

**Policy Responses to
the Economic Crisis:**

***Investing in Innovation for
Long-Term Growth***

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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

The OECD is a unique forum where the governments of 30 democracies work together to address the economic, social and environmental challenges of globalisation. The OECD is also at the forefront of efforts to understand and to help governments respond to new developments and concerns, such as corporate governance, the information economy and the challenges of an ageing population. The Organisation provides a setting where governments can compare policy experiences, seek answers to common problems, identify good practice and work to co-ordinate domestic and international policies.

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Foreword

The current crisis is the first of this severity to hit OECD countries, since they have shifted to knowledge-based service economies where investment in intangible assets is of equal importance as investment in machinery, equipment and buildings. Efforts to stimulate the economy need to both reflect the current drivers of economic growth and take advantage of the process of “creative destruction” to accelerate structural shifts towards a stronger and more sustainable economic future. Innovation policies need to be adapted to current conditions both in terms of how such policies are crafted to work, but also as elements of stimulus packages that may often be the foundation for these medium- and long-term initiatives

The OECD is developing a strategic response to the crisis focusing on two priority areas: finance, competition and governance; and restoring long-term growth. As part of this strategic response, the OECD Directorate for Science, Technology and Industry (DSTI) has analysed the likely impact of the downturn on the drivers of long term economic growth and the innovation-related items in policy responses of major countries. Special workshops and sessions on the economic crisis were held by the Committee for Innovation, Industry and Entrepreneurship, the Committee for Scientific and Technological Policy, and the Committee for Information, Computer and Communications Policy. In January 2009, the OECD Directorate for Science, Technology and Industry circulated a questionnaire to member countries to collect information on specific innovation-related items of their stimulus packages. By May 2009, 27 member countries, all five OECD accession countries (Chile, Estonia, Israel, Russia and Slovenia) and South Africa had answered the questionnaire. In May 2009, the three OECD Committees recommended to make public, under their responsibility, this updated version.

This report presents the results of this exercise: the first chapter reports the general analysis of the impact of the crisis and the appropriate policy responses, and the second chapter reviews current national responses.

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Part 1

FOSTERING INNOVATION FOR SUSTAINABLE GROWTH IN A TIME OF ECONOMIC CRISIS

Innovation will be one of the keys to emerging from the current crisis, but it risks being hit hard by the downturn

The economic crisis has prompted an immediate response by governments to avoid a collapse of the financial and banking systems and limit the economic effects of the credit crunch. Such policies aim at stabilising the economy and initiating a rapid recovery. But policies also need to ensure that the recovery is durable, *i.e.* based on sustainable growth. The crisis should not damage the drivers of long-term growth, but should instead be used as a springboard to accelerate structural shifts towards a stronger, fairer and cleaner economic future. Failing to do so might lead only to a temporary recovery as the macro-economic and structural roots of the current downturn would remain untouched. This implies integrating long term concerns in the short term policy packages currently assembled by governments and implementing specific policies aimed at strengthening the supply-side of the economy. While the impact of some of the latter actions may emerge in the medium- to long-term, they warrant consideration now because:

- They add credibility to government's borrowing demands that are imposing long-term debt, thus making a contribution to fiscal sustainability;
- They take advantage of structural changes imposed by the crisis to accelerate a redeployment of resources from ailing activities to those that offer the largest longer term economic and social benefits.

The foundation for these medium- and long-term initiatives consists of: fostering innovation through promoting entrepreneurship, investing in smart infrastructure, encouraging R&D, green investment, upgrading the skills of workers, steering market actors towards innovation-related investments, and accelerating activities for which barriers may have been too high otherwise.

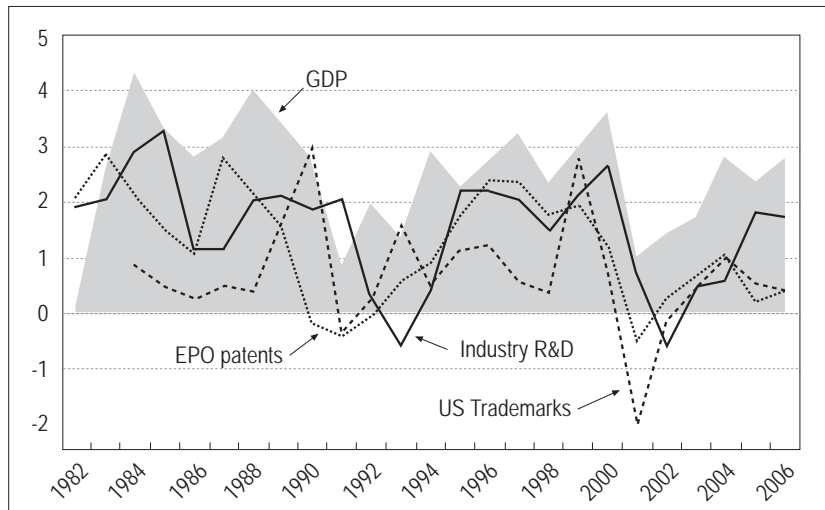
The crisis is affecting innovation and a number of other determinants of long-term growth

Investments in innovation are declining in many firms

The available evidence suggests that the crisis has already begun to affect innovation. Historically, business R&D expenditure and patent filings have moved in parallel with GDP, slowing markedly during the economic downturns of the early 1990s and of the early 2000s (Figure 1). Data on trademark filings, that reflect the creation of new goods or services, with or without technological content, shows that the business cycle is affecting a wide range of innovation.

Figure 1. The impact of the business cycle on innovation

Business-funded R&D, patents (applications to the European Patent Office), trademarks (filed at the US Patent and Trademark Office) and GDP (Annual growth rate for the total of OECD countries; divided by standard deviation)



Source: OECD, MSTI and Patent database.

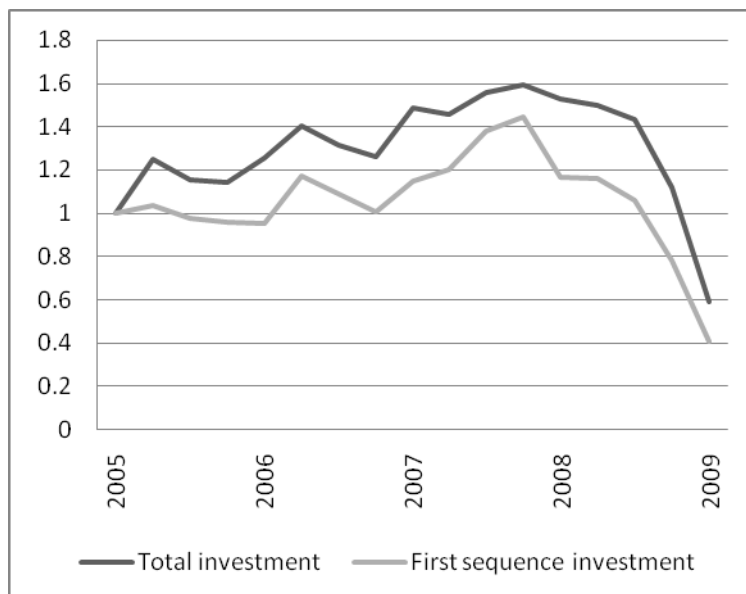
Evidence for the current crisis confirms these findings. Corporate reports for the fourth quarter of 2008 in many cases already show a decline or slower growth in R&D spending. Forecasts for 2009 confirm the trend. A recent McKinsey survey of almost 500 large businesses world-wide indicated that 34% expect to spend less on a R&D in 2009 while 21% forecast an increase.

R&D is declining because it is mainly financed from cash flow (retained earnings), which contracts in downturns. At the same time, as banks, markets and investors have become more risk averse; firms face difficulties in tapping into external sources of funding to support their investments in R&D. Business R&D is also being re-oriented towards short-term, low-risk innovations, while longer term, high risk innovation projects are being cut first. The decline in business R&D risks affecting the stock of knowledge as highly trained researchers and innovators lose their jobs. Small, innovative firms are particularly hard hit because in many cases their primary asset is intangible in nature (*e.g.* an idea or a patent) and difficult to value, making it hard to borrow against, or sell, to stay afloat.

The crisis can, however, magnify the competitive advantage of research-intensive firms who seize the opportunity to reinforce market leadership through increased spending on innovation and R&D. Many of today's leading firms such as Microsoft or Nokia were born or transformed in the "creative destruction" of economic downturns. And several of today's leading technology firms such as Samsung Electronics, or Google strongly increased their R&D expenditures during and after the "new economy" bust of 2001.

Figure 2. Investment in venture capital has fallen sharply

(Venture capital investment in the United States, index: 2005 Q1 = 1)



Source: PricewaterhouseCoopers and National Venture Capital Association.

Fading support by the financial system for firms, and especially new entrants, is a major concern in the current context, underscoring the primary importance of fixing the financial system. Growing aversion to risk combined with other factors (such as difficulties for investors to exit) is already drying up many sources of seed and venture capital. The total amount of venture capital investment in the United States started declining at the beginning of 2008, and the fall accelerated at the end of 2008 and beginning of 2009 (Figure 2). Total investment in the 1st quarter of 2009 was down 60% as compared with the 1st quarter of 2008, while 1st sequence investment was down 65%. Venture capitalists are concentrating their efforts on helping firms survive that are already part of their investment portfolio – not on new start-ups. In China, the number of Initial Public Offerings fell substantially at the end of 2008 as did venture capital investment, notably in high technology sectors.

