CDM facilitates the use of relatively low cost emission reduction options in non-Annex I countries. Indeed, the carbon price of EUR nine in the EU ETS and EUR six in the non ETS sectors in the EU is substantially lower than in PLEDGES. The same holds for carbon prices in other Annex I countries, where these prices are about 20–50 percent lower.

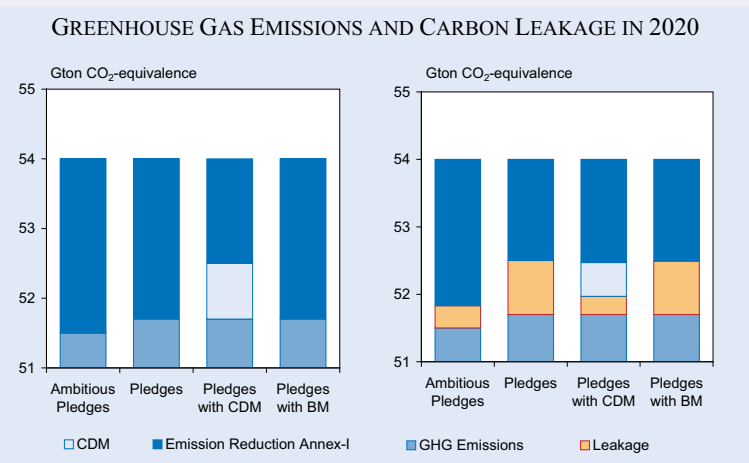
However, we do not find similar impacts for the alternative complementary policies, PLEDGES WITH OBA and PLEDGES WITH BM. The differences between PLEDGES WITH OBA and PLEDGES are negligible. Hence, we do not show the effects for this scenario separately. The reason is that the production cost subsidy in PLEDGES WITH OBA scenario is too small to change the results noticeably. In the PLEDGES WITH BM the differences in welfare with PLEDGES are small. Apparently the price in the EU ETS sectors increases (on average) only by one euro. At a more disaggregate level, however, the sectoral impacts will differ, which we will see in the next section.

Results: emission reduction and leakage

The overall welfare effects obviously not only depend on regional reduction efforts, but also on the impact on global emissions. Climate policy aims to reduce global GHG emissions in the first place. As one might expect, emission reduction in Annex I countries is highest in the AMBITIOUS PLEDGES scenario. Reductions are estimated at 2.5 Gton CO_2 equivalents, which is illustrated by the blue bar in the left-hand diagram in Figure 2.[2] However, carbon leakage is responsible for increases in emissions in non-Annex I countries, which is illustrated by the red bar in the right-hand diagram of Figure 2. Emission reductions in Annex I countries in the PLEDGES scenario are slightly lower and equal to 2.3 Gton CO_2 -equivalent. For this unilateral case carbon leakage is considerably larger, reducing the net effect to 1.5 Gton CO_2 -eq. In the CDM variant, 0.8 Gton is realized through emission reductions in non-Annex I countries, while Annex I countries reduce their own emissions by 1.5 Gton. Carbon leakage in this scenario is considerably smaller due to much lower carbon emission prices. Finally, we also find that the PLEDGES WITH BM scenario is almost similar to the PLEDGES variant, with almost no difference in terms of leakage, showing

[2] Our baseline scenario GHGs estimate for 2020 comprises 43 Gton CO2 emissions, 6.5 Gton CO2 equivalent emissions of CH4 and N2O, 1.7 Gton F gases and 3 Gton of emissions related to land use, land use change and forestry (LULUCF).

Figure 2



CMD = Clean Development Mechanism, BM = Border Measures.

Source: Bollen, Koutstaal and Veenendaal (2011).

the very limited effect of BM on climate change emissions at home and abroad.

Carbon leakage in terms of the emission increase in non-Annex I countries as a percentage of the decrease in Annex I countries may reach rates of up to 36 percent depending on the specific scenario (Table 2). Such large impacts on carbon leakage are surprising, although a recent study by Böhringer et al. (2010) reports similar results.[3] Our rates are considerably higher compared with earlier studies showing leakage rates of only 3–11 percent (e.g. Manders and Veenendaal 2008). An important difference with these earlier studies is the use of more recent data for 2004, which reflects the increasing integration of the world economy and the increase in energy use in fast-growing countries such as China and India. Moreover, fossil energy markets are now characterized by lower supply elasticities, which is consistent with the higher fossil energy prices in our baseline (USD 100 per barrel in 2020) that results from an enduring underinvestment in production capacity of oil supply.

The usual perception is that unilateral policy has major competitiveness effects through the relocation of energy-intensive sectors. Our leakage rates seem to confirm these concerns at first sight. In fact our study shows such relocation concerns to be exaggerated. The leakage we find is almost entirely due to the indirect effect of lower fossil fuel prices due to the carbon constraint in the countries imposing pledges. Climate change policies in Annex I countries reduce worldwide consumption of fossil fuels and lower demand causes fossil fuel prices to fall, depending on the scenario. For instance, in the unilateral PLEDGES scenario global prices fall on average 3.2 percent relative to the baseline (Table 2). This fossil fuel price reduction induces a rebound effect at the global level, with lower prices stimulating demand in countries without a binding emission target. Given that the volume of energy use in these countries is substantial, even a small percentage increase will have a considerable absolute impact on energy use and therefore on CO_2 emissions at the global level.

To illustrate that the fossil fuel price effect of climate policy is far more important for leakage than the trade channel, we keep fossil fuel prices at the level of the baseline scenario and find that the leak-

[3] Böhringer et al. (2010) report that leakage is never reduced by more than 15 percent for different climate policy scenarios, including various border measure variants.

Table 2

Leakage rates and fossil fuel prices

	GHG leakage rate [a)] %	GHG leakage rate trade channel [b)] %	Global fossil fuel prices % deviation from baseline
Ambitious Pledges	16	0	-1.8
Pledges	36	2	-3.2
Pledges with CDM	13	-3	-2.8
Pledges with BM	35	0	-3.3

[a)] The GHG leakage rate is defined as the increase of GHG-emissions in non-Annex I countries relative to the emissions reduction in Annex I countries; in the case of CDM the leakage rate reflects CDM efforts from the perspective of the Annex I countries that buy CDM credits.

[b)] The GHG leakage rate as defined in a) when fossil fuel prices are kept at baseline levels.

Source: Bollen, Koutstaal and Veenendaal (2011).

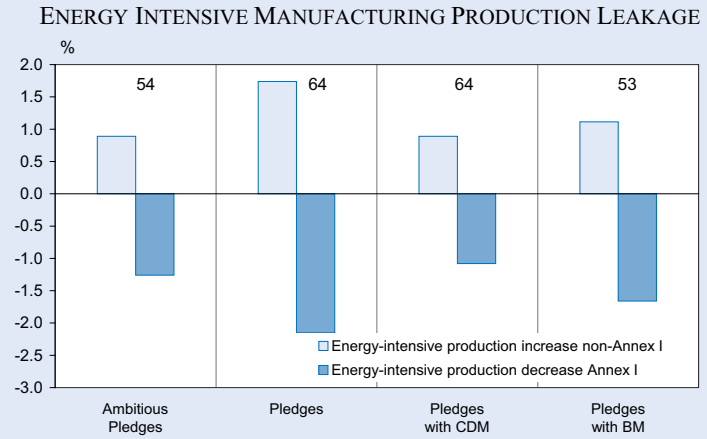
age rates are at most two percent in the PLEDGES scenario (see the GHG leakage rate trade channel column in Table 2). The relative weight of trade in energy intensive products between different regions can hardly be taken to explain the large leakage rates found. In the Baseline scenario, the OECD countries import six percent of their total demand for energy intensive manufacturing products from the rest of the world. Exports from the OECD to the rest of the world amount to ten percent of total demand outside OECD. In the PLEDGES scenario, imports in the OECD increase by one percentage point to seven percent, while exports fall by one percentage point. The impact of climate change policies on trade flows in energy intensive products is therefore limited, which underlines the limited effect of the trade channel on carbon leakage.

If leakage undermines emission reduction efforts in Annex I through the fossil fuel price channel instead of the trade channel, the effectiveness of complementary measures, like Border Measures and CDM, is likely to be smaller as well. To illustrate, Figure 3 presents the impact of higher carbon costs on output reductions of energy intensive manufacturing in Annex I countries. The decrease in output is presented as a percentage deviation from baseline production levels in Annex I countries. As expected the reduction in output is smallest in the coordinated policy case AMBITIOUS PLEDGES due to the encompassing emission trading scheme. The decline is largest in PLEDGES with a 2.2 percent reduction of baseline production. Both complementary policies reduce the impact on production of energy intensive manufacturing relative to this unilateral case. Border measures reduce the competitiveness impact on production through the levy on energy intensive imports and the refund on exports. CDM credits reduce the abatement costs for energy intensive firms even more and therefore soften the impact on production as well.

However, the carbon impact of this production reduction is quite limited. Firstly, part of the output reduction will be taken over by firms in the energy intensive sectors outside Annex I. Figure 3 shows this increase using the same denominator as for the production decline of Annex I energy intensive manufacturing, i.e., Annex I baseline production. The increase in energy intensive production in non-Annex I reflects increased consumption within these countries due to lower fossil fuel prices, as well as the increase in exports from energy intensive manufacturing to Annex I countries. The numbers shown in Figure 3 are the energy intensive production leakage rates and they are always above 50 percent.

Secondly, because the fossil fuel input mix in non-Annex I has a higher emission-intensity than the fuel mix in Annex I, leakage in terms of carbon is even larger. In the case of BM reduced production leakage is more than compensated for by the increase in more carbon intensive input use outside Annex I due to lower fossil fuel prices, which explains the overall ineffectiveness of carbon based BM for climate policy.

Figure 3



CDM = Clean Development Mechanism, BM = Border Measures.

Source: Bollen, Koutstaal and Veenendaal (2011).

Conclusions

The impact of climate change policies on the competitiveness of energy-intensive sectors in countries that implement more ambitious climate change policies than other countries appears to be limited. The decrease in energy intensive manufacturing production in Annex I countries as a percentage of baseline production is a maximum of 2.2 percent. Over half of this production loss is replaced by an increase in the production of energy intensive manufacturing in non-Annex I countries.

In contrast to earlier studies, which reported carbon leakage rates of 3–11 percent, carbon leakage in our analysis even reaches a level of 36 percent in the PLEDGES scenario in which non-Annex I countries do not have binding limits on their emissions. The major reason for the high carbon leakage is the fossil fuel price channel. Climate change policies in Annex I countries reduce world fossil fuel prices. Accordingly, fossil fuel use in non-Annex I countries increases, which partly reverses the emission reductions realized in Annex I countries. Our simulations show that carbon leakage through the trade channel is very limited and responsible for at most two percentage points of the leakage rate. The main reason for the increased leakage is that fossil energy markets are now characterized by lower supply elasticities than in the past. Inelastic oil supply is typically consistent with the high energy prices in our baseline and results from an enduring underinvestment in the production capacity of crude oil.

A consequence of the negligible impact of the trade channel on carbon leakage is that border measures will be ineffective in reducing carbon leakage. However, they do affect the competitiveness of energy intensive manufacturing, reducing production loss from 1.4 percent to 0.9 percent of baseline production. Allowing the use of CDM credits is most effective in reducing carbon leakage. With CDM, emission reductions are realized at lower costs and the impact of Annex I climate policies on fossil fuel prices is more limited. Consequently, carbon leakage through the fossil fuel price channel is also reduced.

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Comparing informal institutions

Theresia Theurl* and Jochen Wicher*

Introduction

The crucial role of institutions in the economic development of countries is increasingly widely accepted in economic research (Harms 2010, 109). Nevertheless, there is demand for further research, especially when the aim is to measure and to compare institutions not only in a qualitative, but in a quantitative way. Some cases in recent history revealed that political restructurings of formal institutions without considering the informal institutions can cause severe (economic and social) problems. One well-known example is the transformation process of Eastern Europe. Developing a tool that is able to operationalize and measure the informal institutions of a country and compare them to those of other countries can help to solve this problem.

This paper aims to provide the approach of a composite index as a first step towards a measurement and comparison of informal institutions. Since this methodology has its advantages and disadvantages, like any other scientific method, the results of this index should be interpreted with caution. Yet it is possible to identify some major tendencies and developments.

Compared to another recently published article by Theurl and Wicher (2012), the focus of this paper is broader. The next section lays down the theoretical background which is necessary for the analysis, while the following section explains the construction of the index and the methodology. The paper concludes with a presentation and discussion of the descriptive results.

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Theoretical background

The concept of categorising institutions as formal or informal was first developed by Douglass C. North (1990). He uses two criteria for this distinction: (i) the degree of formalization of institutions (written and unwritten) and (ii) their emergence and change. As far as the written form is concerned, North uses the terms of informal and formal constraints. He describes informal institutions as codes of behavior, conventions and customs in contrast to formal institutions, which are rules that are provided in written form (North 1990, 4). In terms of the emergence of institutions, he argues that the formal institutions have been consciously established by humans. So they are invented at a certain time. Informal institutions have a more complex genesis and are part of a culture in which information about institutions is transferred between generations. Different forms of this transfer can be imitation, oral traditions or the teaching of traditions (Pejovich 1998, 4). It is also possible to describe the emergence of formal institutions as a process planned by political agents and that of informal institutions as spontaneous. In conclusion, the emergence of formal institutions is a dateable event and conducted by humans. The emergence of informal institutions, by contrast, is an uncontrollable process (Geiger 1987, 82-83). However, it is also important to bear in mind that these processes can be seen as sequential. Many economists consider informal institutions as the preliminary stage of formal institutions (Axelrod 1986). They think that an informal institution, once established, may achieve such a level of relevance that political agents want to transform it into a formal institution.

Similar to the process of emergence, institutions can be distinguished in terms of their change. In line with North, informal institutions are persistent to a high degree. Formal institutions can be changed through political or judicial decisions within a short period of time, which is not possible for informal institutions. That is the main reason why they cause challenges and problems in the process of economic transformation (Mummert 1995, 17). The different levels of institutions developed by Williamson in his hierar-

chy of institutions (Williamson 2000, 597) highlight this problem. Informal institutions are part of the first level, at which changes are especially difficult and require more time.

Additionally, North also states that there are generally only gradual differences between the categories of distinction and that the classification is not dichotomous. He therefore proposes a continuum that is capable of displaying different degrees of formal and informal institutions.

Another distinction criterion is the enforcement of institutions (Knight and Sened 1995, 5). Informal institutions are not enforced by official sanction mechanisms, whereas formal institutions are safeguarded by courts, for example (Helmke and Levitsky 2004, 730). The existence of formal institutions is exogenously guaranteed by governmental authority, the enforcement is provided by central state agencies and the sanctions for violations are clearly determined. The enforcement of informal institutions, on the other hand, is provided by local entities, namely members of affected groups. The sanction mechanisms of informal institutions do not have a written form, since the sanctions are mostly provided by another informal institution. These sanctions may include exclusion from a group, ostracism by neighbors and friends, or the loss of reputation (Pejovich 1998, 4).

In our paper we use an additional criterion for the classification of institutions, namely a content-related criterion. This provides further differentiation and allows for a more sophisticated analysis of institutions, including informal institutions. The previous literature mainly uses four different categories of institutions: political, judicial, economic and cultural/social institutions (Acemoglu and Johnson 2005, 949). Before we explain these categories in detail, it is important to remember that this classification is also not selective.

The content of political institutions is, in most cases, related to the form of government of a country. This includes the rules of election, details of governance and other characteristics of the political system (Kotte 2004, 67–68). The constitution is the most commonly cited example of a formal political institution (De Soysa and Jütting 2006, 5). An example of an informal political institution is the acceptance of the political system. There are several countries in the world, for example the USA or France, which have a long democratic tradition and thus the democracy in these countries may be described as more stable than in countries that have recently become democratic.

As the name indicates, judicial institutions are related to the judiciary of a country. They generally include the legal framework, the systems for recruiting judges and the determination of their tenure, the assignment and enforcement of property rights and the rights and protection of customers and investors. A general characteristic of judicial institutions is their written form (Grusevaja 2005, 4). Therefore, the majority of judicial institutions are formal institutions. Like political institutions, the acceptance of the legal framework of a country is an informal judicial institution. This can be approximated by the level of organized crime in a society, for example. If organized crime is high, the acceptance and enforcement of the legal framework is insufficient.

Economic institutions deal with the economic system of a country. They lay down the rules that determine the production, allocation and distribution processes in a society (Jütting 2003, 14). Formal economic institutions, for example, apply to the competition law and regulation. As for informal judicial institutions, a high level of shadow economy in a society can be interpreted as a sign of the low acceptance and enforcement of formal economic institutions. The fourth type of institutions are cultural or social. Their content is less concrete. Examples of this type of institution are codes of conduct postulating ethical behavior like certain Corporate Governance Codes, for example. The granting and enforcement of civil liberty rights can also be understood as a cultural institution (Havrylyshyn and Van Rooden 2002, 6).

Data and methodology

This section explains the construction of the composite index. It starts by describing the data used in the paper. Based on this description, the methods conducted to build a composite index are presented.

The methods of the surveys on which the composite index is based, are very similar. It is therefore sufficient to describe just two surveys in detail, the "World Competitiveness Yearbook" of the Institute for Management Development (IMD) and the "Country Policy and Institutional Assessment" of

the Asian Development Bank. The proceedings of the other surveys vary mostly only in terms of the questions asked and geographical regions covered, but not in terms of the method itself.

In the "World Competitiveness Yearbook" of 2010, the IMD analyzes the economic competitiveness of 58 countries worldwide. According to the IMD, these are the 58 countries that have a substantial impact on the world economy. The IMD surveys 300 different variables covering economic performance, government efficiency, a country's infrastructure and corporate efficiency. The survey was completed by 4,460 managers at an upper and middle management level. The questions were answered on a zero-to-six interval-scale.

The annual "Country Policy and Institutional Assessment" survey of the Asian Development Bank focuses on countries of the Asian continent. In the 2009 edition, economists were asked to state their opinion on 16 different variables on a zero-to-six interval-scale. The topics covered were the efficiency of government, an evaluation of the trade policy and the enforcement of property rights.

The following part contains the explanation how the data of the surveys described above (and other) can be merged to obtain a composite index. The goal is to consider the most influential and important countries of the world. When choosing the countries that should be part of the analysis of the informal institutions, one has to ensure that these countries cover geographical regions all over the world to increase the validity of the results. This can cause problems because the collection of data is much easier in industrialized compared to developing and emerging countries. We therefore opted for a combination of the two criteria. The 193 countries under consideration have been listed according to their places in two rankings of the 2009 edition of the CIA World Factbook: the number of inhabitants and Gross Domestic Product divided by the number of inhabitants (GDP/capita). The mean of the two positions was subsequently calculated. Germany, for example, ranked 14th in terms of number of inhabitants and 21st in terms of GDP/capita. Hence, Germany obtained a value of 17.5 in the new ranking. The 100 countries with the lowest ranking values were chosen for the analysis of the informal institutions. In comparison to the isolated consideration of the number of inhabitants, the advantage of this procedure is that it also covers small countries with a strong economy. On the other hand, the isolated consideration of GDP/capita would have excluded too many countries from Asia and Africa. Within the 100 countries selected there are 36 European, 32 Asian, 12 African, 18 American and two from Oceania, so that each region of the world is covered.[1] In other rankings and composite indices a common procedure is to approximate missing values with the help of cluster-based averages. This will not be applied here, since there will be a cluster-analysis later on and the proceeding would antedate the results, or would at least have an impact on it.

As stated above, the general methodology of this analysis is the building of a composite index in connection with country rankings. The goal of this approach is to construct an index that assigns a value of the validity of its informal institutions to each country. The index consists of four sub-indices relating to the four different types of institutions described above, respectively. The partition into four sub-indices allows a more detailed view and an analysis on a disaggregated level, so that the respective strengths and weaknesses can be identified for each country (Enste and Hardege 2006, 7).

The construction of such a sub-index can be illustrated with the help of the following examples. The sub-index for informal political institutions includes several variables, for example the "Transparency of government policymaking" of the World Economic Forum´s "Global Competitiveness Report" in the 2010 edition. Individuals in 139 countries have been asked to state their opinion as to what extent the political decision process related to the business operations within a country is transparent. The scale ranges from one (absolutely intransparent) to seven (absolutely transparent). Subsequently, the mean was calculated over all answers of a country and then the countries were ranked with respect to the mean. Since this is only one variable of the sub-index and the other variables are sometimes based on different scales, the results have to be standardized by assigning relative values. The standardization is necessary to aggregate them. To do this, the countries with the most extreme results within a variable get assigned the values 0 and 100, and the countries in between receive values relative in dis-

[1] When conducting the analysis, some problems with data availability will arise. For this reason, some countries have to be deleted from the analysis, namely Equatorial Guinea, The Bahamas, Burma, Iraq, Yemen, Cuba, Liechtenstein, North Korea, Sudan, Uzbekistan and Belarus.

tance to these extreme values (Enste and Hardege 2006, 54). The standardization is conducted in two different ways. If a high value of a scale implies a good characteristic of informal institutions, the standardization equation can be written as follows:

$$X_i = \frac{I_i - \min(I_i)}{\max(I_i) - \min(I_i)}$$

I_i denotes the absolute value of the variable in the respective country and X_i is the assigned relative value. max (I_i) and min (I_i) denote the two most extreme absolute values over all countries.

On the other hand, if a low value on a scale implies a good characteristic of informal institutions, the standardization equation is as follows:

$$X_i = \frac{\max(I_i) - I_i}{\max(I_i) - \min(I_i)}$$

Subsequently, the relative values are used to build one of the four sub-indices by computing the mean over all relevant variables. Since the four sub-indices are constructed in the same way, an aggregation to an overall index is possible.

The only deviation from this procedure takes place when the number of countries covered by a variable is too small. An example is the "Trust in police"-variable of the Afrobarometer survey. In the latest edition of 2009 only three of the countries that took part in the analysis were covered by the Afrobarometer. In such cases of insufficient observations an application of the normal procedure would lead to a bias, because the values 0 and 100 would have to be assigned to two of the three countries. So the alternative procedure chosen is to assign the numbers of 0 and 100 to the lowest and highest possible answers (i.e. the range of the scale), respectively, and the countries receive the relative values with respect to these answers.

Table 1 offers a short overview of the contents of the four sub-indices. For a more detailed description of the sub-index informal political institutions, for example, see Theurl and Wicher (2012, 81).

There are, of course, critical points concerning the procedure used for this analysis. They can be divided into two categories, the general scientific critique and the criticism relating to parts of the analysis. The critical points are stated here and followed by a description and discussion of the results of the analysis.

The general scientific critique questions the appropriateness of the applied procedure. Some economists state that the selection, the weighting, and the assignments of points are highly subjective and not scientifically justifiable (Van Suntum 2004, 2). Other researchers argue that there are several possibilities for manipulation, so that the results may be influenced by the researcher. This questions the validity of the results (Grupp and Mogee 2004, 1382).
The criticism related to parts of the analysis has at least three dimensions (Enste and Hardege 2006, 15): (i) the incorrect reduction of informational variety, (ii) the weaknesses of the methods used, and (iii) the determination of the results by the availability of data.

The critique of incorrect reduction of informational variety relates to the aggregation and computation of the mean values. A concentration of several variables into a single number can result in a loss of informational details (Nardo et al. 2005, 63). One way to reduce this critique is to state that the exact results shall not be taken too seriously and that only general tendencies can be derived. If one wants to obtain concrete operation instructions, additional data are necessary.

Criticizing the weaknesses of the methods used points in the same direction. When constructing a composite index the implicit substitutability is a problem. A bad result in one sub-index can be compensated for by a good result in another sub-index. So if there is a great variety within the results, this information is lost in the process of aggregation. Explicit analysis of the four sub-indices therefore becomes necessary.

The third critique states that the availability of data determines the results. Aspects that are difficult to operationalize are excluded from the analysis, although they do constitute an important part of it. This reduces the possibility of obtaining reasonable operation instructions.

Subsequent to the construction of the index, a cluster analysis will be conducted. With the help of the Single-Linkage-Approach statistical outliers are identified in the first part and excluded from the analysis. This is also called the "nearest neighbor"-approach. The distance between two clusters is estimated through the distance between the two most similar observations. In the second step, the approach of Ward (1963) is used to assign the coun-

Table 1

Contents of the index

Sub-index	Contains indicators explaining
P	Trust in political agents Corruption (political) Transparency Political stability
J	Acceptance of the judicial system Crime Independence of the judicial system
E	Shadow economy Competition policy Corruption (economic)
C	Ethical behavior Credibility Civil rights

Source: Compilation of the authors.

tries of the analysis to different clusters. This approach is used to minimize the loss of information that is inherent when grouping several objects. Ward states that this loss of information can be approximated with the help of the following equation:

$$ESS = \sum_{i=1}^{n} x_i^2 - \frac{1}{n}\left(\sum_{i=1}^{n} x_i\right)^2$$

x_i denotes the assigned single number of a country and ESS is the error sum of squares. As stated above, the approach of Ward tries to find the number of clusters and the assignment of countries to those clusters that minimize the loss of information.

Descriptive results

In this chapter the descriptive results of the analysis are presented. Table 2 shows selected results from the four sub-indices and the overall index.

When interpreting the results one has to keep in mind that these values are relative. They are an approximation of the distance to the best or worst performing countries in this study. It follows that if all covered countries would improve with respect to their current position, the results of Table 2 would be the same.

Denmark achieves the best results in the overall index. It gets high values in each of the four sub-indices, like the other Scandinavian countries. Like Denmark, the runner-up country Sweden accomplishes 90+ percent scores in three of the four sub-indices, followed by several countries, which are European or Anglo-Saxon and have a strong economy. Switzerland and Germany obtain the sixth and the eleventh place, respectively. Today, both countries are managing to sustain a strong economic performance, although the countries around them struggle because of the Euro crisis.[2] New Zealand is one of the most liberal countries of the world as far as its economy is concerned. It is ranked the fifth best country and therefore achieves much better results than the United States of America at 24th place. This rather bad result for the USA is caused by the low values in the sub-indices of the informal political and judicial institutions.

The next group contains those European countries that have faced substantial economic problems in their recent history, like Spain or Greece. Spain reaches a position similar to that of the USA, whereas Greece also falls behind emerging economies like India or Brazil and finishes 43rd. This group also includes the most OPEC-countries covered by analysis, such as Qatar for example. These countries obtain relatively high values in the sub-indices of the informal political and judicial institutions, but relatively low values in the sub-indices of informal economic and cultural/social institutions.

The second half of the ranking mostly consists of Asian and Southern American countries. They represent the center of the ranking, achieving better results than the African countries, but worse results than the European countries. Angola and Nigeria, for example, finish second and third from last.[3] Venezuela takes the last place, with a value of just above 20 percent for the sub-index of cultural/social institutions.

These results can be used to conduct the cluster analysis mentioned above. The approach of Ward

[2] Switzerland is not part of the European Monetary Union, but has strong economic links to it as its exports to and imports from European Union countries account for over 50 percent.
[3] Caused by the non-availability of data, the overall index consists only of 83 countries.

Table 2

Selected results

Country	Sub-indices				Overall index (equally weighted)	Rank
	Political	Judicial	Economic	Cultural/ Social		
Denmark	88.36	93.08	93.74	96.64	92.96	1
Sweden	90.08	93.24	88.80	94.62	91.69	2
New Zealand	87.81	94.76	86.53	92.06	90.29	5
Switzerland	86.66	93.71	84.94	91.38	89.17	6
Germany	76.64	89.21	86.99	82.96	83.95	11
USA	66.62	55.62	79.46	84.21	71.48	24
Spain	51.40	65.07	76.16	75.88	67.13	25
Brazil	46.93	39.61	63.37	83.94	58.46	36
Qatar	85.70	83.14	30.46	33.22	58.13	37
India	39.99	48.34	58.98	79.77	56.77	41
Greece	41.34	55.31	53.67	75.60	56.48	43
China	50.01	43.64	39.67	28.27	40.40	64
Ethiopia	35.33	46.72	22.61	26.07	32.68	76
Angola	38.76	38.91	17.80	18.75	28.56	81
Nigeria	10.90	23.80	24.12	52.44	27.81	82
Venezuela	9.16	4.75	18.07	57.02	22.25	83

Source: Based on the authors' analysis.

leads to the five clusters, depicted in Table 3. The ranking of the clusters themselves is irrelevant.

If two countries are assigned to the same cluster, this does not necessarily mean, that they have the same informal institutions. One can only say that the informal institutions are similarly viewed and rated. Not included in the cluster analysis is Singapore as it has been identified as a statistical outliner due to the Single-Linkage approach.

Discussion

This section offers a brief discussion of the descriptive results above. Cluster 1 consists of ten countries, four located in Africa and six located in Asia. The countries in this cluster have relatively low values in each of the four categories. Relating to the sub-indices of informal political and judicial institutions, the countries have an average of about 40 percent, the other two sub-indices are in the mid-twenties. Therefore, this is the cluster of those countries that are the so-called "under-performers" in terms of informal institutions. Besides, the cluster also includes China and Russia, which shows that economic performance plays only a minor role in this ranking, as intended.

The second cluster includes 15 countries, two European countries, as well as three Asian, seven American and three African countries. In terms of the first three sub-indices this cluster resembles the first cluster. The major difference lies in the fourth category, or informal cultural/social institutions. Here, cluster 2 has an average of about 60 percent, whereas the average of cluster 1 is about 20 percent. Cluster 3 contains 23 countries: 14 European, four American, three Asian and two Oceanian. This cluster can be described as the "best-countries" cluster, as the averages of all four sub-indices of the countries in this cluster lie above the averages of any other cluster. The countries included in this cluster are mainly so-called "first world" countries. This

Table 3

Result of the cluster analysis

Cluster	Countries
1	Angola, Azerbaijan, China, Egypt, Ethiopia, Iran, Libya, Russia, Syria, Vietnam.
2	Algeria, Argentina, Bangladesh, Dominican Republic, Ecuador, Guatemala, Kenya, Lebanon, Mexico, Nigeria, Pakistan, Peru, Serbia, Ukraine, Venezuela.
3	Australia, Austria, Belgium, Canada, Chile, Cyprus, Denmark, Estonia, Finland, France, Germany, Ireland, Israel, Japan, Netherlands, New Zealand, Norway, Sweden, Switzerland, Taiwan, United Kingdom, United States, Uruguay.
4	Bahrain, Brazil, Bulgaria, Colombia, Czech Republic, Greece, Hungary, India, Indonesia, Italy, Kazakhstan, Kuwait, Latvia, Lithuania, Malaysia, Morocco, Panama, The Philippines, Poland, Portugal, Romania, Slovakia, Slovenia, South Africa, South Korea, Spain, Sri Lanka, Thailand, Turkey.
5	Oman, Qatar, Saudi Arabia, Tunisia, United Arab Emirates.

Source: Based on the authors' analysis.

does not hold for Chile, but Chile was the first country in Southern America to open its borders to world trade (Sachs and Warner 1995, 23).

Out of the 29 countries of the fourth cluster, 13 are located in Europe, 11 in Asia, two in Africa and three in America. These countries achieve medium results in all of the four categories. This cluster can therefore be seen as the cluster of the Transition Economies, because it contains countries with improving economies like Brazil, India, South Korea, South Africa and the Eastern Europe countries. The "PIGS-countries", i.e., the countries that faced the most severe economic problems in the current financial crisis, are also part of this cluster and can be seen as Transition Economies, with the restriction of decreasing economic performance.

The countries of the fifth and last cluster are from Asia (four) and Africa (one). This cluster achieves good results in terms of the averages of the political (71.5 percent) and informal judicial institutions (77.0 percent). As far as the other two sub-indices of informal economic institutions and informal cultural/social institutions are concerned, this cluster performs "below-average" with 37.9 percent on average and 33.0 percent, respectively. Furthermore, the cluster can be described as Islam-related.

Some general tendencies can be derived from the results of the cluster analysis. Again, the absolute values should not be overemphasized. However, the previously described analysis is a first step towards measuring and comparing informal institutions.

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LEARNED FROM MISTAKES? AN ASSESSMENT OF THE "GLOBAL GO-TO THINK TANKS" RANKINGS 2011

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Introduction

The Global Go-to Think Tanks Ranking of the Think Tanks and Civil Societies Programme at the University of Pennsylvania has been published annually at the beginning of every year since 2007. It aims to rank think-tanks worldwide, regionally and in terms of their expertise. The ranking is based on surveys of experts, journalists and the think tanks that feature in the ranking. Seiler and Wohlrabe (2010a,b) were highly critical of the ranking for 2009. In addition to a large number of technical errors, many problematic methodical aspects of the ranking were highlighted. On 20 January 2012 the latest ranking for 2011 was published.[1] We are taking this opportunity to investigate the extent to which the method underpinning the ranking has been changed and/or improved. To sum up, it can be said that the main problems have not been resolved and that the ranking fails to fulfil its own objectives. Its results should therefore continue to be interpreted with great caution.

Before assessing the methodology used to compile the ranking, we begin with a brief introduction to it. Many of these changes were already implemented in the 2010 ranking. For the sake of comparison we refer below to the 2009 survey. For a summary of the methodology used at the time see Seiler and Wohlrabe (2010a).