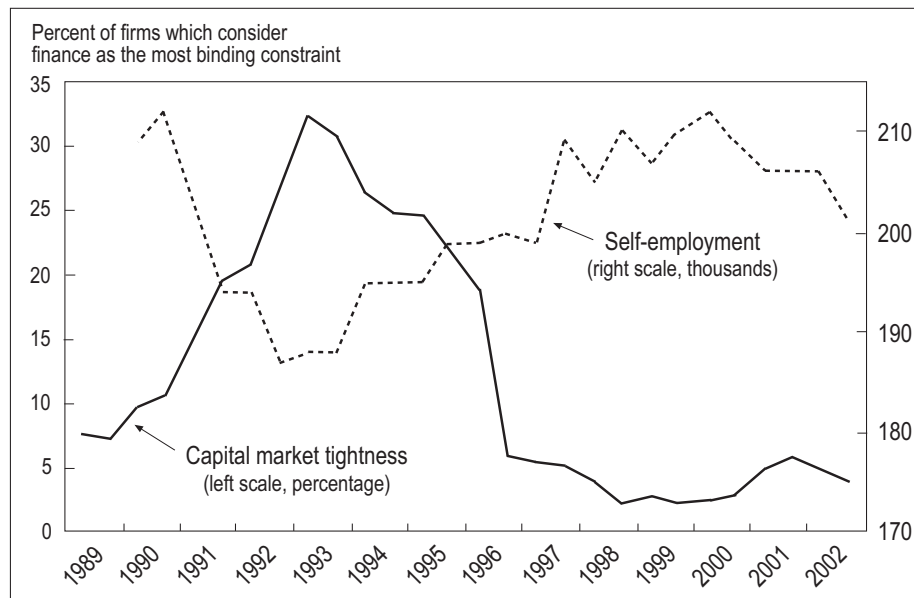
The crisis is affecting entrepreneurship and business dynamism

Economic crises are historically times of industrial renewal. Less efficient firms fail while more dynamic ones emerge and expand. Creative destruction is an essential engine of long term efficiency in market economies, and it intensifies in downturns. Available data for many OECD countries point to a sharp increase in bankruptcies and business failures in recent months. New business models and new technologies, particularly those allowing a reduction in cost, often arise in downturns, as was the case with low-cost airlines which grew out of the recession of the early 1990s. As dominant players weaken, they open space for new players and innovators.

However, economic downturns can have a detrimental effect on the creation of new, innovative businesses when access to financing dries up. The key role of finance in the development of small and medium-sized enterprises (SMEs) is illustrated by Finland (Figure 3) where the peak in financial constraints coincided closely with the deep recession of the early 1990s and a downturn in self-employed. Economic growth suffers doubly in the long term since innovative new firms exert competitive pressure on established firms pushing them to innovate. Barriers to entry are higher during downturns: studies for the United States, for example, show that fewer manufacturing firms enter during recessions, and that these firms are (on average) larger and more efficient than firms created during expansion phases.

Small and medium-sized enterprises (SMEs) in most OECD countries are now confronted with a clear downturn in demand for goods and services if not a demand slump, crimping cash flow. And many SMEs are faced with two additional problems: *a*) increased payment delays on receivables which add - together with an increase in inventories - to an endemic shortage of working capital and a decrease in liquidity and *b*) an increase in reported defaults, insolvencies and bankruptcies.

Figure 3. Finance is a key obstacle to entrepreneurship



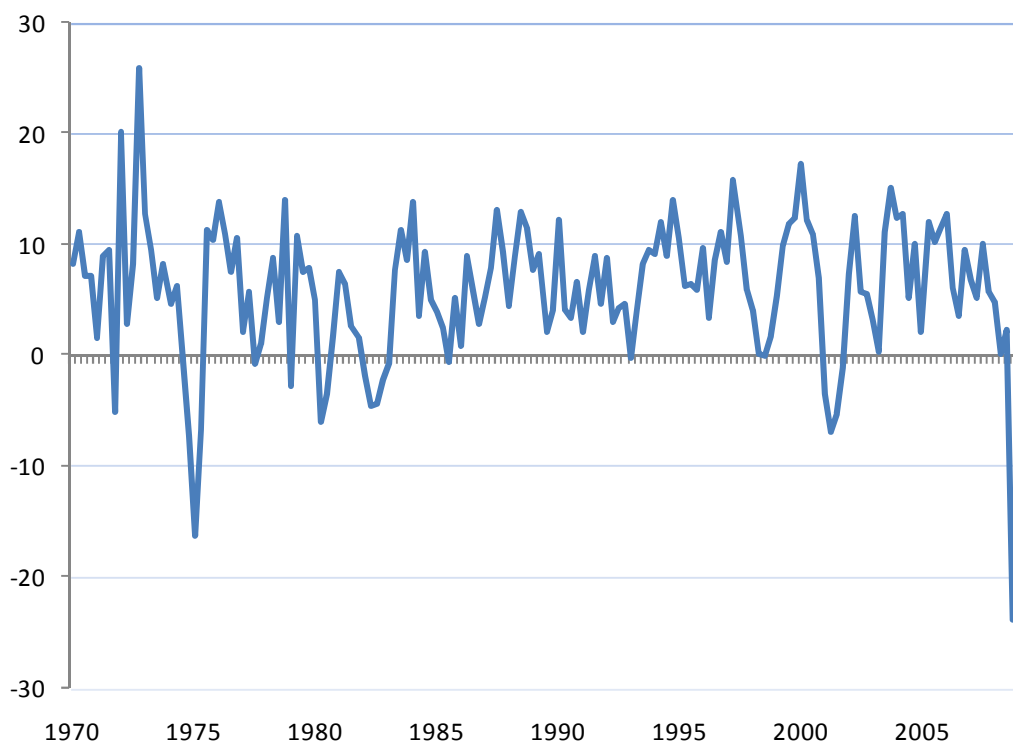
Source: Hyytinen and Pajarinen (eds.) (2003), "Financial Systems and Firm Performance: Theoretical and Empirical Perspectives" ETLA B: 200.

Plummeting international trade is affecting global value chains, an important source of innovation

The sharp decline in trade, foreign direct investment and access to international financing, poses a risk to the global supply chains that underpin innovation. These supply chains are critical sources of new knowledge and learning. They provide companies with technical expertise, knowledge of foreign markets, critical business contacts and international partners. The current decline of trade and investment flows (Figure 4) could have severe consequences for these knowledge transfers and for innovation at the global level. Trade is not at the origin of the crisis, but since it binds economies closely together, it helps to spread developments from one country to another – the negative developments as well as the positive.

Figure 4. World trade has plummeted

Annualised quarter on quarter growth (%)



Note: The first quarter of 2009 is an estimate.

The risks to global value chains emerge not only from the decline in international trade, but also from key suppliers facing bankruptcy, and from firms re-considering their investment strategies and retrenching to core markets. Protectionist policies could exacerbate these risks. It would increase the input costs for domestic industries and would penalise exporters twice, through higher costs and through retaliation from other countries.

Firms now rely on a global business model, and retrenchment risks disrupting international links, affecting growth and future innovation in both OECD countries and non-OECD economies. Co-ordination of government actions can help address these risks, can produce a more effective, longer-lasting solution and can also result in positive spill-over effects.

Human capital is being depreciated

Crisis-driven layoffs are on the rise in many OECD countries and experience from previous recessions shows that many skilled workers will become unemployed (see the example of Korea in Box 1). High-tech industries (like IT, aeronautics or pharmaceuticals) and knowledge-intensive services (like financial services) are announcing layoffs almost daily. This human capital will quickly depreciate if the downturn is protracted. However, such talent could make an important contribution to the many innovative businesses that have experienced a shortage of skilled workers in the recent past, or could contribute to a new wave of innovative entrepreneurship.

Education and training are particularly important in the current crisis. In times of recession, budget constraints (in government, households and businesses) tend to reduce expenditure on education and training. On the other hand, due to rising unemployment, demand for training increases. Support for education and training during the current crisis can help displaced workers find new job opportunities and can thus support the restructuring process.

Incentives to develop a greener economy have weakened

Efforts to promote a greener economy can also be compromised by the current crisis. Lower oil prices have already reduced incentives to switch to alternative energy sources – and the declining prices of raw materials are reducing pressures to use these resources more efficiently. Environmental innovation is also affected as consumers buy less expensive goods. Firms are therefore reluctant to introduce innovations because it is more difficult to reap a price premium. Moreover, as banks have reduced credit, process innovations that could reduce costs (*e.g.* energy-saving equipment) are more difficult to implement, as they imply capital investments. New entrants are also limited by lack of venture capital and declining market prospects.

On the other hand, the prospect of industrial restructuring creates opportunities for new and greener businesses, whereas the depreciation of currently installed equipment (due to business downsizing or closure) offers opportunities for the promotion of environmentally friendly investments.

But the crisis also offers opportunities to foster innovation for sustainable growth

Although the current economic situation poses hard new questions and choices for all governments, it offers an opportunity to strengthen the medium and long-term potential of the economy. Governments can incorporate forward-looking structural measures that inject innovation into the mix of policies being adopted to tackle the economic downturn. Some of these may add to demand in the short term, but most are more likely to offer benefits in the longer term.

Past experiences demonstrate the opportunities of crisis to enhance innovation performance

The governments of Finland and Korea both have demonstrated during past downturns that bold innovation policy initiatives can accelerate structural changes which face high obstacles in normal times (Box 1). Such initiatives require proper framework conditions and a coherent crisis strategy.

Anti-crisis policy measures can provide built-in incentives to innovate

Clearly, innovation will be one of the keys to emerging from the downturn and putting countries back on a path to sustainable – and smarter – growth. Many governments have incorporated measures to strengthen innovation in their stimulus packages, and can also take action to improve their long-term potential for innovation.

Box 1. Pro-innovation responses to crisis – the examples of Finland and Korea

Finland experienced an exceptionally deep economic crisis during the first half of the 1990s. Within four years, output was reduced by more than 10% and the unemployment rate quadrupled to almost 17%. External shocks (the collapse of trade with the former Soviet Union in 1991, but also a sharp downturn in the OECD area), combined with a domestic banking crisis, led to a collapse of consumption and investment spending.

Overcoming the crisis required drastic measures to improve competitiveness and to consolidate public finances -- at the same time as very costly measures were needed to revive the banking sector. Most public expenditures were cut almost across the board, and some taxes were raised. The main exception to this was R&D spending, which was *increased* rather than *cut*. In particular, the counter-cyclical support of TEKES (the largest Finnish Funding Agency for Technology and Innovation) proved very important in reducing the depth and length of the downturn in business R&D, which helped lay the ground for a strong rebound. The government decision to complement macroeconomic stabilization measures with sustained investment in infrastructure, education and incentives for structural change helped put the Finnish economy on a stronger, more knowledge-intensive, growth path following the crisis.

Korea's experience also illustrates how good crisis management can accelerate structural adjustment. The Asian financial crisis of the late 1990s led to significant down-sizing among large firms in Korea. This process was characterized by mass lay-offs of highly-skilled personnel, and large reductions in corporate R&D spending. The response of the Korean government, in addition to boosting education expenditure, was to increase its R&D budget, to offset the decline in corporate R&D spending. Moreover, it used the crisis as an opportunity to develop a technology-based SME sector, using the Special Law to Promote Venture Firms (enacted in 1998). A co-ordinated mix of policy measures was put in place: regulations that helped improve the environment for venture start-ups and their growth; government-backed venture funds and tax incentives for investors; as well as measures to support research.

These measures fuelled rapid expansion in the number of corporate R&D labs (which numbered about 3 000 at the time of the crisis, but grew to about 9 000 by 2001) with SMEs accounting for 95% of this increase. On the eve of the crisis, there were about 100 “venture firms” in Korea. By the end of 1999, this number had increased to over 5 000, and by the end of 2001, it had grown to over 11 000. The long-term effects of these measures were striking. In 1997, SME spending accounted for just 12% of total business R&D, but by 2006, this figure had increased to 24%.

Of course, this success cannot be explained by policy intervention alone. The world-wide shift to a digital economy provided an exceptional business opportunity for people with technology and ideas – notably those being laid-off by large firms. Nevertheless, government action helped shape an environment that enabled new businesses to seize upon these emerging opportunities.

Mitigating the negative impact of the crisis on innovation is important as the crisis has magnified widely acknowledged market failures in innovation financing. Investment in innovation is now considered even more risky and some of the longer term investments in new technologies are particularly affected. Moreover, stimulus measures offer an opportunity to put available resources for innovation (notably skilled labour) to good use. In supporting private investment in innovation, care should be taken to ensure that government spending provides good value for money; the less promising innovation projects are among those abandoned first by the private sector and there is no reason to revive these with public money. Policies that can be considered in this context include:

- Focusing public support on promising research and innovation affected by the crisis, *e.g.* long-term and risky research, research conducted by start ups, and research addressing societal challenges (environment, ageing, etc.). Using existing instruments and vehicles for support can help maximise the short term impact.
- Well-designed public-private partnerships can help enhance the resilience of investments in R&D over the business cycle. One way of achieving this could be through adjusting the balance of public and private funding over the business cycle. Such partnerships can also be used at the local or regional level, *e.g.* in innovative clusters, to ensuring that government funds reach new and small players, thus reducing the risk of capture by “strong players”.

- As with other investments in infrastructure, investments in research infrastructure can contribute both to stimulating demand in the short term and supply in the longer term.
- Open and competitive public procurement can also be used to support R&D, especially where it contributes to solving social challenges, *e.g.* mobility, energy or health.

Governments also need to focus on medium to long-term actions to strengthen innovation. A broad range of policy reforms will be needed in OECD countries and non-OECD economies to respond to the changing nature of the innovation process and strengthen innovation performance to foster sustainable growth and address key global challenges. This involves, amongst others, fostering innovation in all its forms and broadening the focus of innovation policies beyond support for R&D

In changing their approaches to innovation, governments also need to consider how to best support risk-taking, such as investments in innovative start-up companies. Regulatory reform of financial markets to address the financial crisis should consider the financing of innovative start-ups and the provision of appropriate incentives for risk-taking. Venture capital markets and the securitisation of innovation-related assets (*e.g.* intellectual property) have proven to be particularly important for many innovative start-ups and should not be harmed by new financial regulation. Existing support measures for new, innovative firms which limit the risk taken by entrepreneurs and capital providers can be updated to enhance their effectiveness.

Policies can lower the obstacles to entrepreneurship and industrial renewal

New business opportunities and the reallocation of resources from declining activities towards emerging opportunities are vital to recovery. Governments will need to avoid locking-in old economic structures and business models. Supporting firms and industries that do not have a viable business model will thwart the restructuring required for more sustainable growth. Facilitating the creation of new firms and ensuring competition can help underpin such restructuring.

Governments can prepare for the next phase of innovation-led productivity growth, for example, by encouraging the entry and expansion of new businesses or the exit or re-orientation of existing businesses facing difficulties. Several policy avenues can be considered in this regard:

- Encourage firm entry and growth, *e.g.* by reducing the administrative cost of creating a new company; reducing the barriers to growth of small companies; more favourable conditions for the survival and restructuring of ailing businesses (instead of quasi-automatic bankruptcy) should be considered; or developing micro-credit for “necessity-driven” entrepreneurs, *e.g.* through loan guarantees to banks.
- Ease the liquidity constraint faced by small firms. The measures that have been put in place by countries can be classified in three different groups: *a)* measures supporting sales and preventing depletion of SMEs’ working capital such as export credit and insurance, factoring for receivables, tax reductions and deferrals, and better payment discipline by governments, *b)* measures to enhance SME’s access to finance, mainly to credit through bank recapitalisation and expansion of existing loan and credit guarantee schemes; *c)* measures aimed at helping SMEs to maintain their investment level and more generally their capacity to respond in the near future to a possible surge in demand through investment grants and credits, accelerated depreciation, and R&D financing.

Several countries have introduced policies that are intended to support industries particularly affected by the economic crisis, such as the car industry. Introducing or increasing government subsidies to producers may undermine the long-term production capacity of the economy. Even if subsidies boost short term demand, they can backfire by postponing needed restructuring and wasting taxpayer funds. Furthermore, these subsidies can be protectionist measures, and may provoke retaliation from other countries and a global reduction in growth potential. Such measures therefore need to remain selective, and avoid bailing out firms which are not competitive.

Producer subsidies distort the marketplace and can multiply across sectors and borders as “equal treatment” is sought. If subsidies are made, their economic cost should be minimised by making them conditional on progress in industrial restructuring and attaching clear targets and strict limits in terms of size and duration. It is important to ensure that measures are consistent with long-term goals, notably higher productivity and the ability to respond to environmental challenges.

Investments in a networked recovery can preserve ICTs as a key engine of growth

The current crisis could also have negative effects on the communication sector which has been investing in high speed broadband networks and next generation switching technology. Telecommunication incumbents have historically had strong cash flow positions but face increasing difficulties raising sufficient capital. Smaller new entrants, with fewer assets and lower cash flow, may be disproportionately affected by capital shortages. There is also concern that incumbents will use the financial crisis as a means to obtain regulatory concessions from governments in exchange for promises to invest. Such concessions would have negative effects on the development of long term competition in the sector, innovation and lower prices.

Investment in high speed broadband communication networks that are part of economic stimulus packages must be accompanied by regulatory frameworks which support open access to networks and competition in the market. Such investment should also aim at stimulating the use of information and communication technologies (ICTs) to secure economic and social benefits. Linking ICT investment with other large physical infrastructure investment, such as buildings, roads, transportation systems, health and electricity grids, allows them to be “smart” and save energy, assist the aging, improve safety and adapt to new ideas. These infrastructures can also lower the barriers to entrepreneurial activities and provide means for the efficient and “green” delivery of energy, mobility and important social services – training, job search and networking.

Given the costs involved in fibre deployment it is fairly certain that outside the dense urban areas the market will not be able to support more than one fibre based network. The exception may be in markets which already have well developed and ubiquitous, cable TV infrastructures which may provide an alternative and competing platform. Governments, both central and municipal, can play an important role by facilitating investment, e.g. through public-private partnerships which stimulate development of nationwide high speed broadband networks. However, when the public pays for broadband investment they should expect to benefit from improved service and greater choice in the market place. One means to accomplish this is to ensure that networks built or augmented using any public funding are available via “open access” rules meaning network providers offer access or capacity to all market participants at cost-based, non-discriminatory terms.

Outside the OECD area, there is a risk that the economic crisis will slow the catch-up of developing countries in terms of access and use of ICT infrastructure, thus enhancing the digital divide.

The crisis also presents an opportunity to scale up investments in people

The crisis also presents an opportunity to raise investment in human capital. Support for education and training can accelerate the healthy transition to new jobs and emerging opportunities. It is also essential for innovation, which requires a broad set of skills. Building such skills starts in primary school and continues through firm-based training and lifelong education. Policy initiatives include:

- Investment in educational infrastructure, which can also support demand. For example, many countries face challenges regarding school buildings. Renovating the school infrastructure (*e.g.* in integrating ICT and building more ecologically-friendly schools) can also foster more innovative and effective learning environments.
- Reforming education and training policies. Some countries are using the crisis as an opportunity to reinvigorate reforms to higher education institutions or training policies, *e.g.* Spain and Portugal. Such reforms are needed in many countries in any case, but are also required to adapt to the emerging needs of a post-crisis society. The crisis will accelerate structural changes: new sectors will appear; old ones will fade away; new work organisations will be introduced; thus increasing the need for new skills. Training should therefore be encouraged notably in restructuring industries where the skill mix is more likely to change. As demonstrated in the OECD Innovation Strategy, entrepreneurial skills and attitudes, risk-taking behaviour, creativity, etc., will be crucial competencies in the economy of the future that need to be nurtured by more adaptive and innovative education and training systems.
- Enhance support for students from low-income households. For example, the Federal Reserve Board of the United States is supporting the issuance of asset-backed securities (ABS), collateralized by student loans. In Russia, the government has put policies in place, such as low interest rate student loans, an increase in state scholarships, a freeze of tuition fees and free student accommodation, to help enhance access to education.

The crisis can serve to prime the greening of the economy

The current economic crisis should be used to strengthen efforts to achieve low-carbon economic growth. Recent OECD analysis shows that ambitious policy action to address climate change makes economic sense, and that delaying action could be costly. Providing that governments send a clear policy signal now about their medium and long-term climate change objectives, OECD analysis suggests that the actual cost of climate policy measures could be quite low in the initial few years, while countries are still struggling to move out of the crisis, notably in enhancing energy efficiency.

The crisis offers an opportunity and an incentive to improve efficiency in the use of energy and materials, to move towards more sustainable manufacturing, and to develop new green businesses and industries. Dealing effectively with many environmental challenges will require investment in innovative energy-efficient buildings and transport systems, alternative energy supplies and “smart” electricity grids, pollution control, as well as investments in environmental infrastructures, such as sea walls to protect coastlines. Investing in the environment is thus an important element of many of the stimulus packages being put in place by governments in OECD and emerging economies. As with other elements of the stimulus packages, “green” investments should not be used as a cover for protectionist measures. Support programs, for example, should not be tied to the purchase of nationally-produced construction materials.

The crisis can also be a spur to much needed structural reform, where there is an opportunity for both economic and environmental gains. It provides an opportunity to reform or remove policies that may be expensive, inefficient and environmentally harmful. Examples of immediate win-win policies that governments can take advantage of include:

- Remove subsidies to fossil fuel-based energy production and consumption.
- Cut trade barriers to climate-friendly goods.
- Address market failures that prevent improvements in the energy-efficiency of buildings and transport systems.
- Reform policies that could achieve a given environmental objective more cost-effectively.

Such policy reforms will also improve the incentives for innovation, as they remove distortions in the market. At the same time, investors need a clear and credible price signal now to invest in a greener future. It is not a choice between better pricing *or* stimulation of technological innovation: Both are vital. OECD analysis clearly shows that better pricing will likely be one of the best triggers for the development and diffusion of greener technologies. New technologies, such as carbon capture and storage (CCS), will not be aggressively deployed in the coming decades without a clear carbon price. Even with such a price, however, the development and implementation cost of some technologies may be very high initially, and government investments in demonstration facilities may be needed.