The latest study is based on a three phase survey, just as it was two years ago. However, the procedure followed at each stage differs. In the first stage the think-tanks were no longer nominated for the ranking by a panel consisting entirely of 293 experts, but by 6,545 previously identified think tanks[2] and 6,500 experts, journalists, politicians and donors from around the world. The reason cited for this change was a potential distortion of the ranking by the survey of experts conducted previously. As with the 2009 ranking, participants were asked to give between five and twenty-five nominations per ranking category from the list of 6,545 organisations. These categories remain divided up according to geographical, specialist and other criteria. Table 1 provides details of the exact classification. The categories have remained the same on the whole, with the introduction of an additional category for think tanks with an annual budget of below five million dollars.[3] This is supposed to pay tribute to smaller think tanks, which (in some cases) do not historically have a large budget at their disposal (p. 11). Think tanks with five or more nominations are covered by the ranking. This "democratic" approach (p. 2) increases the number of nominations considerably compared to the expert nominations of 2009. 5,329 think tanks were nominated at least once.[4] In the second phase the list of think-tanks with at least five nominations was once again sent to around 13,000 institutions and journalists, politicians, donors and experts. These individuals were asked to rank the think tanks. Their assessments then formed the basis for the ranking into the various categories. Finally, in the last stage, the survey results were sent to a group of 793 experts in regional and specialist matters, who checked the ranking for inconsistencies and made recommendations for key changes. The same experts were also called upon to check the consistency of the interim results.

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[1] The current ranking can be downloaded at www.gotothinktank.com.

[2] This selection is based on internal research conducted by the institute of the ranking publisher. The number of think tanks identified increased by 240 versus 2009. The database was improved. The think tanks covered by this survey are listed by region and country at the website http://www.gotothinktank.com/directory/. The respective internet addresses of most of the think tanks are also listed.

[3] It remains unclear who has filtered these think tanks and based on what information.

[4] In 2009 only 391 think tanks were nominated.

Despite meaningful changes, the new structure of the study is still riddled with weaknesses. Firstly, it should be pointed out that the survey often falls short of its aim to be rigorous, comprehensive and objective (p. 12). Although the report contains a large quantity of information (which is sometimes repeated), many points that are supposed to make it possible to assess the quality and meaningfulness of the ranking are vague, unclear or missing entirely.

There are no exact figures on how many of the 6,545 think-tanks and around 6,500 journalists, private and public donors and policy-makers responded in rounds I and II. On page 22 there is talk of 1,500 participants in both the nomination and the ranking process. In Table IV of the report (p. 82) the covering letter on participation in the ranking mentions that 875 individuals participated in the nomination process. Moreover, it remains unknown how their responses are distributed geographically and in terms of specialist fields. This is important when assessing the meaningfulness of the regional and specialist ranking. Without knowledge of the origins of the think-tanks and individuals participating in the survey process, it is also difficult to assess whether the survey is justified in claiming that it has an "increasingly global reach" (p. 21).

The report also gives no exact information on how many think-tanks were ultimately put to the vote in the respective categories. The report only states that 202 think-tanks were put to the vote in the worldwide ranking. It is not clear whether the 5,329 think tanks nominated (p. 22) were nominated once or several times. Five nominations were necessary to qualify for the ranking process. In addition, experts were able to make their own additions. Once again, there is only a mention in annex IV (p. 82) that over 1,500 think-tanks were nominated in the 30 categories. The last key piece of quantitative information missing is the number of votes registered in each category. This is of central importance in order to be able to assess representativeness and robustness. The fewer votes cast per category, the more prone to fluctuations the series is. Finally, it would also be very interesting for readers to know the extent to which the votes cast are relatively distributed.

Another point concerns the influence of experts. On page 12 it is proudly stated that the use of experts has resulted in a significant reduction in distortions or major problems with the rankings. Page 90 contains a sample letter from round III, inciting the experts in question to indicate "any mistake, translation error or other points" related to the ranking. The same request had already been made in round I (letter as of p. 86ff). It remains unclear

Table 1

Ranking Categories

I. Top Think Tanks in the World
Think Tank of the Year 2011 – Top Think Tank in the World
Top Think Tanks – Worldwide (Non-US)
Top Think Tanks – Worldwide (US and Non-US)
II. Top Think Tanks by Region
Top Think Tanks in the United States
Top Think Tanks in Western Europe
Top Think Tanks in Central and Eastern Europe
Top Think Tanks in Asia
Top Think Tanks in Sub-Saharan Africa
Top Think Tanks in Mexico, Canada, and the Caribbean
Top Think Tanks in Central and South America
Top Think Tanks in the Middle East and North Africa (MENA)
III. Top Think Tanks by Area of Research
Top Security and International Affairs Think Tanks
Top International Development Think Tanks
Top Environment Think Tanks
Top Health Policy Think Tanks
Top Domestic Economic Policy Think Tanks
Top International Economic Policy Think Tanks
Top Social Policy Think Tanks
Top Science and Technology Think Tanks
Top Transparency and Good Governance Think Tanks
IV. Top Think Tanks by Special Achievement
Think Tanks with the Most Innovative Policy Ideas/Proposals
Best New Think Tanks (Established in the last 18 months)
Think Tanks with Outstanding Policy-Oriented Public Policy Research Programs
Think Tanks with the Best Use of the Internet or Social Media to Engage the Public

Source: Go-To Think Tank Ranking (2011).

Table 2

Nomination Criteria

It is essential that you consider a variety of criteria in making your decisions. These may include, but are not limited to:
• Direct relationship between organization's efforts in a particular area to a positive change in societal values such as significant changes in quality of life within respective country (amounts of goods and services available to citizens, state of physical and mental health, quality of environment, quality of political rights, access to institutions)
• Publication of the organization's work by peer reviewed journals, books and other authoritative publications
• Ability to retain elite scholars & analysts
• Access to elites in the area of policymaking, media and academia
• Academic reputation (formal accreditation, citation of think tank, publications by scholars in major academic books, journals, conferences and in other professional publications)
• Media reputation (number of media appearances, interviews and citations)
• Reputation with policymakers (name recognition with particular issues, number of briefings and official appointments, policy briefs, legislative testimony delivered)
• Level of organization's financial resources (endowment, membership fees, annual donations, government and private contracts, earned income)
• Ability of the organization to meet the demands of those that fund it or to meet the goals of its respective grant-making institution
• Overall output of organization (policy proposals, publications, interviews, conferences, staff nominated to official posts)
• Number of recommendations to policymakers, staff serving advisory roles to policymakers, awards given to scholars
• Usefulness of organization's information in advocacy work, preparing legislation or testimony, preparing academic papers or presentations, conducting research or teaching
• The organization's ability to produce new knowledge or alternative ideas on policy
• Ability to bridge the gap between the academic and policymaking communities
• Ability to bridge the gap between policymakers and the public
• Ability to include new voices in the policymaking process
• Ability of organization to be inscribed within issue and policy networks; Success in challenging the traditional wisdom of policymakers and in generating innovative policy ideas and programs

Source: Go-To Think Tank Ranking (2011).

whether experts were also able to change the rankings (comments on page 20 indicate this), subsequently leading to a supposed reduction in distortions. If this was the case, there can no longer be any talk of an objective process, for the extent to which the rankings were adjusted after the survey is not comprehensible. There is no information whatsoever on this issue.

A central point of criticism in Seiler and Wohlrabe (2010a) was that the ranking was based on the purely subjective assessments of the survey participants. There was an attempt to take this point of criticism into account. Alongside the nomination criteria (Table 2) a catalogue with quantitative indicators (p. 24–25) was introduced to provide orientation for survey participants prior to drawing up their rankings. These indicators are presented in Table 3. This consideration is correct, but cannot be practically implemented. A summary of this information for a large number of think-tanks for just one of these categories would be very complex and would merit its own publication.[5] It is to be assumed that the survey participants have access to only minimal information on a small selection of think-tanks. This gives rise to two potential conclusions. Firstly, the think-tanks are only ranked by survey participants that have information on them. This means that both the number of votes falls, as does the representativeness of the results, which means that the rankings are distorted. For it is to be assumed that some think-tanks are better according to objective criteria, but are not ranked. This selection bias could only be potentially overcome through a very big sample. The information available in the report as a sample does not lead us to this conclusion. The same problem applies to

[5] A ranking for faculties and institutes in the field of economics based on a multitude of quantitative indicators published by the REPEC network (www.repec.org). See Seiler and Wohlrabe (2010c).

the assessment of think tanks in different fields. It is difficult for an economic research institute, for example, to assess the influence of political and scientific think tanks and vice versa. A potential consequence here is also a distortion of the results if only certain specialist fields have participated and/or if these are over-represented. Secondly, the lack of objective information leads to a ranking based purely on perception and the criticism of Seiler and Wohlrabe (2010a) is applicable here. Only think-tanks that have sufficient information on all nominated institutes should take a position.

Another critical point is potential strategic response behaviour among the think tanks taking part. Although self-nominations are rightly excluded, there is nevertheless an incentive not to nominate direct competitors in corresponding research areas or regions in order not to improve their ranking. Moreover, it cannot be excluded that think tanks which do not feature on the nomination list tend not to answer since they feel excluded. However, such behaviour is difficult to correct through survey design.

Finally, we would like to take a look at the current results in terms of the development of the ranking over time. The think tank of the year was the Brookings Institution from the USA. It was selected best think tank of the year for the fourth year in succession. Figure 1 shows the placement of the top ten best think tanks worldwide (excluding the USA) in the rankings since 2008. It is striking that the majority have been among the top ten think tanks since 2008. The exceptions are Bruegel, the European Council on Foreign Relations and Amnesty International, which were not even among the top 50 in 2008. In the top 20–50 (excluding the USA) the fluctuation is higher. This year seven think tanks made it into the top 50 since the start of the survey. Human Rights Watch was even selected directly at place 18. The other newly ranked think tanks include three from emerging countries, although the Western countries continue to dominate the ranking. There are still a large number of inconsistencies between the various categories. The Stockholm International Peace Research Institute (SIPRI), for example, ranked lower than Amnesty International at place four in the Western Europe category, while in the worldwide category (non-US) it was placed above Amnesty International at rank two. The same applies to a direct comparison of the institutions Transparency International and International Crisis Group. In the Western Europe category Transparency International ranks higher in the worldwide category (non-US) than the International Crisis Group.

Finally, we wish to compare the survey ranking and a quantitative ranking. The latter is the worldwide ranking of economic faculties and institutes of the RePEc. This aggregates the 31 output indicators into an overall ranking. These indicators reflect the number of publications (weighted and unweighted), the number of citations and the number of downloads among other factors. See Seiler and Wohlrabe (2010c) for a detailed description of the ranking methodology. Figure 2 presents a scatter plot diagram that compares the rescaled ranking positions of the think tank rankings of the "International economic policy" category (p. 53) with those of the worldwide RePEc ranking. The first striking fact is that only nine institutions from the top 30 are ranked in the RePEc. This may be due to three possible reasons. Firstly, the top think tanks from the field of economics are not rated in the think tank ranking. Examples are the World Bank (ranked two by the RePEc), the International Monetary Fund

Figure 1

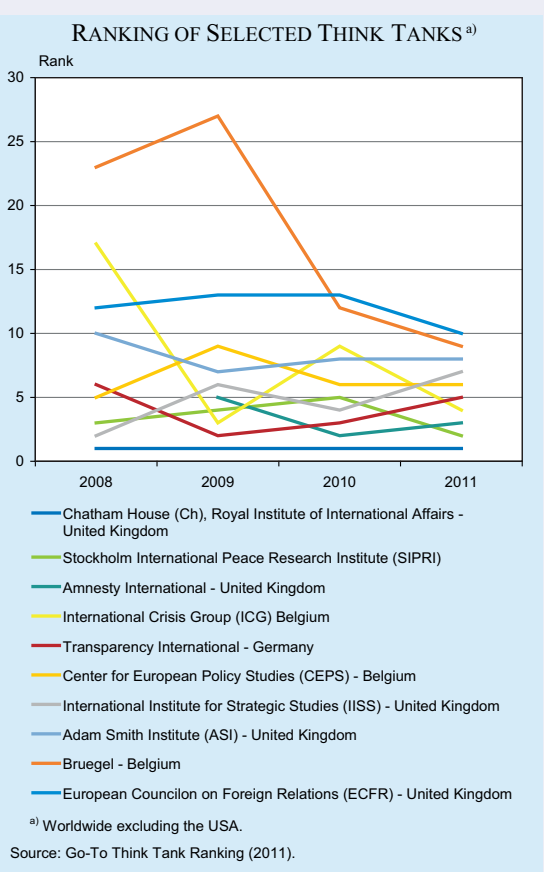


Table 3

Quantitative Ranking Indicators

Resource indicators	Ability to recruit and retain leading scholars and analysts; the level, quality, and stability of financial support; proximity and access to decision-makers and other policy elites; a staff with the ability to conduct rigorous research and produce timely and incisive analysis; institutional currency; quality and reliability of networks; and key contacts in the policy academic communities, and the media
Utilization indicators	Reputation as a "go-to" organization by media and policy elites in the country; quantity and quality of media appearances and citations, web hits, testimony before legislative and executive bodies; briefings, official appointments, consultation by officials or departments/agencies; books sold; reports distributed; references made to research and analysis in scholarly and popular publications and attendees at conferences and seminars organized
Output indicator	Number and quality of: policy proposals and ideas generated; publications produced (books, journal articles, policy briefs, etc.); news interviews conducted; briefings, conferences, and seminars organized; and staff who are nominated to advisory and government posts
Impact indicators	Recommendations considered or adopted by policymakers and civil society organizations; issue network centrality; advisory role to political parties, candidates, transition teams; awards granted; publication in or citation of publications in academic journals, public testimony and the media that influences the policy debate and decision-making; listserv and web site dominance; and success in challenging the conventional wisdom and standard operating procedures of bureaucrats and elected officials in the country

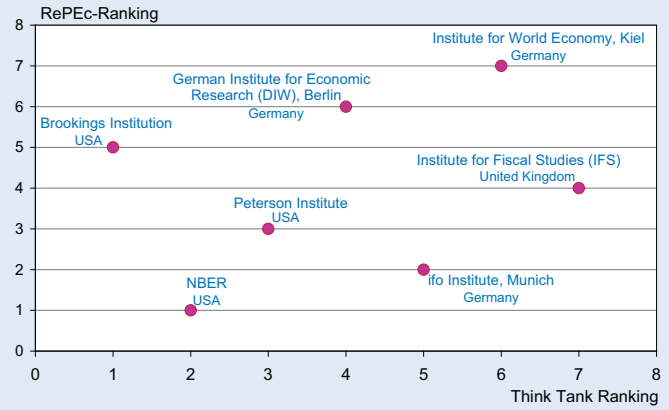
Source: Go-To Think Tank Ranking (2011).

(ranked nine by the RePEc) and the central banks (Federal Reserve Banks). These institutions generate a large amount of relevant output as required by the definition of output criteria stated in Table 3. Secondly, it may be the case that the think tanks ranked by the RePEc are not listed or ranked. The RePEc only features the top five percent of over 5,000 institutes and faculties currently in existence. So the think tank Bruegel, for example, is only among the top eight percent in the RePEc, while it is ranked three in the think tank ranking. This leads to the third reason, namely that there are major differences between the intended survey based on quantitative information and an actual quantitative ranking. This is clearly illustrated by the scatter plot diagram in Figure 2.

To conclude, it can be said that the think tank ranking does not fulfil its own objectives. Many points that would make it possible to assess the quality and meaningfulness of the ranking are very vague, unclear or missing entirely. The methodology of the ranking and the presumably very low case numbers could potentially lead to major distortions of the results. Any conclusions and interpretations drawn from the ranking should therefore continue to be treated very cautiously.

Figure 2

COMPARISON OF THINK TANK RANKING AND REPEC-RANKING, 2011



Sources: Go-To Think Tank Ranking 2011; RePEc.

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Dutch pension system reform A step closer to the ideal system design?[1]

Dirk Broeders* and Eduard H. M. Ponds**

Introduction

Key points

The Dutch occupational pension system was – like pension systems in other countries – heavily affected by the two recent financial crises. The funding ratio, which was at 200 percent at the turn of the millennium and still 144 percent in 2007, dropped to below 100 recently (Figure 1). Although the financial crisis is typically perceived as the immediate cause of this decrease, Dutch pension funds are also vulnerable to more structural developments; and specifically, the increase in longevity estimations, the decline in market interest rates, reflecting lower capital market returns and more volatile financial markets. Recent reforms are aimed at enhancing the sustainability of the pension system.

The Dutch pension system can be characterized in terms of the usual three pillars. The first pillar is constituted by the state old-age pension, which is financed on a pay-as-you-go (PAYG) basis and provides a basic income to all citizens of 65 and over. The second pillar is constituted by job related or occupational pensions. The third pillar consists of individual savings for retirement. Current reforms as proposed in 'the Pension Accord' mainly affect the first and second pillar. The Accord is an agreement between representatives of employers, employees and the government. In this paper we focus primarily on occupational pensions, or the second pillar.

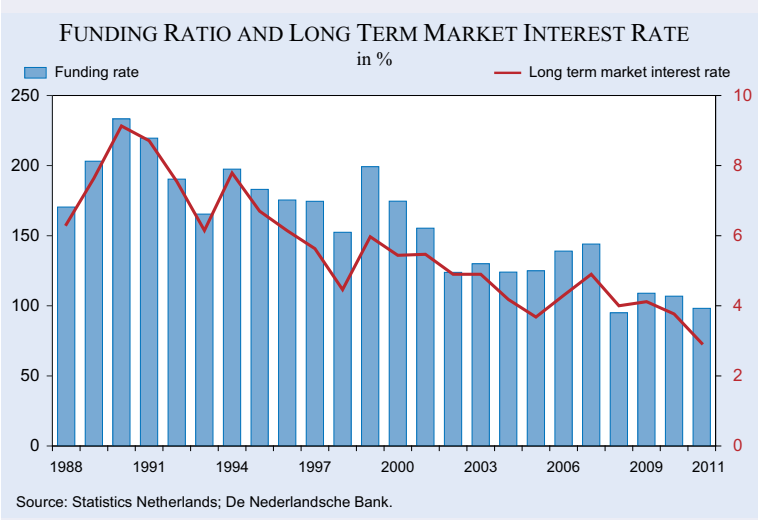
Recent reform proposals: first pillar

In the Pension Accord, the first pillar retirement age will be linked to average life expectancy beyond the age of 65. If life expectancy rises, the retirement age will also increase so that the period over which state pension is received is equal for each generation. This will be reviewed every five years and annual adjustments in the state pension will be indexed to wages in order to strengthen the first pillar.

Recent reform proposals: second pillar

The retirement age in the second pillar will be linked to the retirement age in the first pillar. However, changes in the second pillar are even more profound. The existing defined benefit will be modified into

Figure 1



[1] The views expressed here are those of the authors only and do not necessarily reflect official positions of De Nederlandsche Bank or APG. The authors are grateful to Paul Cavelaars, Paul Hilbers, Zina Lekniute and Sophie Steins Bisschop for useful comments and computional assistance.

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'nominal contracts'. In addition an innovative pension contract will be introduced. The new contract is identified as a 'real contract' as benefits will be automatically indexed. The indexation target must be at least equal to price inflation. Furthermore, this new pension contract translates financial market shocks and shocks in life expectancy directly into changes in the accrued pension benefits, both positive and negative. These shocks, however, will be smoothed over a maximum period of ten years.

The aim of this paper is to identify the reasons behind the reform proposals and to describe the reform proposals themselves in more debt. After this introduction, we first briefly describe the historical context of the Dutch pension system and the problems it currently faces. We continue by presenting the reform proposals currently being implemented. The article ends by drawing some conclusions on whether or not these reforms are a step closer to the ideal pension system.

Historical context and problem diagnoses

Institutional setting

A pension system has an important function in society. The ultimate goal is to provide sufficient income to the elderly. The income problem can be solved by the working population paying directly for the elderly or, alternatively, by each (group of) person(s) having to save for themselves. In the first case we have a PAYG system and in the second it is a funded system. In the Netherlands, the PAYG system is being used for financing first pillar pensions. Occupational pensions in the Netherlands are collectively financed on a funded basis.

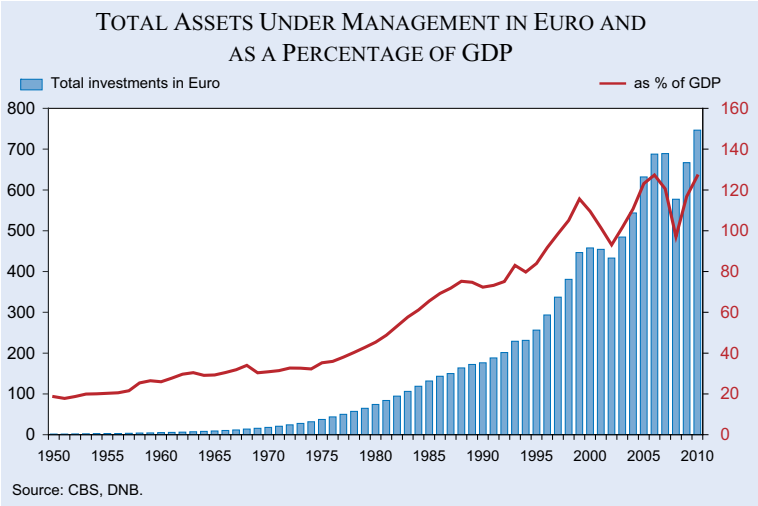
The core of the Dutch occupational pension system is the promise of a highly secure, indexed pension benefit to individuals based on years of service and accrual rate per year. Funding and longevity risks are borne collectively as they are absorbed by adjusting indexation and/or contributions, based on explicit rules. Through a complex set of agreements, institutions and legislation, the core of the Dutch pension system is the potential of the working population to protect the elderly financially. In return the elderly leave excess wealth to following generations.

This solidarity is enforced by the government through so-called mandatory participation. Upon the request of the employers' organizations and trade unions, the Minister of Social Affairs and Employment can make membership of an industry-wide pension fund mandatory for companies in a certain industry. Additionally, for most employees, participation in a pension plan is automatically linked to the contract of employment. This is known as the 'employment-related mandatory participation'.

Brief historical overview

It was the Dutch government that started awarding pension rights for its officials and soldiers. The conditions related to pension rights were established in the late 1800s. The first company pension fund was believed to be the Hollandsche IJzeren Spoorweg Maatschappij and was founded in 1845. The foundation of the now largest pension fund ABP, the pension fund for the government and education, took place in 1922. Most industry pension funds also have their roots in the 19th century and first half of the 20th century. In the first half of the last century, retirement provisions developed from a voluntary expression of a good employer into an essential part of labor compensation. After the Second World War, the Dutch pension system reached full maturity.

Figure 2



The Dutch pension system has been under construction for decades. In the 1950s, 1960s and 1970s there has been a development from fixed amounts schemes, average pay systems to final pay defined benefit schemes. Defined benefit schemes offer members a high degree of pension security. In a defined benefit (DB) scheme, the level of pension benefits are determined by earnings (final pay or career average), the accrual rate, and the number of years of service. A replacement rate of 70 percent of final pay became more or less standard. This included both the first and the second pillar pensions. Widespread coverage of occupational pensions was also reached under the working population. Currently around 95 percent of employees are covered. Figure 2 shows the development of total assets under management from the 1950s until today.

During the mid-1990s growing awareness emerged that labor costs, including deferred pay, should be constrained. In short, this led to a trend towards average pay schemes, away from final pay schemes.[2] In a career average pension scheme the accrual only relates to the salary received in a particular year. If someone earns a flat salary, the outcome is the same as in a final pay scheme; and as in that case, the average wage equals to last salary. However, with salary increases during the career, the average wage is typically lower than the final wage. Therefore, average pay schemes often use a higher accrual rate to achieve a similar expected pension for the average participant as in a final pay scheme.

Industry-wide pension funds versus corporate pension funds

The bulk of assets is managed by pension funds. They are separate legal entities and usually take the form of a trust and are equally governed by representatives of employers and employees. Due to new legislation, the board structure of pension funds will change in the near future. For example, in the new structure retirees' representatives will be part of the board. New legislation will also allow for a board consisting only of professionals. In that case employers, employees and retirees will influence the board's decisions via a representative body with co-determination rights on some important issues.

There are three different types of pension funds. Company pension funds provide pension plans to the employees of a single company. Industry-wide funds provide pension plans for employees working in an industry. Such pension plans are based on a collective labor agreement between an industry's companies and the labor unions, representing the employees in that industry. Finally, professional group pension funds offer pension schemes to specific professional groups (e.g. general practitioners, public notaries). A limited proportion of the pension assets have been outsourced by employers to insurance companies.

Uniform treatment of participants

Dutch pension schemes typically treat participants uniformly in numerous ways see, for example, Kemna et al. (2011). Firstly, active members have a uniform accrual rate. In average pay schemes accrual rates are often in excess of two percent per year. Secondly, all active members pay the same contribution rate as a percentage of their pensionable wage.[3] Thirdly, the indexation rate is the same for participants, although some pension funds differentiate between active members and retirees. Fourthly, the asset allocation policy is equal for all participants. That is to say, the wealth of all participants is collectively kept in a single asset mix. Fifthly, as an ultimate measure accrued benefits can be reduced evenly across participants. For instance, if the funding ratio is below the minimum required funding level of 105 percent, and recovery is not feasible through contribution increases or sponsor donations, benefits must be reduced.

Adoption of fair valuation

Pension funds should be able to meet their obligations. The Dutch regulatory model is based on adequate capital funding, as well as sound conduct of business with proper management of financial risks. Pension funds enter into long-term promises. Therefore, the determination of the present value of pension liabilities is a key regulatory issue. Until 2007 pension liabilities were discounted using an actuarial discount rate. The applicable discount rate was capped at four percent. Some pension funds,

[2] It is typical of final pay schemes that pension accrual must always retroactively be improved to keep pace with individual salary increases. These so-called back service increments have a significant impact on pension costs and therefore labor costs.

[3] The contribution is defined by law as the sum of the actuarially required contribution for the accrual of new pension benefits, an extra sum for buffer requirements, an extra sum for the administration costs and, depending on the relevant policy, an extra sum for the indexation.

specifically with a high indexation target, used a lower discount rate. The fixed interest rate was considered a prudent discount rate as the market interest rates were typically higher.

Around the turn of the millennium, the disadvantages of a fixed discount rate became clearly visible as market interest rates came close to the fixed discount rate. When it comes to assessing the adequacy of pension funds to fulfill their liabilities, market interest rates are obviously an important determinant.

As a result, marked-to-market valuation of liabilities was adopted around 2005.[4] The marked-to-market value of pension liabilities equals the market value of the replicating investment portfolio, being the investment portfolio that generates the same cash flows as the pension benefits promised under all circumstances. The replicating portfolio for defined benefit pension liabilities is that constituted by fixed-rate investments that involve negligible credit risk, such as government bonds and interest rate swaps. Therefore, pension benefits are discounted using the term structure of interest rates derived from the interbank swap market. The replicating portfolio of unconditionally indexed defined benefit liabilities is constituted by index-linked bonds. In some cases the benefit is linked to the performance of another variable. In many Dutch pension schemes, for instance, indexation is linked to the funding ratio (see the next section). In theory, the marked-to-market value of contingently indexed liabilities is determined in the same way, using the replicating investment portfolio. The contingency can be mirrored by a series of financial options, see, for example, Steenkamp (1998), Kocken (2006) and Broeders (2010).

Introduction of contingent indexation

Defined benefit plans around the globe are in decline as a combined result of demographic ageing, low interest rates and volatile investment returns. Therefore, the trend is away from defined benefit and towards hybrid schemes and defined contribution schemes. Dutch pension funds also realized that they had to improve their shock resilience. A first step was taken in the aftermath of the 'dotcom' crisis in 2003. Pension funds replaced unconditional indexation with contingent indexation based on a so-called indexation ladder, see Ponds and Van Riel (2009). This policy ladder relates the indexation to the financial position of the pension fund. The indexation policy ladder is discussed in more detail in the *Existing Contract* Section (below).

Solvency requirements

Dutch pension funds are required to retain additional assets over the marked-to-market value of the liabilities. These assets serve as a cushion and allow them to absorb losses in case of adverse events. Typical adverse events include a sharp decline in interest rates, a large fall in stock prices and lower than expected mortality rates. The solvency requirement is based on the well-known Value-at-Risk (VaR) risk measure on a one-year horizon and a confidence level of 97.5 percent. For an average pension fund the additional assets amount to 25 percent of the liabilities. This confidence level is low compared to legislation for other financial institutions, but the difference can be explained by the additional policy instruments possessed by pension funds like being able to raise future contributions and cutting back on benefits when necessary. In addition to the solvency requirement based on VaR, pension funds must always comply with the minimum solvency requirement. This follows on from the fact that the Dutch Pension Act is based upon the European directive on the activities and supervision of institutions for occupational pensions. This directive prescribes a minimum solvency requirement of around five percent of liabilities.

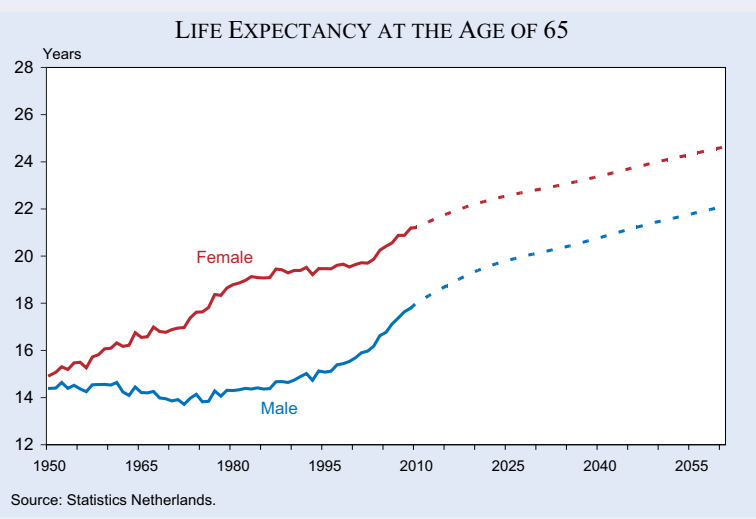
Developments in recent years

In recent years there has been growing recognition that sustainability is at stake. Dutch pension funds have insufficient buffers and control mechanisms to absorb large shocks in financial markets and in longevity estimates. This is the result of a number of trends. Firstly, the increasing degree of maturity makes the contribution as a policy instrument less flexible and less effective. The size of accrued liabilities increases relatively over time compared with the size of contributions, thus weakening the steering power of a flexible contribution policy. Secondly, the prolonged decline in market interest rates led to an increase in the present value of pension benefits. The introduction of fair valuation revealed a high mismatch between assets and liabilities in terms of duration, and thus increased vulnerability to financial

[4] Marked-to-market valuation of liabilities was legally introduced in 2007, however pension funds could voluntary opt for this valuation method from 2005 onwards.

market shocks. This is also due to the fact that pension funds increased their allocation in the 1990s towards equities and other investment categories offering a risk premium. Fourthly, pension fund participants are ageing and they are suffering from unexpected shocks in life expectancy. Longevity risk has been revealed since survival tables are currently based on an extrapolation of longevity estimates, instead of realized survival rates. The result of these four developments is an imbalance between risks and risk-bearing capacity in the pension sector. This challenges the sustainability of the occupational pension system.

Figure 3



Sustainability was placed high on the agenda after the credit crisis of 2008, when funding ratios fell sharply to below 100 percent. There was a fear that pension funds would transform into 'sinking giants', i.e. would be unable to bridge their funding gap, as described in Kocken and Potters (2010). Mature pension funds become uncontrollable sinking giants even after moderate shocks. This is the combined effect of a funding ratio below 100 percent and a heavy dependence on future returns to restore the funding ratio. Furthermore, over 60 percent of total pension assets are earmarked for pensions that have already commenced or will commence within ten years, see Frijns et al. (2010). This not only means that the pension funds' investment horizon shortens, but pension funds may not be able to recover from funding deficits after disruptions in financial markets.

In order to deal with these problems, the Government laid down a road map to sustainability. Two commissions concluded that structural changes are necessary.[5] New pension contracts should make it possible to easily adjust pension benefits in the event of financial setbacks and unexpected surges in life expectancy. Firstly, because the last decade showed that pension funds are highly exposed to a decline in market interest rates and volatile investment returns. Secondly, because pension funds are vulnerable due to the low birth rates and ageing of the population. Figure 3 shows the life expectancy at the age of 65. As this chart shows, life expectancy has risen significantly since the 1970s and is expected to increase further in the coming decades. The combination of longer life expectancy and a 'sticky' retirement age makes pensions more expensive.

Pension Accord

Following the recommendations of the two committees, social partners and the government agreed in the Pension Accord of 2010 that the pension contracts need to be modified. Two flavors were proposed, namely a hybrid contract and a flexible real contract. The hybrid contract provides for a lower accrual of (nominal) defined benefits, supplemented with an investment performance related indexation policy. In the flexible real contract the pension fund offers a real or indexed benefit, but it is not guaranteed. Both types of contracts help to restore the balance by reducing the ambition level for pension funds and by exposing participants more to risk.

The further development of the Pension Accord has led to the Pension Memorandum in June 2011. The memorandum describes how a sustainable pension system is reached along the following lines:

- A complete pension contract,
- Linking pension benefits to life expectancy,
- Linking pension benefits to developments in financial markets,
- Contribution stabilization,

[5] The Government set up several commissions to analyze the Dutch pension system in debt including The Committee on the Sustainability of Supplementary Pension Schemes (Goudswaard et al., 2010) and The Investment Policy and Risk Management Committee (Frijns et al. 2010).

- Transparent communication about risks to participants.