Governments will also have to share the risk of new technologies with the private sector. A number of co-financing measures are already being employed by countries, including: R&D tax credits and public procurement policies to help stimulate private investment; public-private collaboration on R&D projects, including research clusters together with academic institutions; and selective targeted measures to support innovation in small and medium-sized enterprises (SMEs). Public R&D policies are particularly important now, when the private sector may have more difficulty making such investments. In the energy sector, public R&D has been falling since the early 1980s and greater public spending could potentially have a high return.

Looking ahead, the OECD Innovation Strategy will contribute to maximising the benefits of innovation

As policy makers work to stabilise financial markets and strengthen short-term demand, they can leverage the crisis to build the foundations for stronger long-term growth and a transition to a greener economy. Many of the stimulus packages being introduced in OECD countries include components to support innovation, entrepreneurship, infrastructure, human capital and green investments, to foster more efficient and sustainable economic growth.

Today's world is one in which both OECD countries and non-OECD economies increasingly rely on knowledge and services to drive their performance, where investment in intangible assets is of equal importance as investment in machinery, equipment and buildings. Efforts to stimulate the economy must therefore reflect the current drivers of economic growth, and take advantage of industrial renewal to accelerate the important structural shifts underway.

Governments will need to assess the longer-term impact of the crisis on innovation especially since many look to innovation-induced growth as a spark for re-igniting growth. In all likelihood, the crisis will accelerate changes already underway: the increasing internationalisation of investments in innovation; the growing role of non-OECD Member countries such as Brazil, China and India in the global geography of innovation; the increasing reliance on "open" innovation strategies that rely on partnerships and collaboration to share costs and spread risk; and the broadening of the range of

actors who are innovating, including users and consumers making use of the Internet as a collaborative platform. But the crisis could also have a detrimental impact as aversion to risk takes root, as reinforced nationalism puts limits on trade and migration and as tight economic conditions lead to an increase in cybercrime that could erode trust in the Internet.

Innovation policies should be adapted to current conditions, in terms of policy design for both short-term stimulus packages, as well as medium- and long-term initiatives. Policy instruments will have to be adapted to the more international and open character of innovation and to the central importance of non technological innovation. Equally important, innovation policies must form part of a coherent and well-designed government strategy that takes account of the interactions and complementarities between different policies and increases the overall efficiency of resource allocation. In the current context, it will be particularly important that policies in response to the crisis will continue to provide sufficient incentives for risk-taking, a key driver of innovation. The OECD will continue to work on these issues as the crisis evolves. The development of the OECD Innovation Strategy, which will be presented to Ministers in 2010, will be a key step forward beyond the crisis and towards sustainable growth.

Part 2

ASSESSING POLICY RESPONSES TO THE ECONOMIC CRISIS FROM AN INNOVATION AND LONG-TERM GROWTH PERSPECTIVE

Introduction

Governments in OECD and major non-OECD countries are currently launching economic stimulus packages to address the economic downturn. Most governments have expressed the concern that their economic stimulus package should not only be limited to raise aggregate demand in the short run but also help raise aggregate supply and restore favourable conditions for innovation and growth. As a result, the recovery packages include measures directed towards areas such as investment in modern infrastructure, research and development (R&D), support to innovation and to small and medium-sized enterprises (SMEs), education, and the greening of the economy. The goal is to secure competitiveness and a new foundation for growth while using the downturn as a chance to begin work on several long-term goals, such as improving energy efficiency.

The OECD has developed a strategic response to the crisis focusing on two priority areas: finance, competition and governance; and restoring long-term growth.¹ The economic crisis also increases the importance and the urgency of the work on the OECD Innovation Strategy.² As part of this line of work, the OECD is identifying the strategies adopted by member countries to foster innovation and long-term growth in above elements of their policy responses. This stocktaking was conducted through the implementation of an OECD policy questionnaire and several workshops. The OECD questionnaire to member countries investigated the recovery packages' broader objectives, their specific measures as they relate to long-term growth, and their design.³

This chapter sets out initial results of this stocktaking. The first section sets out the broad characteristics of the economic stimulus packages (*i.e.* their size and main features). The second section then discusses measures relating to innovation and long-term growth – the focus of this chapter. The third section discusses project selection, co-ordination, oversight and evaluation of these measures related to innovation and long-term growth.

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1. OECD Strategic Response to the Financial and Economic Crisis – Contributions to the global effort, January 2009, www.oecd.org/dataoecd/33/57/42061463.pdf and The Road to Recovery – Update on the OECD's Strategic Response to the Financial and Economic Crisis, March 2009, www.oecd.org/dataoecd/40/14/42528786.pdf.
 2. OECD Innovation Strategy Portal at www.oecd.org/innovation/strategy.
 3. As of early May 2009 – the cut-off date for this paper – 27 out of 30 OECD countries had replied to the OECD questionnaire: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Hungary, Iceland, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey and the United Kingdom. Also, the five OECD accession country candidates, Estonia, Chile, Israel, Russia and Slovenia and one candidate for enhanced engagement (South Africa) have answered the OECD policy questionnaire.

The objective of this chapter is to allow comparing OECD policy responses in specific areas and to provide a vehicle for exchanges on agreed measures, their effective design, implementation and impacts.

Broad characteristics of economic stimulus packages

Size of economic stimulus packages

Virtually all OECD countries have introduced discretionary measures in response to the crisis, though the crisis-driven stimulus packages represent only one among other effects on government revenue and spending (e.g. the operation of automatic stabilisers).

Based on a consistent approach to the definition of packages, the size of fiscal packages, introduced as a direct response to the crisis and measured by their cumulated impacts on fiscal balances over the period 2008-10, amounts to about 3½% of area-wide 2008 GDP.⁴ The crisis-related fiscal injection is typically expected to be strongest in 2009, although again with some variations between countries.

However, there is considerable variation in the size of packages across countries, partly reflecting the severity of the economic crisis, the fiscal position before the onset of the crisis and the size of automatic stabilisers (see Figure 5 and Table 1). As a share of GDP, the size of the economic stimulus packages ranges between 0.1% of GDP to over 5% of 2008 GDP. An unweighted average of countries introducing positive stimulus packages implies a typical stimulus package amounting to more than 2½% of GDP over the period 2008-10. But five countries (Australia, Canada, Korea, New Zealand and the United States) have introduced fiscal packages amounting to 4% of 2008 GDP or more, the US package - at about 5½% of 2008 GDP - being the largest. Countries with the largest absolute spending are the United States, Germany, Japan, Canada, Spain, Australia and Korea (in decreasing order) – see Table 1. A few countries (in particular Hungary, Iceland and Ireland) are expected to drastically tighten their fiscal stance.

Most countries have adopted broad-ranging stimulus programmes, adjusting various taxes and spending programmes simultaneously. A majority of countries have given priority to tax cuts over boosting spending (although Japan, France, Australia, Denmark and Mexico are clear exceptions). On the spending side, virtually all OECD countries have launched and/or brought forward public investment programmes. Australia, Poland, Canada and Mexico are projected to be the most pro-active in this domain, with an increase in public investment as a response to the crisis close to 1% of 2008 GDP or more (see Figure 6). Denmark, France and Japan also have a clear focus on public investment. Transfers to households have often been made more generous in particular for those on low incomes. A few countries (including the Czech Republic, Japan, Korea, Portugal, Mexico and the Slovak Republic) have also announced larger subsidies to the business sector.

Non-OECD countries are also carrying out significant economic stimulus packages, e.g. China (USD 585 billion, 19% of GDP), Brazil (USD 152 billion, 15% of GDP), Russia (USD 101 billion, 8% of GDP)⁵, Chile (USD 4 billion, 2.8% of GDP) although definite figures and exact spending details are hard to break out for most of these countries.

4. These data capture the impact of fiscal packages and may not reflect all the measures introduced to boost activity. In particular, recapitalisation operations and increases in public enterprises' investment are not included. For further details on how the stimulus packages have been identified, see the OECD *Interim Economic Outlook*, March 2009.

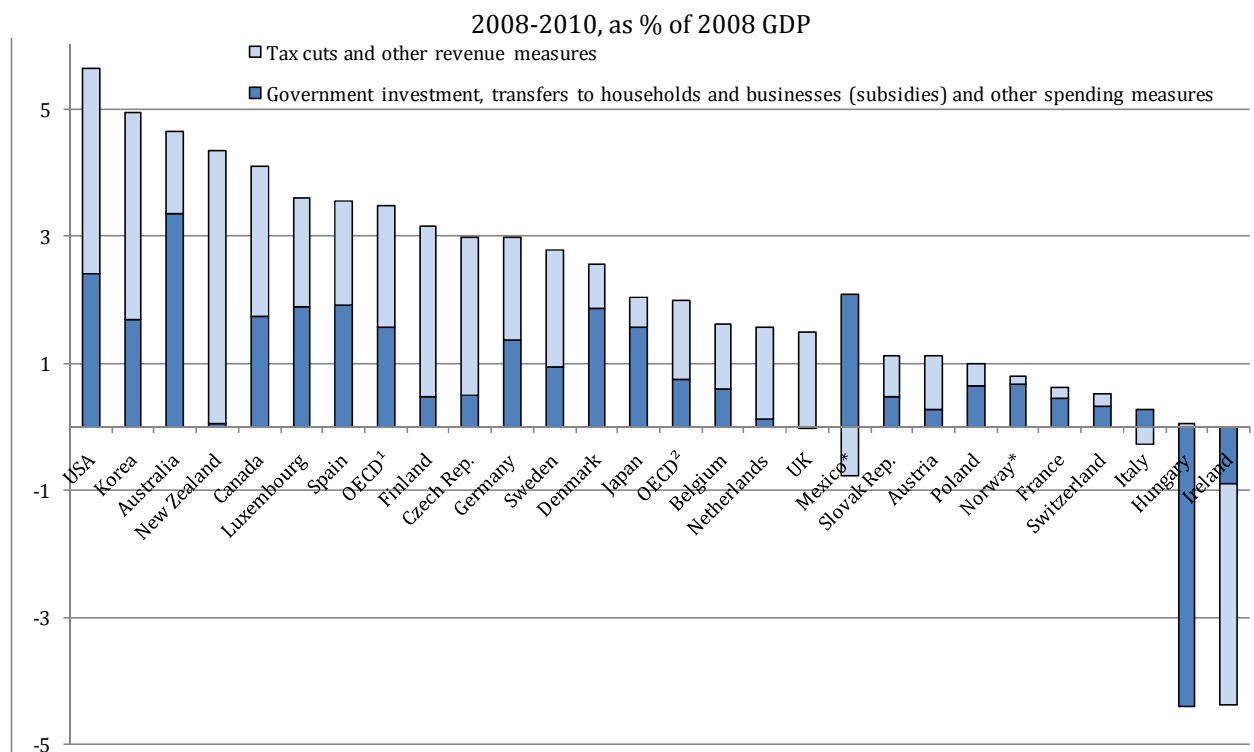
5. This figure is based on Russia's response to the OECD policy questionnaire.