Financial Assessment Framework

A key element of redesigning the pension fund industry is a new Financial Assessment Framework (FTK). Distinctive to the new FTK is that pension funds can choose in the future between two types of contracts: the nominal contract and the real contract. Both contracts must stipulate in advance how risk sharing across stakeholders will be established. The nominal contract needs to have a complete set of policy ladders. The real contract needs to have a mechanism for absorbing financial shocks and a mechanism for absorbing shocks in life expectancy.

Table 1

Impact on the value of participants' claims

	Young	Old
Higher discount rate	-	+
Higher contribution rate	-	+
Excess indexation when the funding ratio is high	-	+
Benefit cuts when the funding ratio is too low	+	-
More buffering	+	-
Price indexation instead of wage indexation	+	-

Source: Based on Lever et al. (2012) and Ponds and Lekniute (2011).

In the course of discussion of the new contracts, concerns were put forward whether they would be fair to the different groups of stakeholders, particularly to young and old participants. As a pension fund has to be seen as a zero-sum game, it should be recognized that any contract redesign might lead to the redistribution of wealth (and risks) between participants. The value to be distributed by the pension fund among the stakeholders is equal to the value of assets and the value of future contributions, see Ponds (2003). Hence the value of the claims of various stakeholders is necessarily equal to the sum of assets plus the present value of future contributions over the evaluation horizon. By definition a contract change will not lead to more or less value in the pension fund. It will, however, lead to adjustments in the way value is allocated to the stakeholders. For example, a more restrictive indexation policy is implemented at the expense of the old, but will benefit young participants. A less prudent method for discounting liabilities stands to benefit the old whereas the young will have an equivalent disadvantage. A balanced distribution of wealth and risks across generations is an important prerequisite for a sustainable collective pension system.

Two recent studies have reported on the direction and size of the intergenerational redistribution for the various proposals (Ponds and Lekniute 2011 and Lever, Mehlkopf and Van Ewijk 2012). Table 1 reflects some of the key findings of these studies in a qualitative way. The table lists the impact on the value of the claims for young and old participants for a number of specific contract adjustments.[6] Typically, in case of high funding ratios, the elderly benefit from excess indexation. They also stand to gain from a higher discount and contribution rate. These measures will increase pay outs in the short run. By contrast, at low funding ratios, benefit cuts, a less ambitious indexation target and more prudence are favorable to the young. The young stand to gain from benefit cuts at low funding ratios, greater prudence via more buffering and a less ambitious indexation target, which will all reduce benefit pay-outs in the short run.

Generational aspects of the reform proposals (an example)

Comparing pension contracts

Table 1 reveals that contract adjustments may influence a pension fund's generational balance. The following section presents a numerical example of the generational consequences of the nominal and the real contract. It begins by defining the settings of these new contracts and then compares the new contracts to the existing contract using valued based Asset Liability Management (ALM). We also comment on the generational aspects of these contracts.

Existing contract

Most pension funds currently run an average-wage defined benefit plan with conditional indexation based on a so-called indexation ladder, see also section *Brief historical overview* (above). For each year of service participants accrue new pension

[6] The horizon considered defines which age groups should be seen as young and old. For a horizon of 25 years the young cohorts are aged 40 and lower. When the horizon is set at 75 years, the young is understood to be the cohorts that are still to be born in the coming 75 years and the elderly are all cohorts already born.

rights determined by their pensionable wage times the accrual rate, typically being equal to two percent. Accrued rights are indexed annually. Diagram (a) in Figure 4 displays the current indexation policy. The y-axis plots the indexation rate as a function of the funding ratio on the x-axis. Full indexation is given when the funding ratio is equal to or higher than the upper boundary of the policy ladder. We use a nominal funding ratio of 135 percent as the upper boundary. This funding level warrants full indexation. When the funding ratio is below the lower boundary of 105 percent funding, no indexation is given at all. In between the lower and upper boundary, partial indexation is granted proportionally to the funding ratio. When the funding ratio is sufficiently high, for example, well above the upper boundary, pension funds can give catch-up indexation to repair for previously missed indexations.

This policy ladder was introduced in 2005 and at that time this was perceived as a key improvement of the previous practice of de facto unconditional full indexation. A main shortcoming of the ladder, however, is incompleteness. There was no explicit policy should the funding ratio fall significantly below 105 percent. In such a case an explicit recovery policy was needed to avoid the sinking giant problem, discussed in section *Developments in recent years* (above), as well as to have a generational fair policy. The regulator came up with additional explicit rules regarding the recovery term. Pension funds with a funding ratio below 105 percent have to recover to at least 105 percent within five years.[7] If the recovery does not take place after that period, then cuts in the accrued rights must be applied.

Nominal contract

The nominal contract displayed in Diagram (b) in Figure 4 is a typical example of the renewal of the policy ladder from the previous section. This example reflects the settings of the 'nominal contract' compatible with the new Financial Assessment Framework (compare above section *Financial Assessment Framework*). The displayed policy ladder explicitly addresses the policy rules for all possible funding levels. Whenever the funding ratio falls below 135 percent, a recovery period of 15 years is allowed to return to a funding level of 135 percent or higher. In order to complete the policy rules in our example, we apply the following rule. If the funding ratio after 15 years is still below 135 percent, then the pension fund needs to reduce liabilities such that the funding ratio meets the upper boundary. Additionally, it is prescribed that in case the funding ratio falls below 105 percent, it must be restored to 105 percent within a period of three years. If not, benefit reductions need to be applied. The new ladder design also explicitly defines policy in case of significant overfunding. When the funding ratio is well above a predefined level, say the upper boundary plus ten percent, the funding surplus can be used for excess indexation above full indexation.

Real contract

The real contract is also a complete contract. It is a new form of how to grant indexation to the accrued liabilities. Diagram (c) in Figure 4 displays this new type of indexation policy. It is worth noting that, compared to current and the nominal contract, the indexation is linear in the funding ratio. The new contract is based on the RAM policy, where the term RAM is the abbreviation of Return Adjustment Mechanism. In this framework, indexation is annually given in full. However, subsequently a correction, either plus or minus, is applied. The correction is related to the actual funding position aimed at recovering to a real funding ratio of 100 percent. After some discussion a consensus has been reached that a recovery period or smoothing period of a maximum of ten years can be used. The RAM indexation takes the form:

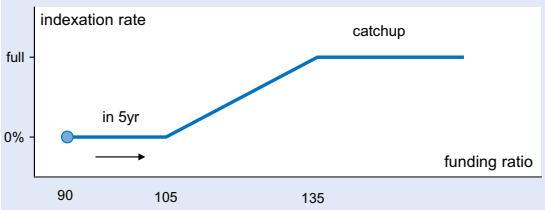
$$\text{Indexation RAM} = \text{wage indexation} + (\text{FR-100\%})/n \quad (1)$$

Where *FR* is the real funding ratio and *n* represents the smoothing period.

Figure 4a

INDEXATION POLICY LADDERS IN DIFFERENT PENSION CONTRACTS

Diagram a: Current contract: Indexation ladder



Source: The authors.

[7] Normally the recovery period is three years. However, in case many pension funds together suffer from a shortfall, the Pension Act allows for longer recovery periods to be decided upon by the Government. In 2008 it was decided to increase the recovery period to five years.

Figure 4b and 4c

INDEXATION POLICY LADDERS IN DIFFERENT PENSION CONTRACTS

Diagram b: Nominal contract: Indexation ladder

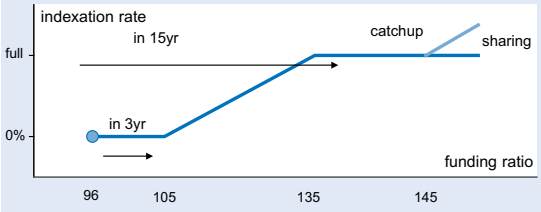
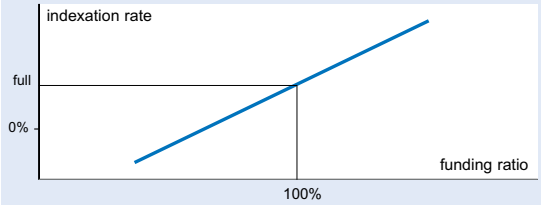


Diagram c: Real variant: Indexation ladder
Indexation = wage + (F-100%)/10yr
Discount curve = swap curve - fixed expected inflation (2%)



Source: The authors.

Discount curve

A key topic under discussion is the appropriate discount rate. For the nominal contract the applicable discount rate will remain the zero coupon interest rate curve derived from the interbank swap market, (see section *Adoption of fair valuation* above). Following developments in the Solvency II project for insurers, the Dutch government wants to adopt an ultimate forward rate (UFR) methodology. Although no decision on the specifications of the UFR has been made yet, this would imply that the interest rate curve would evolve in the very long run to the UFR level of, for example, 4.2 percent.[8]

Under the real contract, liabilities are discounted using a real discount rate. There has been a long and intense discussion over what the ingredients for this curve should be. The real curves can be constructed easily from the nominal term structure of interest rates by subtracting the expected inflation rate (or indexation rate).[9]

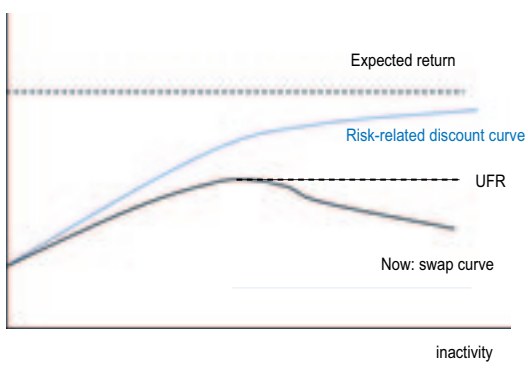
As the liabilities in the new contracts can no longer be perceived as risk-free (i.e., accrued benefits can be cut), it was initially proposed by social partners to use the expected rate of return on the pension funds' assets as the discount rate. This led to significant resistance, specifically from the academic community, as it introduces adverse incentives, like for instance, the incentive to increase equity exposure as that would lead a higher discount rate. Nijman and Werker (2012) have suggested using the swap curve plus a term-dependent surcharge to account for the fact that benefit payments are more riskier the later they are paid (due to the smoothing mechanism). In that case, the outcome would be that the real discount rate is composed of the swap curve, including a UFR plus a term-dependent surcharge. It is worth noting that, for an arbitrage free valuation procedure, the expected benefits (the nominator in the valuation formula) and the discount curve (the denominator) need to be consistent with each other. Figure 5 outlines the current swap curve, the swap curve plus a UFR and the swap curve plus a UFR plus the term-dependent surcharge based on Nijman and Werker (2012).

New contracts are more flexible

The existing and both new contracts will not necessarily lead to different pension results for the participants as long as the realization of economic variables and actuarial variables (e.g., longevity) is in line with expectations at the moment that the funding policy was set. However, they may differ significantly should the markets perform badly and/or were longevity to be underestimated. In the existing contract the implied fall in the funding ratio of these adverse developments cannot be reversed easily by adjustments in the pension entitlements, which may initiate the trend towards a sinking giant. In the new

Figure 5

PROPOSED DISCOUNT CURVE



Source: The authors.

[8] Please note that in the Solvency II methodology the one year forward rate is fixed for very long maturities. The long term zero coupon rate is subsequently derived from this assumption.
[9] Ideally the market consistent expected inflation follows from the relationship between the real and the nominal term structure of interest rates. Since a liquid market for Dutch inflation is missing, an alternative needs to be found.

contracts, the fall in the funding ratio will be tackled more flexibly by a downward adjustment in the liabilities. This endogenous process of adjustment brings the funding ratio back to a level that is sustainable in the longer run. As a result, risks are obviously transferred to the participants themselves.

Discussion results

We now present a closer look at the performance of the different contracts. Below we report the main results for the three contracts from a valued based ALM study. However, we first specify some of the settings used in the ALM study. The horizon of the study is 25 years ahead. The demographic structure of the pension fund is similar to that of the Dutch population. The current pension plan is an average wage plan with a two percent accrual rate per working year and conditional indexation benchmarked against wage growth. All three plans continuously hold the same asset allocation of 50 percent bonds and 50 percent stocks during the evaluation period. It is assumed that accrual and received indexation have been in line with ambition, so that pension entitlements for the various cohorts correspond with the plan ambitions. The economic scenario set of the ALM model is based on van den Goorbergh et al. (2011).

The valuation of liabilities in the current contract is based on using the nominal swap curve. The promised benefits in the new contracts are discounted using the discount curves described in section *Discount curve* (above). The contribution rate in the existing contract is 20 percent of the pensionable wage, in the new contracts the contribution rate is set at 24 percent reflecting tighter supervisory rules (additional solvency surcharge) and the abolition of the practice of basing the discount rate on the expected rate of return net of expected indexation rate.

The initial nominal funding ratio is set at 100 percent based on the valuation of nominal liabilities against the current swap curve (without UFR). In order to be able to compare the solvency position of the three contracts, the funding ratios of the nominal contract and the real contract are recalculated using the swap curve as a discount rate.

Table 2 first displays the pension result at the end of the horizon for individuals who are 25 and 65 respectively at the start of the simulation. The pension result is defined as the actual value of pension rights over the aimed fully wage-indexed value of pension rights. It is 100 percent when the received indexation over the 25 years horizon equals the cumulative wage growth. We report the median and the 2.5-percentile and the 97.5-percentiles of the pension result as indicators for downside and upside risk respectively. Table 2 also reports on the median and the downside and upside risks of the nominal funding ratio. Finally the probability of a benefit reduction (negative indexation) is given as well as the average size of the reduction when it is applied.

The nominal contract in our example is effective in controlling downside funding risk as the probabilities of underfunding and applying benefit reductions are low. The complement is the less favorable outcome regarding the pension result for older cohorts.

Table 2

Key results for the different contract specifications in %

		Current contract	Nominal contract	Real Contract
Nominal Funding ratio	2.50	98	122	97
	50	131	147	137
	97.50	192	221	177
Probability FR < 100%		4	0	3
Pension result 25yr	2.50	68	71	75
	50	100	107	101
	97.50	124	135	135
Pension result 65yr	2.50	45	38	53
	50	82	73	87
	97.50	100	99	133
Contribution rate		20	24	24

Source: Based on the authors' own calculations.

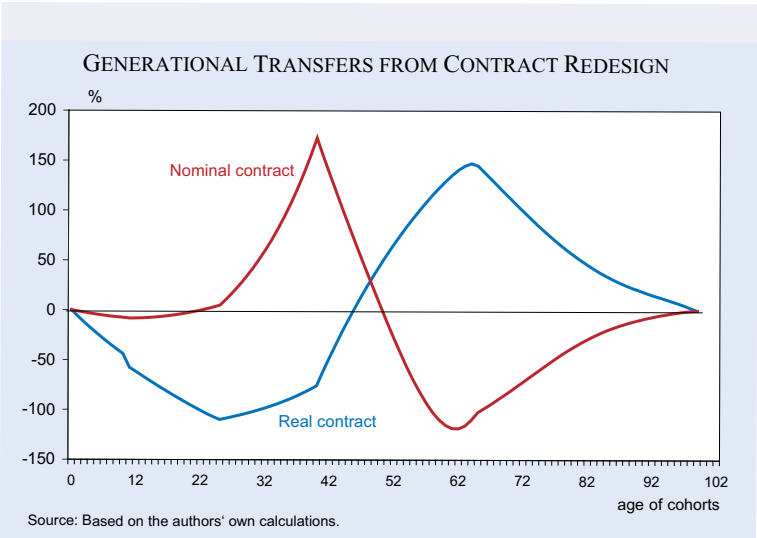
This is primarily to be explained by the requirements that the funding ratio has to be restored to 105 percent in three years and to a level of 135 percent within 15 years. The resulting 2.5-percentile and the median pension for the now 65-year old are lower compared to the outcomes in the existing contract. By contrast, the pension result of the now 25-year old is better than the current contract, as this cohort will hardly be hurt by benefit cuts. This cohort will also benefit materially from the redemption of the overall missed indexation and cuts applied later on in their career as the funding ratio on average recovers to a level above 145 percent.

The table also reports on the consequences of the real contract. In the example, the real contract uses a smoothing period of seven years to absorb deviation of the funding ratio from 100 percent real (or from 135 percent nominal). As the smoothing process is implemented in an 'open manner', the smoothing period is effectively longer than seven years.[10] The pensioners in this contract will be less affected by the initial low funding ratio than in the current contract as the smoothing period is extended from three years in the current contract to seven years in the new contract. The recovery process is much slower than in the nominal contract, implying a lower funding and high probability of underfunding compared to the nominal contract. The overall outcomes for the funding ratio and the pension results for the 25-year and the 65-year old are better compared to the current contract because of the impact of the higher contribution rate (24 versus 20 percent).