Table 1. The absolute size of fiscal packages (revenue and spending measures)

2008-2010, in absolute USD millions

United States	804 070
Germany	107 789
Japan	99 992
Canada	61 551
Spain	56 754
Australia	45 673
Korea	42 667
United Kingdom	38 003
France	18 568
Netherlands	13 367
Sweden	13 109
Denmark	8 668
Finland	8 575
Belgium	8 016
Czech Republic	6 500
New Zealand	5 404
Poland	5 145
Austria	4 600
Switzerland	2 486
Luxembourg	1 968
Portugal	1 963
Slovak Republic	35

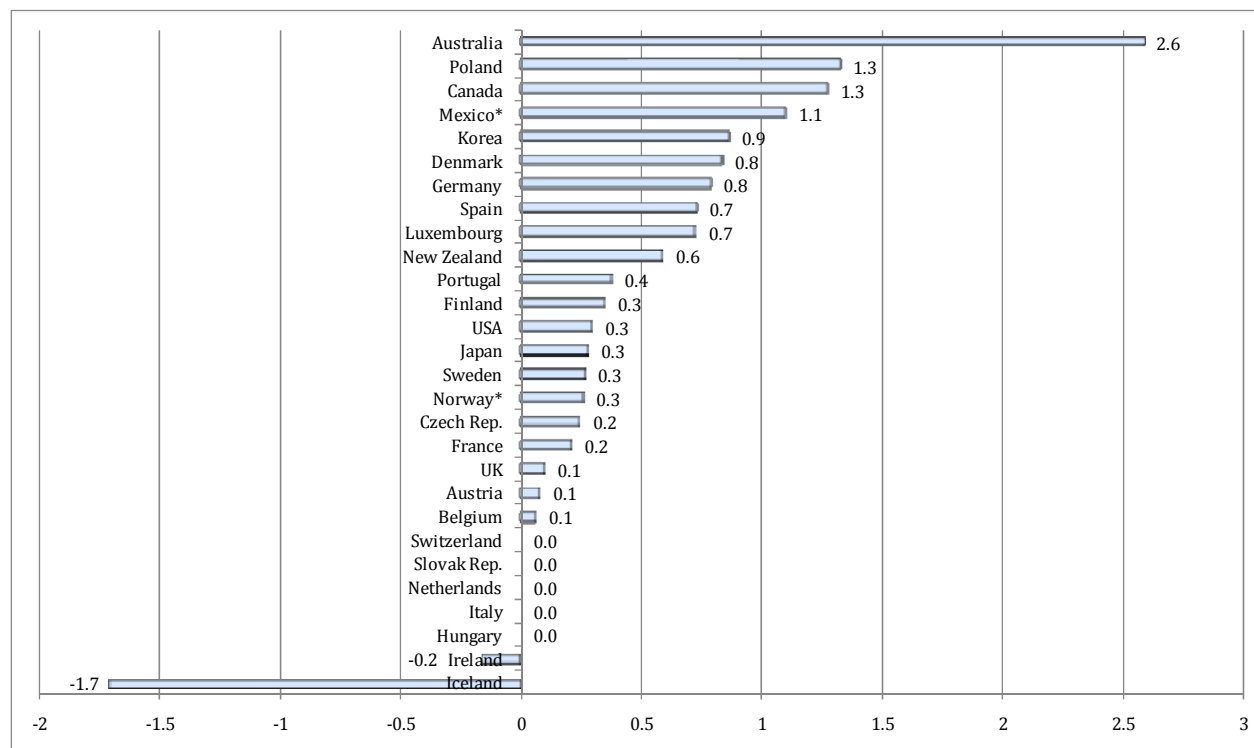
See notes and sources for Figure 5 and footnote 4.

Figure 5. The size of fiscal packages (revenue and spending measures)

1. Weighted average of the above countries excluding Greece, Iceland, Mexico, Norway, Portugal and Turkey. 2. Simple average of above countries except Greece, Iceland, Mexico, Norway, Portugal and Turkey. *No data available for 2010. *Note:* This information is based on information up until 24 March 2009. The figures include only discretionary fiscal measures in response to the financial crisis. Estimates provided here do not include the potential impact on fiscal balances of recapitalisation, guarantees or other financial operations. They also exclude the impact of a change in the timing of payment of tax liabilities and/or government procurement, a popular measure in several countries. When applying the accrual principle, such measures are not reflected as part of the stimulus packages. Still, they affect fiscal balances measures on a cash basis and may have an impact on the economy. See also footnote 4. In the case of Mexico and Norway no data are available for 2010.

Figure 6. Government investment in stimulus packages over the period 2008-2010

as % of 2008 GDP



Note: See notes and sources for Figure 5 and footnote 4. * For Mexico and Norway, no data are available for 2010.

A comparison of the absolute or relative size of these stimulus packages and their components is challenging for various reasons. First, most plans await political ratification and implementation and thus their details are still changing. Moreover initial plans are often followed up with additional measures (*e.g.* the case of Australia, Chile, Germany, the Netherlands, Slovenia, Switzerland, Japan or India who developed several packages).

Second, the exact financial details and how the priorities are weighted in budgetary terms are usually still uncertain. In some cases the plans propose new budgetary allocations (*i.e.* amounts which are supplementary to initial 2008, 2009 and 2010 budgets), whereas in many other cases they also propose to carry planned government spending forward (*i.e.* relabeling of planned expenditures).⁶ Also often the figures quantifying the size of the recovery packages are not for identical time periods (some covering 2009-2010 whereas others cover shorter or longer time horizons). Moreover, sometimes defining whether a discretionary measure has been adopted as a response to the crisis involves an element of judgment. In some cases governments have anticipated the crisis and factored in responses as part of the usual government budget (*i.e.* not within a stimulus package). In other cases, governments continue, intensify and accelerate previous competitiveness and innovation strategies, rather than implementing an explicit recovery package. Although potentially important and more time-consistent than crisis measures, these are not explicitly captured by an analysis of stimulus packages.

6. In OECD estimates, where possible, measures changing the timing of payments (*i.e.* bringing forward government payments) are not included. While it is difficult to quantify the effect of such measures on activity, they do have the merit that over a medium-term horizon their fiscal implications may be negligible while they may provide an important short-term stimulus.

Third, the size of these plans usually does not take into account automatic stabilisers which work as a tool to dampen fluctuations in real GDP without any explicit policy action by the government. OECD work shows that there is an inverse correlation between the size of discretionary fiscal packages announced/implemented among OECD countries and the strength of so-called automatic stabilisers (the latter are particularly weak in Korea, Japan, the United States, Switzerland and New Zealand). Fourth, these figures do not take into account legislative or regulatory changes which might have important impacts (*e.g.* changing rules and procedures to facilitate the acceleration of planned investments and public procurement, introduction of new innovative R&D tax credit mechanisms).

Nonetheless, this is an attempt to provide a comparative, quantitative and qualitative description and analysis of certain aspects of crisis-related stimulus packages of OECD countries.

Main features and broader objectives

Most economic stimulus packages aim to stimulate demand in the short term (injecting cash into the economy and protecting existing jobs). However, most governments also plan to foster medium- to long-term growth through investments which have repercussions on the supply side.

Tables 2 and 3 present the main objectives and measures of the currently announced or concluded crisis-related policy packages for OECD member countries, accession countries⁷ and enhanced engagement countries⁸ (excluding financial measures such as bank bail-outs and re-capitalisation operations).

Broadly speaking the nature of plans can be distinguished between: *i*) measures aimed at saving banks and the financial system – excluded from the scope of this document, where possible, *ii*) measures aimed at supporting businesses (tax cuts – including cuts in value-added tax rates, short-term credit guarantees, reduction of non-wage labour costs, stimuli for retaining or hiring staff), *iii*) measures aimed at particular industrial sectors (notably the automobile and the construction sectors), *iv*) measures to support household consumption and reduce their exposure to the crisis (including tax cuts, cash payouts to households, unemployment benefits, support to low earners such as pensioners, cuts in healthcare costs, home owners' grants), and finally, *v*) “Measures relating to innovation and long-term growth”, which are the focus of this paper. Certain measures also take the form of regulatory adjustments (*e.g.* non-financial measures to stimulate green technologies).

7. Chile, Estonia, Israel, Russia and Slovenia.

8. Brazil, India, Indonesia, China and South Africa.

Table 2. Main objectives and targets of OECD country budgetary stimulus packages, excluding measures aimed at the financial system (e.g. recapitalisation), May 2009