Figure 6 displays the generational value effects that result from replacing the current contract with either the nominal contract or the real contract. Along the x-axis the age of the cohorts is given at the moment that the new contracts are implemented. Results are given for the cohort as a whole. Along the vertical axis the effects per cohort are given and these results are expressed as percentage of the initial wage sum of the cohort. These effects are calculated as the change in the economic value of the net-claims of the various cohorts. A positive result means that the specific cohort gains from the contract change, while a negative result denotes a loss.

For the specific settings used and given the initial (nominal) funding ratio of 100 percent, we can observe from the figure that the two new contracts have opposite generational effects. The introduction of the nominal contract favors the young, whereas the move to the real contract benefits the elderly. In the nominal contract the young will lose value because of the higher contribution rate they pay and because of the higher discount rate, which implies more indexation payments to the elderly. However, they gain a lot from the tightening of the recovery process. The elderly lose significant value for two reasons: firstly, because the upper boundary of the ladder is inflated from 135 to 145 percent, and secondly, and most importantly, the requirement in our example is that the funding ratio needs to be at least 145 percent after 15 years. In the real contract the young will lose out on balance. They have to pay more contributions, the discount rate is higher and they must accept that the strict five-years recovery period in the current contract is replaced by the seven-years open smoothing procedure of the RAM.

Figure 6



[10] The open manner of smoothing follows from the formula, i.e. (FR-100%)/7yr. After 7 years around two-thirds of the initial shock is absorbed, and after ten years this share rises to around four-fifths. Open refers to the fact that entrants in the pension fund participate in shocks that occurred before they entered the pension fund. Initially the RAM contract was supposed to be closed of nature, which means that any shock needs to be allocated to the accrued rights that are in the pension fund at the moment the shock hits the fund, and so will not be borne by new rights to be built up after the shock.

Age differentiation

The results in the previous section reveal that contract changes may easily result in generational transfers. It is very likely that the proposed renewals must be seen as an intermediate step. The new plans, similar to the existing ones, treat all participants in a uniform way. Uniform plan structures do not accommodate heterogeneity among plan members very effectively. More specifically, the interests of young and old members diverge. The elderly will aim for an investment policy oriented towards pension security; while the young will prefer a risky mix for an attractive return.[11] Although this is currently not 'on the table', one step further in the process of the pension plan reform is age-differentiation in risk exposure, as proposed by the lifecycle investment approach, see, for example, Broeders and Rijsbergen (2010). This approach does not necessarily lead to individual accounts. Age differentiation can be organized within collective pension plans by means of an age-dependent indexation policy. One of the main advantages of maintaining a collective plan is that the plan structure, as a system of deferred indexed annuities with risk sharing, can basically be maintained along with the economies of scale of large collective investment pools.

An age-dependent indexation policy can be modeled as a variant of RAM (compare Ponds 2008, Ponds and Molenaar 2012) in the following manner:

Age-dependent indexation = $a_x \cdot$ return indexation + $(1- a_x) \cdot$ wage indexation + (FR-100%) / n (2)

With ax is related to age x, for example ax = (65-x)/40, where the formal entry and retirement ages are 25 and 65 respectively. As in (1) FR stands for real funding ratio and n for the smoothing period in years. As in the basic RAM variant, the participants first receive full indexation which, for all ages below the retirement age of 65, consists of an age-dependent mixture of return-linked indexation and wage-linked indexation. Subsequently a correction is applied as in the RAM, which is the same for all ages. For example, a cohort of the age of 45 will receive half of the indexation from the return and the other half linked to wage growth.

[11] A key parameter in the optimal asset allocation is the correlation between human capital and financial capital. As long as the correlation between labor income and stock market returns is assumed to be low, young workers may better diversify away equity risk with their large holding of human capital.

Closer to the ideal system?

The Dutch pension system ranks high in international comparisons (see, for example, Knox 2012), however its long-term sustainability has also been questioned (Jackson, Howe and Nakashima, 2010). The Pension Accord, the new pension contracts and the new regulatory framework are key contributors to a sustainable pension system. Certain steps have been defined as to crucial aspects, particularly a higher retirement age and an automatic linking to any further increase in life-expectancy, and a more shock-resilient pension fund system, as the proposed new contracts are based on explicit rules regarding who has to bear downside risks. The evolution towards the new pension fund contracts is necessary for the system to retain the advantages of collective risk sharing and economies of scale. In an ageing society, a low interest rate environment, and a world with volatile investment returns, it is inevitable that participants in pension plans are exposed to risks. Maintaining collective pension schemes, however, requires a balanced distribution of wealth and risk across generations. This is a challenging task as this distribution is easily affected by changing contract specifications or regulatory parameters.

The Dutch pension system has always been adaptive to changing circumstances and ongoing renovations are also likely to happen. It is highly probable that pension funds will cooperate, creating a trend towards a small number of large pension funds. There is still high support for pension plans based on collective and risk sharing, however to address the specific interest of younger and older participants, it is likely that age-differentiation will be considered as a possible next step.

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National Adaptation Strategies on Climate Change in Europe

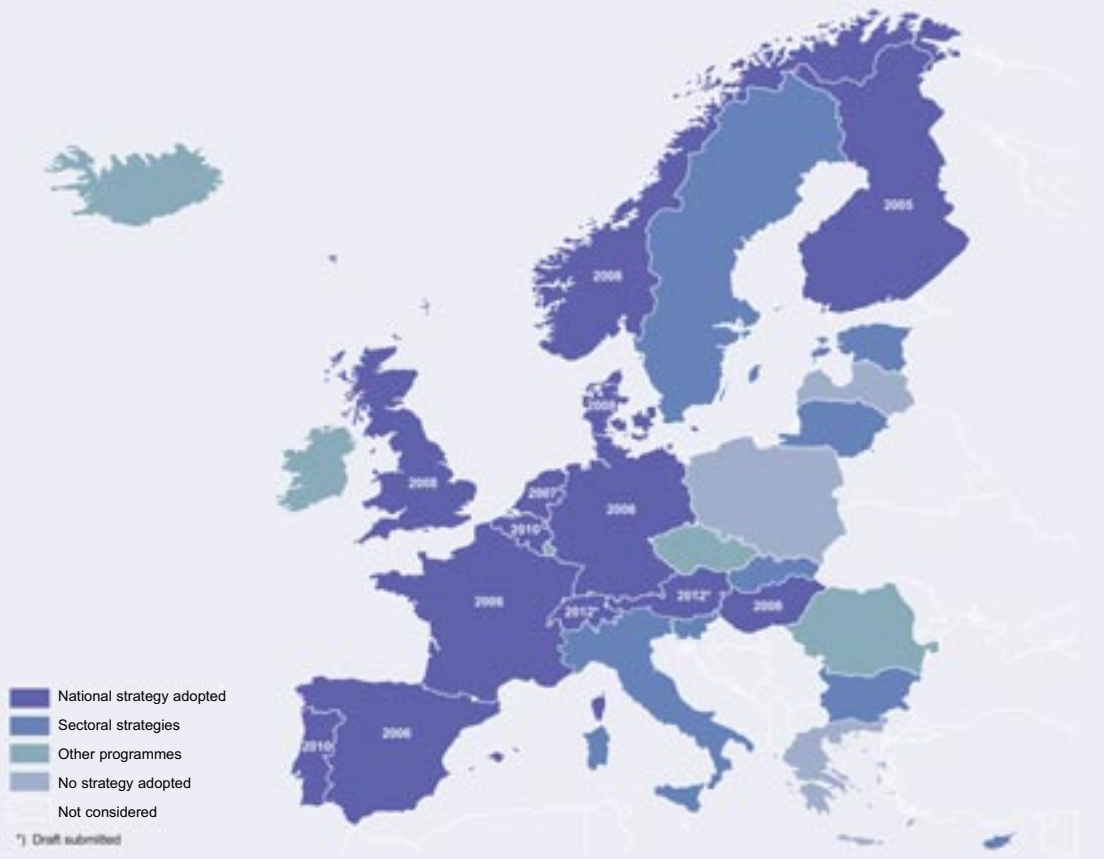
The objective of limiting climate change to a manageable level represents one of the world's major challenges, and dealing with the resulting problems for mankind and environment will be a long-term task for present and future generations. It currently remains highly uncertain whether it is, in view of previous efforts, still possible to limit global warming to 2°C compared to its pre-industrial level, i.e., 1.2°C above the present temperature. There are even fears of a 3.5°C warm-up unless emissions can be reduced quickly and permanently (Climate Action Tracker 2011) and a climate treaty that goes further than the Kyoto Protocol comes into effect by 2020. The reasons for the concerns are non-assessable risks and costs, and irreversible effects that occur above a temperature rise of 2°C or more (WBGU 2009).

Given the moderate success of the last climate negotiations in some cases, adaptation to climate change is becoming an increasingly important topic. Article 4 of the Kyoto Protocol established the commitment of all parties to develop measures for the mitigation of additional emissions and for adapting to climate change. During the climate conference in Cancun in late 2010, the Cancun Adaption Framework was adopted to establish international programs and strategies for adapting to climate change, to promote cooperation between countries and to create a common knowledge base.

An adaptation strategy must satisfy various requirements: it should be a long-term and cross-section oriented bundle of information and should contribute to address deficits in the field of climate change (see Umweltbundesamt 2006). All of the sectors affected and the actors present in them should be involved. Furthermore, such a strategy must be regularly adjusted in line with changed conditions in order to respond in a flexible way to future climate change.

Figure 1

National Adaption Strategies to Climate Change in Europe



Source: EEA & European Commission (2012) and PEER (2009).

Many European countries have already adopted national adaptation strategies in advance of the Cancun conference. Figure 1 illustrates the current status of the national adaptation plans of European countries, as well as their year of implementation. It is becoming clear that the Western European and Scandinavian countries in particular developed and implemented such strategies early on. Finland was one of the first European countries to develop a specific adaptation strategy, especially in the field of water management, transport and health measures (PEER 2009). The United Kingdom and The Netherlands are the only countries where the adaptation plan is legally binding. Some countries like Ireland, Iceland, Czech Republic and Romania, have to date adopted specific national programs on climate change that only partly address adaptation to its impact. Poland, Latvia and Greece do not have any special strategy for adapting to climate change, although some specific projects and guidelines have been adopted in these countries. Estonia, Lithuania, Italy, Bulgaria, Sweden and Slovakia, on the other hand, have developed strategies for some sectors (EEA 2012). Germany adopted a national adaptation strategy (DAS) in late 2008. This strategy analyses the risks of climate change as well as the vulnerability of various sectors and the consequent need for action (BMU 2011). In August 2011, the German action plan of adaptation was developed. This creates a national focus for the federal government and its subordinate authorities and bundles planned measures. Since German decision-makers operate mostly on a local or regional level, the challenge is to coordinate the adaptation measures by the Länder and regions, to network and promote the exchange of information.

Similar problems are encountered with all national strategies. Since adaptation activities are often limited to extreme events, it is difficult to develop measures to counter the effects of slowly evolving climate change, such as gradually rising sea levels, the increased incidence of diseases and the decline of certain species (BMVBS 2010). Moreover, great uncertainty remains about the actual effects of climate change and their probability of occurrence. EU-wide problems also include the highly decentralised organisation of decision-makers and major differences in planning structures (BBSR 2010). Looking to the future the main aim is to enhance European cooperation in terms of the spatially varying impacts of climate change.

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Regional Economic Development Policies in Europe

The European Union's regional policy seeks to reduce structural disparities between EU regions, foster balanced development throughout the EU and promote real equal opportunities for all.[1] But what about regional development practice within individual countries? Which main challenges can be identified and how do they differ between countries? What are the key objectives for regional development and which policy tools contribute towards their implementation? How are legal and institutional frameworks for regional policy-making designed? Several entries dealing with these questions have been added to the DICE database and the main points are summarised below.

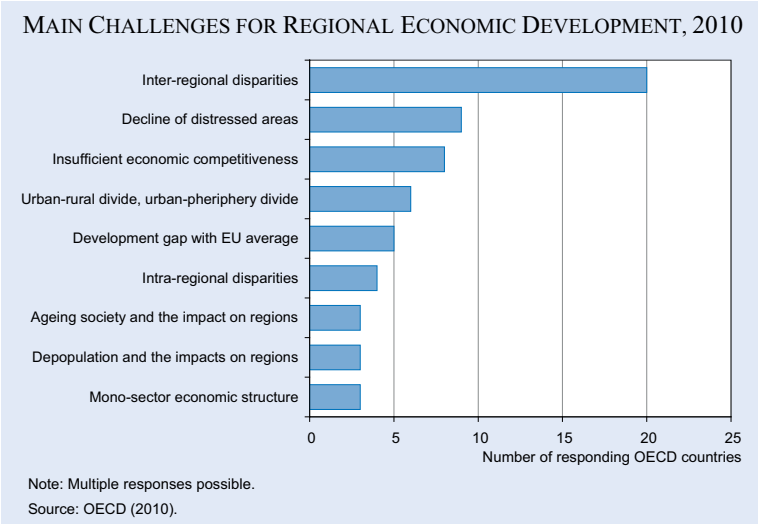
Key challenges for regional development are broad: they range from inter- and intra-regional disparities, increasing overall competitiveness, the restructuring of old industrial areas, local job creation, local service provision, ageing society, migration, urban-rural disparities, lack of economic diversification and environmental issues.

Regional policy objectives in the European Union share some fundamental characteristics (EPRC 2011). In most countries, regional policy objectives are implemented with regard to cohesion (some countries have a constitutional commitment to territorial balance such as Germany, Spain and Italy) and increasingly with regard to competitiveness and growth. Examples of cohesion components in regional policy include prioritisation of peripheral areas in Demark, regional balance focus in Finland, territorial cohesion in France and equal living conditions in Norway. Recent examples of growth orientation policies include enhanced competitiveness orientation to policy in France, the Peaks approach in the Netherlands, and the renamed regional growth policy in Sweden (OECD 2010, p.14). However, new challenges for regional policy are emerging, notably, demographic change, including migration and demographic ageing, and environmental sustainability, including alternative energy and energy security (EPRC 2011).

A comparison of key challenges for regional economic development and main policy objectives (Figure 1 and 2) suggests that countries approach the problem from different angles. However, a paradigm shift from the old paradigm (which focused on top-down, investment orientated, one-size fits all policies) to new regional policies (placed-based endogenous growth and regional competitiveness)[2] can be observed.

However, the institutional framework determines the extent to which real power has been transferred to the regional level. The division of competences between the national level and regional institutions varies between countries; and there are also huge differences between the share of sub-national spending and revenues, as indicated in Figure 3.

Figure 1



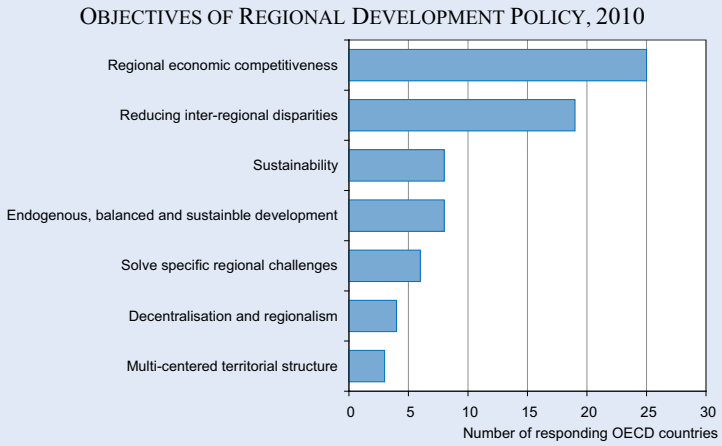
Further summaries and overviews of individual regional economic development policies and the division of power between national governments and regional institutions can be found in the DICE Database under Other Topics / Structural Policy / Regional Policy.

S. R.

[1] http://europa.eu/legislation_summaries/regional_policy/index_en.htm (acc. 14 August 2012).

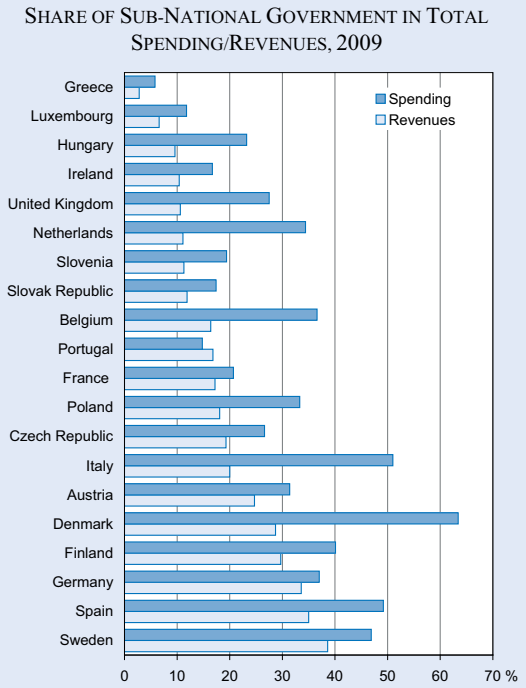
[2] The term place-based policy is at the heart of many debates on the future of regional policy. The concept of endogenous development (i.e. place-based territorial growth) emphasises the identification and mobilisation of the potential of regional assets, by combining social and environmental sustainability with competitiveness, OECD (2010), p. 15, and European Polices Research Centre (2011), p. 4.