Country	Measures
Australia	Large infrastructure investments (road, rail, housing, and education infrastructure); tax measures; support to construction sector; financial support to pensions, workers, families, home owners and others; support to small enterprises (e.g. temporary business investment tax breaks); and training measures.
Austria	Infrastructure (thermal renovation of public buildings, schools); investment incentives through tax measures; support to SMEs (loan guarantees, direct loans, promoting export competitiveness, etc.); regional employment programme; additional R&D spending; and measures relating to day-care.
Belgium	Speeding up of public infrastructure projects and encouraging housing investment; measures to help firms (in particular small ones) to maintain their operations (alleviate financial burden of companies, facilitate payments); safeguarding purchasing power of households; and green technology and energy cost-cutting measures.
Canada	Investments in roads, bridges and public transport, investments in clean water as well as in knowledge and health infrastructure (including post-secondary institutions, research equipment, digitisation of health records, extension of access to broadband services and green energy infrastructure); investments in the renovation and retrofit of social housing and support for home ownership and the housing sector; personal and business tax relief; access to financing, support and training to citizens affected by the crisis; and support to most affected sectors and communities (e.g. targeted funding for the auto, forestry, agriculture, and manufacturing industries).
Czech Republic	Increase in public expenditure; lowering of taxes and social insurance contributions and direct assistance to households; and improving the functionality of the sickness insurance system. <i>A more comprehensive package is currently being debated.</i>
Denmark	Current measures mostly focused on bank aid and financial measures (beyond the scope of this analysis).
European Union	Infrastructure projects (trans-European transport projects, high-speed Internet); employment support initiative (including for the low-skilled, apprenticeships, training, reduction of social charges, etc.); investment in R&D, innovation and education; access to financing for business; reduction of administrative burdens and promotion of entrepreneurship; increase of climate change and energy security investments; improvement of the energy efficiency in buildings; and promotion of "green products" and the development of clean technologies for cars and construction.
Finland	Measures aimed at the infrastructure (transport construction and broadband); energy and mining sectors; education, research, and training; and others as part of the Finnish Innovation strategy.
France	Mainly investment in public enterprises (post, energy and railways), defense, investments in strategic areas (sustainable development and clean technologies, higher education and research and the digital economy); investment for regional and local authorities (in partnership investment in hospitals, childcare facilities and other social institutions); support to employment, housing, the financing of firms (in particular SMEs), health, and some measures for the environment. Special measures targeted at the automobile sector.
Germany	Infrastructure (particularly schools and universities, also measures to foster broadband); measures to help businesses and households retain employment and overcome the crisis (secure funding, government guarantees, reduction of non-wage labour costs, income tax cut and other means to ease burden on households – e.g. payments for children); training and upgrading grants (raising levels of education); fostering innovation and R&D; green technologies. Special measures targeted at the automobile sector.
Hungary	Accelerating construction projects of national importance; simplifying the application system of the National Development Plan; simplifying construction regulation, financial measures to ease financing of (small) firms (including microfinance, venture capital and interest subsidies); easing the administrative burden of firms; and R&D and Innovation support.
Iceland	Despite heavy impact of crisis, the full operation of automatic stabilizers is guaranteed; measures for unemployed and benefits to the self-employed; improving the financial capacity of households, mortgage payment adjustment for homeowners; payment adjustments for businesses (e.g. postponing the payment of VAT); and measures to stimulate employment, including through the acceleration of labour-intensive transportation investment projects.
Italy	Stimulating investments on infrastructures and research (including broadband); supporting low-income households (tax cuts for poorer families and pensioners); reducing the tax burden for SMEs; focus on greening the automobile sector and support to methane systems and the purchase of ecological cars.
Japan	Support for household consumption; tax reductions on mortgages; benefits for dependent persons; cutting of healthcare costs; creation of new public-sector jobs in nursing, retirement homes and childcare, and jobs relating to the protection of the environment; raising the self-sufficiency ratio of food; funds on a priority basis to research in advanced technologies and related research; and reduction of taxes for eco-friendly cars.
Korea	Focus on sustaining green technology and value-added services to build new engines of growth (including sustainable energy, technologies to reduce greenhouse gas emissions, information technologies as well as healthcare and tourism).

Table 2. Main objectives and targets of OECD country budgetary stimulus packages, excluding measures aimed at the financial system (e.g. recapitalisation), May 2009 (continued)

Luxembourg	Support of purchasing power through targeted measures; support of business activity through tax measures and financial support; of business activity through public investments; direct support of enterprises in difficulty; creation of an administrative environment conducive to economic activity; support tackling the effects of the crisis on employment; and measures to prepare growth after the crisis.
Mexico	Transport infrastructure programme; Temporary Employment Programme and the Programme to Preserve Employment; protection of family incomes (extending the social health care coverage, freeze on energy prices, and supporting households to change old home appliances to energy-saving equipment); supporting SMEs by reducing electricity prices, increasing credit availability and using government procurement targeted at SMEs.
Netherlands	Measures focused on problems in the housing market; export credit insurance; help for medium-sized companies; and measures aimed at the health care sector. Additional package of measures aimed at sustainability, innovation, education, the labour market, infrastructure and construction.
Norway	Tax relief and measures for employment, welfare and the environment. Emphasis on municipalities (schools, nursing homes, churches); construction (in particular transport and buildings with energy efficiency in mind); employment, readjustment and skills; business R&D (direct grants and grants for PhD-students) and ICTs (infrastructure, digitising of government services, electronic signature, etc.). Also, focus on green measures.
Poland	Facilitating investment financed from EU funds; stimulating investment in telecommunication infrastructure; financing for enterprises, especially SMEs (including credit guarantees, micro-finance); support to R&D; and focus on renewable energy.
Portugal	Public investment in education (modernisation of schools); energy (especially transmission infrastructures and renewable energy) and new-generation technologies (broadband networks); promotion of economic activity and employment (creation of fund for industrial restructuring, financing facilities to SME and exporting enterprises; new corporate tax benefits; reductions of social contributions in special cases; education/training programmes); strengthening of social protection; investments in R&D; and support to the automotive sector.
Slovak Republic	Infrastructure (roads, high-speed broadband, new atomic reactors); transfer of financial sources from basic research to applied research and innovation; reallocation of funds to SMEs and venture capital; and increase energy efficiency.
Spain	Tax cuts; spending on public works and other stimulus measures to raise employment rates; liquidity to credit-strapped companies (especially SMEs) and households (families, in particular); special help to the automobile sector and modernising of basic industries such as transportation, energy, services and telecommunications; and modernisation of the public civil service.
Switzerland	Railway and road infrastructure; energy efficiency of buildings; tourism industry; and export promotion.
Turkey	Tax cuts (on income, businesses and consumption); other revenue and fiscal measures; credit facilities and guarantee schemes for SMEs; contributions for public pensions; measures to reduce unemployment; support to health care; and measures targeted at increasing economic competitiveness (details to be confirmed).
United Kingdom	Cut in value-added tax rate; acceleration of capital investment projects (likely to include some research infrastructure) and for accelerated roll-out of broadband; credit line and loan guarantees (in particular for SMEs); and measures to combat unemployment (e.g. paying companies to hire and train the unemployed).
United States	Direct relief to working and middle-class families (tax credit, expansion of unemployment insurance, state fiscal reliefs, etc.); large infrastructure investments (roads, public transit, high speed rail, smart electricity grid and broadband); protecting health care coverage of citizens and modernising the health sector (including its computerisation and digital health records); increased funding for key scientific and engineering agencies; modernisation of classrooms; laboratories and libraries; and fostering renewable energy production and investments.

Note: These tables exclude financial or other measures aimed at the liquidity of the financial system / the banking sector.

Source: OECD, based on publicly available stimulus plans, announcements and replies to the OECD questionnaire (cut-off date end of April 2009).

Table 3. Main objectives and targets of non-OECD country budgetary stimulus packages

Country	Measures
OECD accession countries	
Estonia	Infrastructure (water management, transport, municipal infrastructure, etc.); vocational education and health service infrastructure; support to firms (loan and export guarantees, technology and development incentives, etc.); support to the construction sector; entrepreneurship measures; occupational training and active labour market measures; and energy-saving measures for housing.
Israel	Tax reductions; infrastructure investments (desalination plants, railways); credit lines for business (especially SMEs) and export credits; funds to hire workers and retraining; and support to R&D.
Chile	Early tax returns; Construction of new public infrastructure and investment by public companies; financial resources to SMEs and the economy through fiscal guarantee schemes; subsidies to housing market; and employment protection (including subsidies to hire younger workers).
Russia	Tax cuts; enhancement of social welfare; provision of healthcare and social guarantees; state support for employment; maintenance and development of industrial and technological potential; retraining and employment; measures for SMEs; reduction of administrative burdens on businesses; measures to support R&D; and measures supporting energy efficiency.
Slovenia	Measures aimed to infrastructure, energy and environment; support to enterprises (<i>i.e.</i> assuring financial liquidity and safeguarding existing jobs, helping company investments, etc.); measures to improve labour market, life-long learning and social security; and increasing expenditure in research and education.
OECD enhanced engagement countries	
Brazil	Housing for poor families; credits for firms; and support to the automobile sector.
Indonesia	Infrastructure (mainly roads); education spending; and support to affected industries
India	Value-added tax cut; infrastructure investments (mostly in rural areas); support to social security schemes and housing; measures to help businesses (in particular labour-intensive export sectors, <i>e.g.</i> textiles/handicrafts.
China	Low-income housing; rural infrastructure; water; electricity; transportation; the environment; technological innovation and rebuilding after disasters such as earthquakes. Support package to auto and steel industries.
South Africa	Public investment in economic infrastructure; support to low-income workers, the unemployed and vulnerable groups; employment and skills development; effective industrial or sector strategies, higher levels of private sector investment and entrepreneurship; pursue the transformation of the informal economy activities; and improve and streamline government delivery and regulation.

Note: These tables exclude financial or other measures aimed at the liquidity of the financial system / the banking sector.

Source: OECD based on publicly available stimulus plans, announcements and replies to the OECD questionnaire in the case of accession countries (cut-off date end of April 2009). Information for the OECD enhanced engagement countries is provisional and not based on replies to the OECD questionnaire.

When it comes to “Measures relating to innovation and long term growth”, OECD and non-OECD economies focus on the following themes in existing economic stimulus packages:

- Improving the infrastructure (*e.g.* roads, mass transit, information and communication technologies [ICT]).
- Support for science, research and development (R&D) and innovation.
- Investment in human capital, education/training (including schools, teachers).
- Promoting the investment in and uptake of green technologies and innovations to foster energy-efficiency and sustainable economic growth.
- Support for innovation and entrepreneurship (including support for innovation and investment in small and medium-sized enterprises [SMEs], venture capital, etc.).

Most countries announce that they are implementing the above measures in order to emerge stronger from the crisis through sustainable investments in infrastructure, research and other means to secure competitiveness and a new foundation for growth in the future.

Measures relating to innovation and long-term growth

The second part of this paper discusses the planned measures relating to innovation and long-term growth in more detail while providing country examples.

In terms of financial weight, infrastructure investments, education and sometimes green technologies are the first and second most important of these spending items in stimulus packages (Table 4). Yet, in many cases the above components of economic stimulus packages are related: *e.g.* additional financial measures in favour of infrastructure overlap with spending on R&D (new laboratories) and spending on the education category (new schools). Similarly, investments in green technology contain some spending for more energy-efficient housing (*i.e.* infrastructure) or R&D (fostering research in renewable energy). Some more medium-term impacts also exist, *e.g.* scientific research results fostered by increased R&D budget might later prove useful for the development of “smarter” infrastructures (*e.g.* intelligent transport systems) or greener technologies.