Figure 2



Note: Multiple responses possible.
Source: OECD (2010).

Figure 3



Source: OECD (2011).

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Tackling Early School Leaving in Europe: Different Policies

Early school leaving is a severe problem for any country to face. It is the result of a gradual disengagement process of students from school due to various interrelated factors that include lack of motivation, poor educational performance and delinquent behavior – often in connection with a difficult socio-economic background and certain school practices.

A direct consequence of early school leaving is a higher rate of youth unemployment, since only around one in ten available jobs are open to individuals who have not completed secondary education. Early school leavers (ESLs) are also more likely to be unemployed later in life and to have a lower income than their peers who have completed secondary or higher education.

In Europe, one in seven students is an early school leaver. The gravity of the situation has given rise to many attempts to combat this issue. In June 2011, the Council of the European Union issued a recommendation with regard to policies for reducing the number of early school leavers in its member states. After the European member states failed to reach the target agreed in 2003, i.e. to reduce the ratio of ESLs in the EU to below ten percent by 2010 (the actual figure for 2010 was 14 percent), it has now been made a priority under the Europe 2020 strategy and it is a headline target in terms of socio-economic development to reach this level by 2020. As of 2011, the ESL rate stood at 13.5 percent. Early school leavers are defined as all those who leave education or training with only lower secondary education or less, and are no longer in education or training.

Clearly, this issue has been made a priority partly due to the direct impact that a reduction in the number of ESLs would have on youth unemployment (for which there is a separate target in the Europe 2020 strategy). However, a progress report released by the European Commission in June 2012[1] states that even although there has been improvement, only 11 countries have achieved the ten percent target so far and the progress of many countries is so slow that it is jeopardising the prospect of reaching the EU-wide target and all country-specific targets by 2020. Denmark, Hungary, Italy, Latvia, Malta and Spain have been specifically called upon to address the problem of early school leaving.

Table 1 lists several policies that are implemented in European countries to tackle the problem of ESLs. There is a lot of literature on the effectiveness of various measures, which finds overall that the most successful measures are characterised by a multilevel approach to the issue (combining school, outside school and systemic factors). An example is the FAST program, which exists in a similar fashion in several European countries and takes account of the importance of a student's family background. Further such programs include the School Completion Program in Ireland and the Dropout Covenants in the Netherlands.

ESL Policies can be divided into those that are preventive (and thus address endangered students as early as possible) and those that are directed towards young people who have already left school without obtaining any qualifications and need to be reintegrated into the schooling system.

A hurdle many countries have to overcome before being able to design adequate policies is a lack of reliable data. To address this problem, many countries are aiming to construct detailed data bases that enable them to pin down exactly which students decide to drop out and, in some cases, include their reasons for doing so. Examples are the Dropout Explorer in the Netherlands, the Individual Pupil Number in the UK and the Life Course Survey in Hungary.

Finally, the importance of vocational education and training as measures of reintegration has also been recognised. Programs like Production Schools in Denmark, the KUTSE program in Estonia or Bildungsketten in Germany make use of this approach quite successfully.

A.K.

[1] European Commission (2012 b).

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Table 1

Policies implemented in European countries to tackle Early School Leaving

Country	Preventive measure	Description
Austria	Families & Schools Together	Family strengthening and parent involvement program to help children succeed in school. Parent identification and recruitment through home visits. Multifamily group sessions and monitoring by FAST Center staff.
Denmark	Reducing class size, student/pupil ratio	Reducing the student/pupil ratio within a year 8 classroom
	Youth Guidance Centres	Provide guidance for young people under 24 in their transition to the labor market .
	Production Schools	Provide young people under 25 who have not completed a qualifying education with a diffe-rent learning experience through practical work in a binding real working community.
Estonia	KUTSE Program	Get students who had dropped out of vocational education to complete their studies by creating additional study places, launching a campaign to make young people interested in VET, giving study grants etc.
France	Zones d'Education Prioritaire	Resource channeling to schools in prioritized areas based on number of students from disadvantaged background
	Micro Lycées	Permanent structures attached to secondary schools that offer possibilities for early school leavers to finish upper secondary education.
Finland	Early Tracking	Placing students in well-defined separate segments in the education process, typically specializing in general and vocational education before upper secondary.
Germany	Participation in sports	Participation in sports activities.
	Families & Schools Together	s.a.
	Early tracking	s.a.
	Bildungsketten	Improve the transition between school and vocational education and training through individual guidance and help.
Hungary	Life Course Survey	Conducted annually since 2006, it tracks school careers of 10.000 students. Survey collects information on socio-economic status, ethnicity, family background and reasons for dropout. Students with low competence re-sults and Roma students are overrepresented in the sample.
	Tanoda Centres	Extra support for disadvantaged children (mainly but not exclusively Roma) and young people to complete schooling.
Ireland	School Completion Program	The program works in cooperation with school, parents and local communities, targeting each young person individually and supporting as early as possible.
	YouthReach	Promotes personal and social development and increases self-esteem, independence and active citizenship of 15-20-year olds who have left the mainstream school system with poor or no qualifications.
Italy	Early Tracking	s.a.
Luxemburg	Action Locale Pour Les Jeunes	Contacts young people who have dropped out of school and helps them develop educational perspectives.

Table continued

Country	Preventive measure	Description
Netherlands	Families & Schools Together	s.a.
	Early Tracking	s.a.
	Dropout Covenants	Financial incentives to regions to reduce number of dropouts: Ministry of Education offered contact municipalities 2000 € for each early school leaver less in 2006/2007 than in 2005/2006.
	Dropout Explorer (also: Early School Leaver Monitor)	Based on individual pupil numbers that allow tracking the educational development of all pupils, it offers reliable data on drop-out rates at various levels. At the aggregate level, individual data are linked to socio-economic data per region, city and district.
Norway	Certificate of Practice	2 year practice-based program upper secondary: enables students to leave upper secondary education early but with possibility of re-entry.
Russia	Families & Schools Together	s.a.
Spain	PROA program	Program provides extra resources to education establishments to address inequalities in education and to prevent social exclusion.
Sweden	Early tracking	s.a.
	Comprehensive VET	Comprehensive VET reform in 1990's; reduction of differences between vocational and academic tracks; prolonging and substantially increasing the academic content of VET track.
Switzerland	Early tracking	s.a.
UK	Families & Schools Together	s.a.
	Early tracking	s.a.
	Individual Pupil Number	Similar to dropout explorer in the Netherlands.
	EMA – Educational Maintenance Allowance	Means tested conditional cash transfer paid to 16-18 year olds for staying in full-time education.

Sources: Lyche (2010), European Commission (2012a).

Codes of Conduct in national Parliaments: Transparency

As elected representatives of their voters, politicians are supposed to act as role models in fulfilling their tasks as policy-makers. However, scandals demonstrating a lack of integrity on the part of politicians diminish public trust in them. This was certainly the case, for example, when three members of the European Parliament were shown to be willing to propose law amendments for money in March 2011.[1] To restore and enhance public trust, the European Parliament and most national parliaments have introduced or expanded codes of conduct. These codes mostly tackle questions regarding their members, but often also cover parliamentary officials (staff) and lobbyists. As far as members of parliament are concerned, the principles of the codes deal with topics ranging from ineligibility to incompatibility, independence, transparency and fighting fraud and corruption, as well as sanctions.

A core principle of most codes of conduct is to safeguard and facilitate transparency of all kinds.

Table 1 summarizes the principles of codes of conduct for parliamentarians regarding transparency in Europe and the United States. Most codes aim to provide a clear view of all outside financial interests of officials. To this end, parliamentarians in some countries have to provide information on their income situation (e.g., Ireland, Denmark), on their professional activities (e.g., Luxemburg, Germany), on any property owned (e.g., Belgium and Portugal) and on any company stock owned (e.g., United Kingdom). Furthermore, transparency principles may include rules that concern private employment. While the declaration of non-parliamentary activities is voluntary, for example, in Finland, it is mandatory in other countries. In Austria and in the Slovak Republic, for example, parliamentarians have to declare employment related information like directorships, administrative positions or contracts with commercial companies. In some countries, moreover, legislation regulates that gifts have to be declared. In Germany, for instance, gifts with a value exceeding EUR 5,000 must be declared. In other countries like Malta gifts are completely prohibited.

Another important matter addressed by codes of conduct concerning transparency is conflicts of interests. Some countries only require the revelation of any potential conflicts of interest (e.g. Bulgaria, Germany). Others like Finland have stricter legislation whereby parliamentarians are also prohibited from participating in considerations and decision-making in matters concerning them personally should there be a conflict of interests. Another challenging issue dealt with differently across Europe is whether, and if so, how much of the information provided is to be made public. In some countries access is restricted to protect the privacy of the parliamentarians concerned (e.g. Hungary, Poland). However, many other countries grant access to such information on the grounds of public interest.

The current legislation of codes of conduct in EU member states and elsewhere is constantly changing. Many countries are currently reviewing their regulations to optimize the environment for sound policy-making. In view of constant public scrutiny further changes are to be expected.

A.H.

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1 EurActiv (2012) Verstöße gegen Verhaltenskodex im EU-Parlament, http://www.euractiv.de/wahlen-und-macht/artikel/verste-gegen-verhaltenskodex-im-eu-parlament-006565.

Table 1

Principles of Codes of Conduct for Parliamentarians regarding Transparency

	Principles regarding Transparency		Principles regarding Transparency
Austria	• Obligation to declare private employment. • Limited transparency of activities.	Luxem-bourg	• Obligation to declare professional activities (paid or unpaid). • Obligation to declare any financial support.
Belgium	• Limitations to concurrent sources of public incomes (1.5x parliamentary salary) • Registration of property.	Malta	• Any remuneration other than parliamentary remuneration prohibited. • Obligation to declare his/her profession, financial interests, any participation to profit or non-profit organisation. • Gifts prohibited.
Bulgaria	• Obligation to declare financial interests. • Obligation to reveal and to avoid conflicts of interest.	Nether-lands	• Obligation to declare public or private work, paid or unpaid. • Obligation to declare non-parliamentary income over a certain level.
Czech Republic	• Presentation of notifications of personal interest, activities, assets, income, gifts and liabilities (chapter 4 of the law on conflict of interest).	Poland	• Obligation to declare financial interests. • Obligation to notify any additional engagement (e.g. business activity). • Obligation to declare any gift.
Denmark	• Transparency vis-à-vis the public. • Obligation to declare income and financial interests.	Portugal	• Obligation to declare private income, property and holdings. • Obligation to declare non-parliamentary work, private and public, paid or unpaid.
Estonia	• Obligation to declare economic interests. • Other public offices or board membership of commercial companies prohibited.	Romania	• Obligation to declare financial interests. • Ban on the use of the mandate for personal gain and publicity.
Finland	• Voluntary declaration of non-parliamentary activities, paid or unpaid, and financial interests. • Transparency with regard to parliamentary behaviour. • Conflict of interest: disqualification from consideration of and decision-making in matters pertaining to him/her personally.	Slovenia	• Acceptance of gifts. • Duty to report assets and changes in the assets.
Germany	Bundestag • Obligation to declare gifts with a value exceeding EUR 5,000. • Obligation to declare previous activities and other financial and professional interests. • Information provided pursuant to declarations on interests to be made public. • Obligation to declare donations with a value exceeding 5,000 EUR; Donations exceeding 10,000 EUR in 1 calendar year shall be published by the president, with the amount and origin stated. Bundesrat (German Federal Council) Obligation to declare gifts exceeding EUR 10 in value, or EUR 25 in value for employees with representative duties.	Slovak Republic	• Obligation to declare property and financial interests. • Obligation to declare other employment or public office.
Hungary	• Obligation for MPs to declare economic interests, incomes and property.	Spain	• Abusing MP status for private activities prohibited. • Declaration of financial and non-financial interests and of property.

Table continued

	Principles regarding Transparency		Principles regarding Transparency
Ireland	• Members are guided by the public good at all times and never by any private or personal interest. As such all members must: • Provide an annual statement of interests that can be registered including occupational income, shares, directorships, land and buildings, gifts, supplies of property or services, travel facilities, remunerated position as a lobbyist, contracts with the State. This is published as the annual Register of Members' Interests. • Disclose a material interest where he/she is to speak or vote on an issue in either House (including committees) on which he/she is aware of having a material interest. • Not use official information that is not in the public domain, or information obtained in confidence in the course of their official duties, for personal gain or the personal gain of others. • Interact with the administration and law enforcement authorities consistent with of gifts over €650 (with some exceptions), stating material interest in functions to be performed. See Ethics Act, 1995, Section III and Code of Conduct (above).	Sweden	• Obligation to declare contractual and financial interests. • MPs' participation in debates in which they have a personal interest is prohibited.
Italy	• Obligation to declare gifts. • Obligation to declare property and expenses and contractual obligations for election campaigns.	United Kingdom	• Obligation to declare financial and nonfinancial interests • Receipt of financial benefits for raising questions in Parliament prohibited.
Latvia	• Obligation to declare financial interests • Receipt of gifts prohibited • Discretion in handling private data • Receipt of government contracts or concessions prohibited	United States	• Conflict of interest: Voting by Members discouraged when personal and pecuniary interests are involved. • Gifts: acceptance prohibited for gifts from registered lobbyists and foreign agents and amounting to more than USD 50. • Events attendance: regulated in accordance with character of event. • Travel: significant restriction on travel expenses paid by private sources (including lobbyists) and foreign agents. • Financial information: mandatory financial disclosure statements, to be filed annually, reviewed by House and Senate Ethics Committees and published on Internet. All registration and disclosure reports to be made available on internet by the Clerk of the House and the Secretary of the Senate
Lithuania	• Each Seimas Member must avoid conflicts between his private interests and his duties to represent the interests of the public. He must also act in such a way that the public would not cast doubt about the existence of any such conflicts (Rules of Procedure, art.18). • Obligation to declare private interests. • Obligation to declare financial interests and assets. • Receipt of any remuneration prohibited, remuneration for creative activities excepted.		

Source: European Parliament (2011).

The effect of background on student performance

Whereas in the 1960s higher education was a privilege, today the vast majority of individuals in developed countries complete secondary education and a third hold a degree in tertiary education (OECD 2011). In line with growing evidence that education is crucial for economic and social development, countries improved their educational systems. One important goal of educational systems today is to provide all students with equal learning opportunities. The impact of a student's socio-economic, and particularly migration, background on his or her performance should be reduced to a minimum in order to maximize the human capital of a country, and thereby its growth potential.

Figure 1 and 2 focus on the relationship between student performance and immigration status. They show that a migration background can often explain performance differences, but the size of its impact varies strongly across countries.

Figure 1 shows the average difference in reading performance of students with and without an immigrant background. The OECD (2011) defines students with an immigrant background as students who are foreign-born and whose parents are also for-eign-born ("first-generation immigrants"); or those who were born in the country of assessment, but have foreign-born parents ("second-generation immigrants"). The average reading performance is measured by the PISA (Programme for International Stu-dent Assessment) survey of the OECD, which tests young people's skills in all OECD countries every three years.

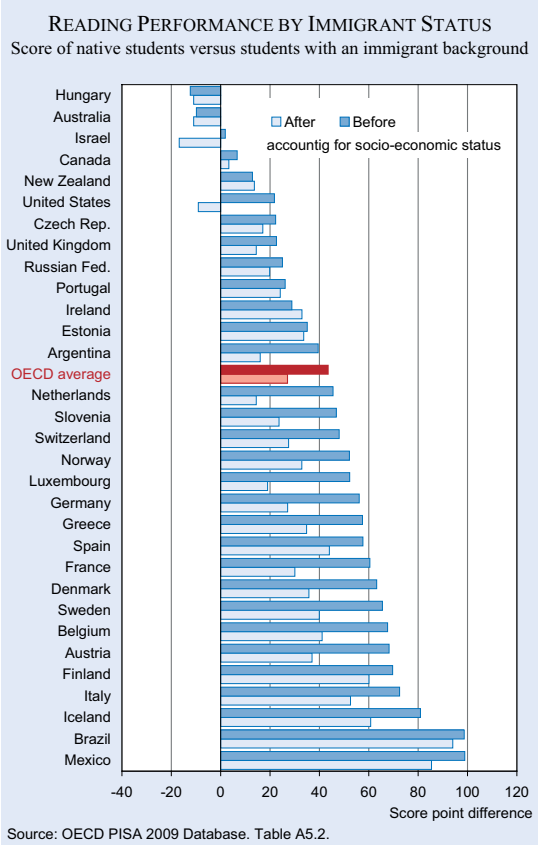
According to Figure 1, in most countries students with no immigrant background tend to outperform students with an immigrant background. The exceptions are Hungary and Australia, where average reading performance is slightly higher for students with an immigrant background.

Moreover, the performance gap varies greatly between countries. On OECD average, students with an immigrant background achieve a score that is 44 points lower than that of non-immigrant students across OECD countries. With the average progress of one school year equaling 39 points on the PISA reading scale, this means that immi-grant students lag more than one school year behind their non-immigrant peers in terms of reading skills (OECD 2011). The greatest performance gaps between non-immigrant students and their immigrant peers are evident in Mexico and Brazil.

Part of the performance gap between students with and without an immigrant background, can be explained by other socio-economic factors. Figure 2 shows the score point difference of students with and without an immigrant background before and after taking socio-economic background into account. The measure of socio-economic background is the "PISA index of social, cultural and economic status", which considers the parents' education and occupation and the students' home possessions (OECD 2011).

Accounting for socio-economic background reduces the performance gap of students with immigrant background in comparison to their non-immigrant peers from 44 to 27 score points on OECD average. In the majority of countries students without an immi-grant background still achieve better reading test scores than their immigrant peers, even after taking socio-economic background into account.

Figure 1



The persistence of the performance gap after accounting for the socio-economic back-ground of students indicates that lower achievements in school by students with migration background can be directly attributed to their immigrant status (OECD 2011).

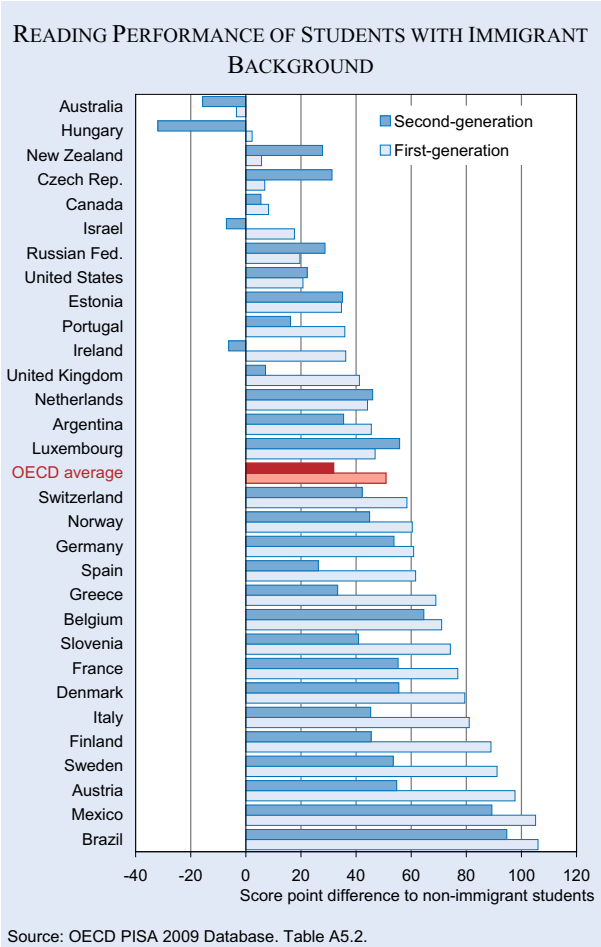
Figure 2 shows that, on the whole, second-generation immigrants tend to have a lower reading performance gap to non-immigrant students than first-generation immigrants. In Australia, Hungary, Israel and Ireland second-generation students even outperform their non-immigrant peers. In seven countries, however, second-generation immigrants achieve lower test scores than first-generation immigrants. This gap is particularly large in New Zealand and the Czech Republic. On OECD average the test scores of first-generation students is 51 points below those of students without immigrant back-ground. For second-generation students the average gap is only 33 score points

While the educational experience of first-generation immigrants abroad may explain part of their performance lag of almost one and a half school years, second-generation immigrants seem to have benefited from the educational system of their host country (OECD 2011).Therefore, the OECD concludes that differences between first and second generation immigrants might reflect the success of integration policies and signal social mobility, but could also be due to the varying characteristics of families participating in different immigration waves.

The results of these figures show that countries still need to improve both their education and their integration policies. Even after controlling for socio-economic back-ground, the performance gap between immigrant and non-immigrant students is very large in most countries. With the exception of a few countries, this performance gap still persists among second-generation immigrants.

K.D.

Figure 2



Source: OECD PISA 2009 Database. Table A5.2.

Reference

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Admission Criteria and Policies for Immigrant Entrepreneurs in OECD Countries

Many migrants move to a foreign country looking for jobs with a higher earning potential or better career opportunities than in their home country. However, some immigrants also engage in entrepreneurial activities and, thus, create new employment in the receiving economy. The OECD Migration Outlook 2011 shows that the fraction of entrepreneurs among the foreign-born working population in OECD countries is 12.6 percent on average. Moreover, immigrants' business activities go far beyond the stereotypical corner shops catering to the needs of fellow migrants. In OECD countries foreign-born entrepreneurs create 1.4 to 2.1 additional jobs on average, often in innovative sectors of the economy. Wadhwa et al. (2007), for example, find that for the last ten years 25 percent of all engineering and technological companies in the USA were founded by migrants. Such businesses foster economic growth and increase welfare. On top of this, migrant entrepreneurs often use their personal networks to engage in trade with their home economies.

Policy-makers in OECD countries have become aware of the potential of immigrant entrepreneurship and have implemented several measures to attract and support migrant entrepreneurs. In general, two types of immigrant business owners can be distin-guished. Firstly, there are entrepreneurs who decide to immigrate in order to become self-employed and benefit from a country's business environment. However, many foreign-born entrepreneurs in OECD countries have immigrated for other purposes and set up their business after some time in the host economy. Different policy measures target these different types of entrepreneurs accordingly.

As for the first group, most countries offer special residence permits for entrepreneurs to attract investment and innovation. Table 1 shows the admission requirements of different OECD countries for immigrants who want to start a business. In the light of generally restrictive immigration policies in the OECD countries, applicants must fulfill the admission criteria in order to receive a residence permit that is usually temporary. Such programs were first established in "classical" immigration countries like Australia or Canada in the 1960s and 1970s. Nowadays almost all OECD countries offer residence permits for self-employed immigrants conditioned on the applicant's skills, as well as on the business plan presented. The policy measures in Table 1 were collected from responses to a questionnaire sent to the governments of all OECD countries in 2009.

In order to obtain a residence permit as an entrepreneur in most cases some previous professional experience in running a business or a certain level of education and training is necessary. In Japan, for example, applicants must have at least three years of experience in operating or managing a business. Some countries, like Switzerland or Norway, require specialist training in the particular field of business. For admission in the Netherlands different factors like education, personal experience and income are weighted in a point based system. An additional admission criterion in some countries like the UK, Canada and Australia is sufficient knowledge of the local language.

Moreover, immigrants who want to start a business often need a minimum amount of investment capital in order to obtain a residence permit. This investment is EUR 300,000 in Ireland, GBP 200,000 in the UK and EUR 60,000 in Greece. In Germany candidates have to invest at least EUR 250,000. Additionally, they have to create a minimum of five jobs with their business in the country. Exceptions may be granted if a particular business is assessed as being beneficial for the German economy. In France, for example, a migrant entrepreneur is not asked to provide evidence of certain investment capital or any personal qualification certificate, but has to create 50 additional jobs to receive a residence permit. Some governments, however, do not impose such strict visa requirements. In the Czech Republic, for example, applicants merely have to provide evidence of self-support funds of CZK 120,000.

Despite these migration channels only two percent of all foreign-born business owners in OECD countries have made use of a special visa for self-employed immigrants. One reason for this may be excessively restrictive admission policies. To provide more incentives for entrepreneurs from abroad, several countries have simplified admission criteria over the last years. So recent policies in Germany,

Sweden, the United States and Australia account for different categories of businesses, which impose less strin-gent restrictions for smaller, independent or particularly beneficial businesses: Depending on the visa category, the minimum investment capital in the United States ranges from zero to USD 1,000,000, and from zero to AUD 100,000 in Australia. To obtain a residence permit as a "business owner" in Sweden immigrants have to prove that they own a majority share in a company, whereas "self-employed" visas merely require proof of solid experience in the proposed business. Another reason for a relatively small fraction of migrant entrepreneurs using special residence permits is the existence of further immigration channels. Many governments have joined multi- or bilateral agreements facilitating the movement of labor between particular countries. Citizens from the European Union, for example, do not need a special residence permit in order to start a business in one of the EU member states. In addition, many migrant entrepreneurs do not move to a country for the purpose of becoming self-employed in the first place. Some entrepreneurs immigrate as employees or family-migrants, for example. Thus, a further policy approach to foster immigrant entrepreneurship is to support immigrant entrepreneurs who already live in the host country.

T. N.

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Table 1

Self-employed entrepreneurs admission requirements

	Depends on business type	Experience	Minimum investment capital	Minimum jobs to be created/ maintained	Minimum net worth	Language knowledge
Austria	No	Applicant's training, skills, know-how,professional experience	No	No	No	No
Belgium	No	Yes	No	No	No	No
Czech Republic	No	No	No	No	CZK 120,000 (minimum self-support funds)	No
Denmark	No	Documented relevant training/education, experience as a self-employed person and/or work experience in the same field.	No	No	No	No
Finland	No	Documented relevant professional qualifications.	No	No	No	No
France	No	No	No	50	No	No
Germany	a)	Previous business experience may be assessed.	EUR 250,000 (but exception may be granted)	5 (but exception may be granted)	No	No
	b)	No	No	No	No	No
Greece	No	Yes	EUR 60,000	No	No	No
Ireland	No	Proof of personal skills levels to undertake the proposed business	EUR 300,000 (but exception may be granted)	2 (but exception may be granted)	No	No
Italy	No	Yes	No	No	No	No
Netherlands	No	Personal experience: Education (35p); Experience in business (35p); Work experience (10p); Income (10p); Experience in the Netherlands (10p).	No	No	No	No
Poland	No	No	No	No	No	No
Portugal	No	May be required for professions subject to special qualifications.	No	No	No, but funds must be available in Portugal (including deriving from loans obtained by a banking institution In Portugal).	No
Spain	No	Applicant must possess the qualifications and experience required for the exercise of the proposed independent activity.	No	No	No	No
Sweden	c)	Proof of ≥50% ownership of a company.	No	No	No	No
	d)	Proof of solid experience in the proposed business; Previous experience in running the business.	No	No	No, but must append bank statements proving personal funds for maintenance for the first year in Sweden.	No
United Kingdom	No	No	GBP 200,000 (25p)	No	No, but maintenance requirement (10p).	Yes (10p)
Norway	No	Generally granted only on the basis of special qualifications in exceptional circumstances. Prove specialist training or possess a craft certificate (whenever relevant).	No	No	No	No
Switzerland	No	Proof of professional qualifications required for the exercise of the proposed activity.	No	No	No	No

Table continued

Australia	e)	Successful business experience = AUD 200,000 combined assets of applicant and partner in a qualifying business and ≥10% ownership of this business if a public listed company; Annual turnover of main business (-es) in 2 of last4 fiscal years ≥AUD 500,000.	No, but ≥AUD100,000 to settle(addi-tional to net worth).	No	AUD 500,000 (combined as-setsof applicant and partner), transferred to Australia within 2 years.	Yes (vocational level)
	f)	Successful business experience = annual turnover of main business (-es) in 2 of last 4 fiscal years ≥AUD300,000.	No	No	AUD 250,000 (combined as-sets of applicant and partner)	No
	g)	Successful business experience = AUD 400,000 combined assets of applicant and partner in a qualifying business; Annual turnover of main business(-es) in 2 of last 4 fiscal years ≥ AUD 3 million.	No	No	AUD 1.5 million (combined as-sets of applicant and partner)	No
Canada	h)	2 years relevant experience: Farm management, Self-employment	No	No	No	Yes (under points system)
	i)	2 years business experience: Managing and controlling a percentageof equity in a qualifying business.	No	No	CAD 300,000	Yes (under points system)
Japan	No	At least 3 years experience in the operation and/or management of a business.	No	2 full-time (in addition to those who operate the business)	No	No
New Zealand	No	Prove business experience that is relevant to the proposed business (business operation or work experience at a senior managerial level in a substantial, relevant business).	No	No	No	Yes (IELTS min.overall score 4)
United States	j)	No	USD 1 million	10 (direct creation of jobs US resi-dents other than the appli-cant and his/ her family members).	No	No
	k)	No	USD 500,000		No	No
	l)	No	USD 1 million	10 (direct creation of jobs US resi-dents other than the appli-cant and his/ her family members).	No	No
	m)		USD 500,000		No	No
	n)	Existing trade: the partner-country and the US must already be in progress on behalf of the individual.	No, but trade must be "substantial".	No	No	No
	o)	Not necessary.	No, but investment must be substantial".	No	No	No

Notes: a) Residence permit for the purpose of self-employment: to set up a business (Residence Act, Section 21)
b) Residence permit for the purpose of self-employment: to work on a free-lance basis as writers, artists, performers, consultants, etc. (Residence Act, Section 21, para. 5)
c) Residence permit to start and operate a business (business owner)
d) Residence permit to start and operate a business (self-employed)
e) Business Owner Provisional (subclass 160) under the Business Skills category
f) State/Territory Sponsored Business Owner Provisional(subclass 163) under the Business Skills category
g) Business Talent (subclass 132) under the Business Skills category
h) Self-employed(one of three Business Class sub-categories, under the Economic category)
i) Entrepreneurs(1of 3 Business Class sub-categories, under the Economic category)
j) EB-5 residence visa
k) EB-5 residence visa for in-vestment in a Targeted Employment Area (TEA)
l) EB-5 residence visa pilot
m) EB-5 residence visa pilot in a TEA
n) E-1 visa (Treaty trader), based on a Treaty of Commerce and Navigation (non-immigrant visa status) according to INA, 101(a)(15)(E)
o) E-2 visa (Treaty investor), based on a Treaty of Commerce and Navigation (non-immigrant visa status) according to INA, 101(a)(15)(E)

Source: OECD (2011).

New at DICE Database

Recent entries to the DICE Database

From July to October 2012 the DICE Database received about 250 entries, consisting partly of updates of existing content and partly of new topics. The subdivisions "Transparency" of the institutional field "Public Sector / Public Governance and Law" and "Regional Policy" of "Other Topics / Structural Policy" have been enlarged considerably. To enhance the user friendliness every division has been supplemented by a short abstract giving further details about the content and the economic impact of the division.

The new or updated topics include:

- Adjustment Processes to Climate Change
- Fight against Corruption
- Status of Basel II and III Adoption
- Public Scholarships and Student Loans
- Eligibility Criteria for Unemployment Benefits
- Regulations in the Transport Sector
- Quality of the Infrastructure

Forthcoming Conferences

CESifo Area Conference on Behavioural Economics 2012

02–03 November 2012, in Munich

The keynote speakers are Douglas Bernheim (Stanford University) and Colin Camerer (California Institute of Technology). The papers introduced at this conference focus on behavioural and experimental economics and applications to other fields.

Scientific organisers: Klaus Schmidt, Ernst Fehr

CESifo Area Conference on Energy and Climate Economics 2012

09-10 November 2012, in Munich

The purpose of the conference is to bring together the members of the CESifo Research Network to present and discuss their ongoing research, and to stimulate interaction and co-operation between them. The papers introduced deal with any topic in the field of Energy and Climate Economics.

Scientific organiser: Michael Hoel

6th Workshop on Political Economy

07-08 December 2012, in Dresden

CESifo, the Center of Public Economics at TU Dresden and the Ifo Institute Dresden Branch will jointly organize a workshop on Political Economy. The two-day workshop will serve as a forum to present current research results in political economy and will give researchers the opportunity to network.

Scientific organisers: Christian Lessmann, Gunther Markwardt

74th EUROCONSTRUCT Conference

11-12 December 2012, in Munich

The conference is part of biannual series of presentations on the latest medium-term outlook for construction in Europe. This event addresses to all those involved in the construction activities: producers of materials and equipment, construction companies, designers, architects, engineers, contractors, investors, financiers, insurer etc.

Scientific organiser: Ludwig Dorffmeister

New Books on Institutions

The Oxford Handbook of Regulation
Edited by Robert Baldwin, Martin Cave and Martin Lodge, Oxford University Press, 2012

Politics and Power in the Multinational Corporation
The Role of Institutions, Interests and Identities
Edited by Christoph Dörrenbächer and Mike Geppert, Cambridge University Press, 2012

Shaping Europe
France, Germany, and Embedded Bilateralism from the Elysée Treaty to Twenty-First Century Politics
Ulrich Krotz and Joachim Schild, Oxford University Press, 2012 (estimated)

DICE

Database for Institutional Comparisons in Europe

www.cesifo-group.org/DICE

The DICE database 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: Business and Financial Markets, Education and Innovation, Energy and Natural Environment, Infrastructure, Labour Market and Migration, Public Sector, Social Policy, Values and Other Topics.

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.
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