Table 4. Financial weights of selected, long-term policies in OECD country stimulus packages, May 2009

	Infrastructure	Science, R&D and innovation	Education	Green technology
Australia	AUD 9.7 billion	AUD 2.9 billion	AUD 15.7-17 billion	AUD 5.7 billion
% of GDP	0.82%	0.25%	up to 1.4%	0.48%
Canada	CAD 20.3 billion	CAD 800 million	1.9 billion	CAD 2.8 billion
% of GDP	1.27%	0.05%	0.12%	0.18%
Chile	USD 700 million	USD 8.8 million	USD 147 million	USD 0
% of GDP	0.50%	0.01%	0.10%	0%
Finland	EUR 910 million	EUR 25 million ¹	EUR 30 million	EUR 38 million
% of GDP	0.48%	0.01%	0.02%	0.02%
France	EUR 4.7 billion	EUR 46 million ²	EUR 731 million	EUR 30 million
% of GDP	0.24%	0.00%	0.04%	0.00%
Germany³	EUR 11.5 billion ⁴	EUR 1.4 billion	EUR 14.5 billion ⁵	EUR 5.7 billion
% of GDP	0.5%	0.1%	0.6%	0.2%
Korea	KRW 50 trillion (USD 36 billion) of green investments (5.14% of GDP) – distributed throughout these categories although a detailed break-down is not yet available.			
Norway	NOK 3.8 billion	NOK 170 million ²	NOK 270 million	NOK 1.6 billion
% of GDP	0.16%	0.01%	0.01%	0.06%
Sweden	SEK 8.6 billion	SEK 9 billion	SEK 500 million	SEK 2 billion
% of GDP	0.27%	0.29%	0.016%	0.06%
Poland	PLN 91,3 billion	PLN 16,8 billion	n.a.	PLN 2.5 billion
% of GDP	0.072%	0.013%	n.a.	0.002%
Portugal	EUR 50 million	EUR 224 million	EUR 682 million ⁶	EUR 260 million
% of GDP	0.03%	0,13%	0.41%	0.16%
USA	USD 100 billion	USD 16 billion	USD 83 bill	USD 59 billion
% of GDP	0.70%	0.11%	0.58%	0.41%

Note: Based on 2008 GDP. Figures are only indicative as applying identical, clear-cut definitions to these categories and making them comparable across countries is very difficult. For instance, a certain degree of double-counting may still occur between spending on items such as infrastructure and education (*e.g.* building schools) as measures could fit in multiple categories.

1. Finland has high public R&D support outside of its stimulus package and has pledged to maintain it.
2. The R&D figures for France, Norway and Portugal do not include carrying forward their R&D tax credit payments.
3. In Germany, some expenditures remain to be determined on the sub-federal level.
4. This figure contains EUR 0.3 billion additional funding for a programme for modernising insulation of buildings and roughly EUR 0.8 billion for energy-use modernisation of federal buildings.
5. This figure contains EUR 8.6 billion of investments in energy efficient school and other education-related buildings.
6. In the case of Portugal EUR 500 million for the modernisation of schools is only included in “Education”.

Source: OECD estimates based on publicly available data, replies to the OECD questionnaire and consultations with member countries.

The policies discussed below are only part of the government responses to the economic crisis and only a broader analysis can yield an understanding of all public measures and their impacts.

Investing in infrastructure

Most OECD and non-OECD economic stimulus packages contain a focus on improving the national infrastructure – mostly through public works – see Tables 2 and 3. The targeted infrastructure investments are mostly concerned with roads, railroads (including freight networks), public transport, airports, childcare facilities, schools and universities, hospitals, energy networks and security, and a modern ICT infrastructure (see Box 2).

In its Nation Building Package, Australia, for instance, plans development work on projects in housing, health and hospitals, and transport (with a focus on rail networks) and communications (approximately AUD 10 billion worth of infrastructure investment, excluding plans relating to next-generation networks). New Zealand has factored in spending USD 100 million on roads and USD 87 million on housing, with a focus on initiating about USD 70 million-worth of fast-tracked projects before July 2009. Japan has offered a subsidy to municipalities of JPY 4 billion to repair and quakeproof public facilities. In the context of its plan to improve the environment for rivers, Korea plans to establish a green transport network, a green information infrastructure and to secure alternative water sources and build eco-friendly mid-sized dams.

Canada has assigned CAD 6.4 billion to renew infrastructure in partnership with provinces and municipalities and CAD 515 million to accelerate projects such as construction of schools, water and waste-water projects and critical community services infrastructure. The United States will be devoting a total of USD 100 billion to infrastructure (in addition to research infrastructure): over USD 17 billion in public transit and high-speed rail, USD 40 billion for roads, bridges, dams, water, and USD 7 billion to expand broadband access. Mexico plans to rebuild the nation's highways, bridges and other public-use facilities (USD 42 billion). Chile's special infrastructure plan worth USD 700 million (10% increase on the 2009 budget) is focused on an extensive housing investment plan, road construction and maintenance, and investments in different areas such as health-related initiatives, schools and stadiums, among others.

The EU has proposed to modernise its infrastructure with a focus on trans-European energy interconnections and broadband projects, mostly through the frontloading of existing budgets. Germany announced EUR 18 billion for infrastructure, mostly educational infrastructure (childcare facilities, schools, and universities), hospitals, transport and ICTs. The Netherlands has announced EUR 1.2 billion in infrastructure and construction investments (*e.g.* health care buildings, schools, bridges, ports). Building on its crisis-related EUR 4.7 billion infrastructure spending, Spain plans to invigorate merchandise transport by high-speed railway and to improve the road infrastructures. Italy is to fund railway investments (EUR 960 million), and the quality of the public transport service (about EUR 1.5 billion over the three-year period 2009-2011). The Slovak Republic is building highways, new energy infrastructure and speeding up broadband Internet access whereas the Czech Republic is spending CZK 14.4 billion on infrastructure and Estonia EUR 670 million. South Africa is committed to maintaining the planned high levels of investment in public sector infrastructure (mainly transport, energy, water and sanitation infrastructure, housing construction, ICT infrastructure, as well as education and health infrastructure).

Most of these infrastructure investments have the express aim to add to resource-preservation and sustainability. For instance, the construction of more energy-efficient buildings is privileged, along with retro-fitting and updating of public buildings and schools. A few countries have announced investment in thermal renovation of public buildings and households (*e.g.* Australia's plan to insulate 2.7 million homes). In many plans, the construction of roads and public transport is expected to lead to reduced traffic congestion and gas consumption.

Non-regulatory measures in the field of infrastructure are also heavily concerned with the streamlining of the approval process of (large) infrastructure projects.

Box 2. "Networked recovery": Investing in ICT infrastructure and applications

Many of the existing stimulus packages put some emphasis on deploying ICT infrastructure and a 'networked recovery' – i.e. the notion that ICT infrastructure and its use are a tool to revive the economy through new innovative services and offer solutions to pressing social challenges.

Existing references to communications infrastructure in stimulus plans cover two key areas: extending broadband to areas without connectivity and upgrading existing networks to support very high-speed communications. The focus of many plans is on closing the broadband gap by providing universal broadband coverage throughout the country, but mostly in rural and remote areas. Some plans also devote resources to building out new, very high-speed networks (next-generation networks). In most cases, the exact meaning of 'broadband' and 'unserved' or 'underserved' is mostly not yet defined in terms of geography, speeds or technology. In all cases, the deployment of broadband is to ensure connectivity of most if not all businesses and households. The table below illustrates these initiatives, including details on the planned financial investment and policy goals. Other OECD countries have developed new broadband plans in parallel to the development of their stimulus packages (e.g. France, Hungary, Japan, Ireland, Korea, and Spain). Other OECD work deals with key considerations to take into account when public funding is used to support broadband.⁹

	Planned investment	Goals	Penetration targets	Speed targets
Australia	AUD 40 billion (USD 33.4 billion)	Fibre all the way to the premises	90% of Australians	100 MB/s
Canada	CAD 225 million (USD 211 million)	Extending broadband coverage to un-served rural and remote communities	n.a.	n.a.
Finland	EUR 66 million of EUR 200 million (public-private)	Extending high-speed broadband	Every household by 2016	At least 1 MB/s by 2010, 100 MB/s by 2016
France	n.a.	Development of broadband network in small or medium-sized cities, extending (fixed / mobile) broadband. Internet on TGV Est lines (EUR 15 million), and development or networks for education and research	Access to broadband by 2010 and mobile broadband by 2012 for everyone	n.a.
EU	EUR 1 billion (USD 1.46 billion)	Extending and upgrading high-speed Internet (focus on rural communities)	100% coverage of high speed internet by 2010.	n.a.
Germany	estimated EUR 150 million (USD 219 million)	Accelerating the spread of broadband networks. By 2010 all unserved areas connected. nationwide capable broadband access by no later than the end of 2010	By 2014, ¾ of households should have access to high-speed Internet (all by 2018).	Target is 50 MB/s
Japan	JPY 3 trillion (USD 29 billion)	Intelligent transport systems, improving IT infrastructure in the medical sector (new fibre-optic network), training of IT personnel, the promotion of e-government, and the creation of new industries such as environment-related IT.	n.a.	n.a.
Luxembourg	EUR 195 million (USD 285 million)	Accelerating the build-out of Luxconnect information highway, including through boosting public telecommunications works	n.a.	n.a.
Portugal	EUR 50 million – fiscal incentives ¹ (USD 73 million)	Subsidised investments in new generation broadband networks	Optic fibre that will allow 1,5 million users to connect	n.a.
Slovenia	over EUR 15 million	Extending broadband to households and public institutions	Connecting households and public institutions	At least 1 MB/s by end of 2010
Spain	n.a.	Measures for overseeing the installation of new generation fibre and regulating broadband	n.a.	Up to 30 MB/s throughout Spain, "at cost-oriented prices"
United Kingdom²	to be announced	Universal service commitment for broadband	Virtually every community	2 MB/s per second by 2012
United States	USD 7.2 billion (EUR 4.9 billion)	To foster broadband service to unserved / underserved areas, promote broadband in schools, libraries, health-care providers, and other entities.	n.a.	Not set minimum data speeds

1. In parallel to its stimulus package, Portugal is planning to increase broadband Internet and local area network access in schools (EUR 61 million).

2. The UK also pursues the 'Digital Region' project, a GBP 100 million (USD 145.7 million) project to roll out next-generation broadband to South Yorkshire.

.../...

9. OECD Council Recommendation on Broadband Development (2004), OECD (2008), *Broadband Growth and Policies in OECD Countries*, OECD, Paris, and OECD (2009), *The role of communication infrastructure investment in the economic recovery*, OECD, Paris.

Box 2. "Networked recovery": Investing in ICT infrastructure and applications (*cont'd*)

Besides direct investment in broadband, stimulus packages often have a more indirect but larger impact on ICT deployment and use, for example investment in education, "intelligent" transport systems, greening the economy, smart buildings and grids, health, the environment, and modernising public services. Investments flowing into these areas can often be much bigger in monetary terms than those for broadband alone (*e.g.* in the US, USD 19 billion for healthcare ICTs and USD 100 billion for modern infrastructure, compared with USD 7 billion for broadband). The fostering of ICT infrastructure and services in, for example, healthcare or underpinning research networks will also provide the technological basis and platform for further ICT-based innovation in other fields as there are, *e.g.* natural synergies between broadband deployment and making other investments work, *e.g.* smart electrical grids and transport systems.

In this context, the United States plans to use technology improvements for a more efficient and secure government and to reduce healthcare costs (*e.g.* digitisation of health records of every American over the next five years, and USD 19 billion to accelerate health IT). Canada plans to invest CAD 500 million to support the use of electronic health records with the goal of 50% of Canadians having an electronic health record by 2010. Spain is reinvigorating plans to provide educational and research institutions with the appropriate ICT infrastructure. Norway is promoting digital government services, video-conferencing in the court system, the introduction of a common electronic signature, and the introduction of electronic prescriptions in the health system (NOK 100 million). France plans to invest in the modernisation of the state-owned French railway operator's IT system (about EUR 100 million), in the modernisation of research networks for higher education, in e-government, in participative web and online computer and video game technologies. Slovenia is fostering broadband connections for public administrations, research networks and electronic health information systems. Turkey is planning tax cuts for cable, wireless and mobile Internet services to foster demand. Japan is drawing up a three-year IT strategy that calls for increasing total public- and private-sector investment by JPY 3 trillion, notably by intelligent transport systems, a fibre-optic network for the medical sector, training of IT personnel, the promotion of e-government, and the creation of new industries such as environment-related IT. As part of their stimulus packages, the United States, Korea and Japan are also using regulatory measures to foster the transition to digital broadcasting.

Investing in science, R&D and innovation

Investments in R&D and innovation are a priority in economic stimulus packages. In principle, through these measures governments formulate and adhere to R&D spending targets (including increases in R&D funding, or measures for specific research areas, and investments in R&D infrastructure), stimulate private R&D investments (including through R&D tax credits, public procurement), implement measures for SMEs, and policies with a particular concern for R&D employment and skills and innovation (*e.g.* avoiding unemployment of young researchers and loss of skills).

In a few cases, the plans also include non-regulatory measures to spur certain innovations, *e.g.* regulations spurring or directing research in life sciences (*e.g.* on issues such as stem cell research) or directing green technology research areas (*e.g.* standards on renewable energy, etc.). Institutional issues such as public-private collaboration and knowledge transfer, and international co-ordination are part of very few stimulus plans but still appear only marginally, *e.g.* in the area of life sciences or green technologies. An example is the launch in 2009 of the EU's public-private partnerships for a total of EUR 3.2 billion of research on European green cars, energy-efficient buildings and factories of the future, all of which will address green technologies.

Looking at the R&D and innovation components in greater detail, the EU has urged its member states to increase planned investments in education and R&D (consistent with national R&D targets) and consider ways to increase private sector R&D investments, for example, by providing fiscal incentives, grants and/or subsidies. Priorities of the Lisbon Agenda are again of increased relevance (large research infrastructures, knowledge transfer schemes, joint R&D programmes, mobility of researchers and international co-operation). The EU also urged to reduce by up to 75% the fees for patent applications and maintenance. Finland has announced that it will keep to its target of extending R&D expenditures to up to 4% of GDP; Norway has allocated more than NOK 1.8 billion in

direct grants for R&D and innovation, and Sweden has allocated additional funding of SEK 5 billion for university R&D and SEK 3 billion for public R&D institutions. Norway, France and Portugal are providing incentives through R&D tax credits (see Box 3) as is Belgium.

Germany has pledged EUR 900 million for R&D in small and medium-sized enterprises in 2009 and 2010 and EUR 500 million are intended to foster the development of hybrid and other clean car technologies. Besides measures relating to its R&D tax credits, France is planning to foster nano-technology research with EUR 70 million and to support ICT research networks for higher education. Luxembourg is increasing its R&D support by EUR 30 million in 2009. Spain's target is also strengthening the public investment in R&D (*e.g.* through tax credits, promoting investment in R&D in association with public procurement) but the measures also have an emphasis on human resources and their advanced training, a focus on improving the transfer of research results (in particular with the business sector) and a focus on spurring institutional developments, *e.g.* establishing R&D consortia among scientific institutions, including the launch of new laboratories and international co-operation.

Box 3. R&D Tax incentives to provide immediate tax relief

OECD countries use various schemes that provide tax incentives for R&D expenditure in firms. The most common scheme is the tax credits for R&D expenditure which provides a tax credit for part of the R&D expenditure in the current year. In the context of the current stimulus plans, there has been growing interest in converting tax credits for R&D into immediate tax relief so as to help companies improve their cash flow. In France, the government – which recently made its tax credit (*Crédit d'impôt recherche*) volume-based only – has agreed to temporarily modify the statutes of the tax credit in order to provide temporary tax relief. As part of the Stimulus package Article 95 of Finance Law 2008-1443, provides for the temporary and immediate payment in 2009 of government R&D tax credit liabilities to companies for R&D expenditures carried out between 2005 and 2008.

In Norway, the ceiling of the R&D tax credit scheme has been raised from NOK 4 million to NOK 5.5 million for intramural R&D (and similarly for extramural R&D, resulting in a total ceiling of NOK 11 million). Norway has also raised the annual ceiling for allowable R&D expenses by 25%, so that firms may qualify for a higher tax credit. In Portugal, on 29 January 2009, the Parliament approved a new scheme of fiscal incentives to R&D, extending the maximum rate of tax credit to 82.5% of total expenses on R&D: the highest rate in Europe. The system comprises two distinct components, cumulative in nature, with a fixed tax credit of 32.5% of total yearly expenses on R&D (also the highest in Europe), together with a second component of 50% over the annual increase of those expenses. Italy proposes the extension of tax credit to research carried out in Italy commissioned by a foreign entity as of 2009.

Estonia is pledging to maintain its priority on R&D spending with overall public R&D spending year-on-year growth by 44% in 2009 and by 25% in 2010. Slovenia will make EUR 35 million available for the investment in new technologies, will subsidise R&D activities in companies and will support acquisitions of new research equipment by universities and institutes (while also asking them to patent and license more and to better interact with the private sector). Turkey plans to develop new support systems for R&D facilities of innovative SMEs and to support their technology development (KOSGEB). Russia will maintain spending for technological federal target programmes (space, civil aviation, global navigation systems) with long-term schedules (some up to 2015) and allocations have been reduced minimally to other federal target programmes (nuclear power, electronic, civil marine equipment). A law will be passed authorising educational and research institutions to establish small companies, thus promoting postgraduate employment and stimulating R&D investment.

Some measures in Europe are focused on R&D employment. Hungary is focusing on maintaining R&D employment, to prevent brain-drain and interim unemployment of skilled R&D personnel (including support for re-employment by innovative SMEs) at a cost of about EUR 6 million. Italy is introducing income tax incentives to scientific researchers residing abroad who return to Italy, consisting of a flat income tax rate of 10% for researchers and the exclusion of their income from certain regional taxes.

Japan has pledged to allocate funds to research involving advanced and innovative technologies such as regenerative cells. A complementary regulatory reform contributing to business creation in the life sciences sector is part of this plan. In addition Japan has pledged to maintain its existing public R&D support. Korea has formulated 17 new growth engines and support to associated research: six projects in green technology industries;¹⁰ six in state-of-the-art fusion industries, such as IT fusion systems, robot applications, and biomedicines; and five in high valued-added services industries, including healthcare, education services and the tourism industry. It also announced a 'Green New Deal' (see section on green technologies) which will bring government investment in green technology R&D to a total of KRW 6.3 trillion (USD 4.7 billion) in the next four years – with a focus on fundamental research. It also entails promoting R&D in green cars, developing technology for energy-efficient buildings and renewable energy.

Canada is planning to update its research infrastructure and to invest in science and technology, as well as develop highly-skilled people. Its 2009 budget will provide more than CAD 1.5 billion towards science and technology initiatives (support of equipment and facilities, significant increases in funding of industrial research assistance programmes devoted to SMEs, funding for space and Arctic research facilities and resources for the Institute on Quantum Computing). The United States is planning to increase employment of scientists and making R&D investments. Significant stimulus packages are announced with an increase in funding for key science agencies such as the National Science Foundation (USD 3 billion, including for basic research to meet environmental challenges), the Department of Energy's Office of Science (USD 1.6 billion, including for research on the energy future), NASA (USD 1 billion, including for work on climate change), the Advanced Research Project Agency-Energy to support high-risk, high payoff research (USD 400 million), the National Institutes of Health (USD 10 billion, including on biomedical research).

Investing in human capital, education, employment and training

Support for education and training that enables the transition to new jobs and emerging opportunities is also recognised as important in existing stimulus plans. Some countries even choose to put this at the heart of their recovery plans (*e.g.* the United Kingdom, Germany). Next to investments in childcare facilities, schools, and university infrastructures (see section on Investing in Infrastructure), countries are mostly focusing on encouraging firms to retain their staff, to recruit new employees and to foster skills. Such measures frequently focus on helping SMEs or fostering entrepreneurship.

Education: Improving education facilities for the 21st Century is key in many recovery plans. Amongst others, Australia, Austria, Canada, Germany and Norway propose to renovate and build new schools and universities (*e.g.* Austria about EUR 200 million, Germany about EUR 8.7 billion, Norway about NOK 470 million and Canada about CAD 2 billion for 2009 and 2010). Italy plans to foster digital innovation in schools. Spain is creating new school places for children under three years old.

10. Including new renewable energies, low-carbon energies, LED (light-emitting diode) applications, and green transportation systems.

Australia will spend AUD 14.7 billion long-term investments to improve infrastructure in its primary and secondary schools. New Zealand is spending NZD 216.7 million (USD 123 million) on new schools, school refurbishments and educational ICT infrastructure. The United States stimulus package proposes new funding for local school districts (also to avoid layoffs and education cuts), a new School Modernisation and Repair Programme, an Education Technology programme, to foster childcare, to improve higher education (student aid, improving teacher quality), providing new higher education tax cuts while improving college affordability for certain students and increasing the number of fellowships for science. Korea is expanding government support to attract foreign students, to support the use of digital textbooks and e-learning, establishing Korean language courses overseas and promoting green schools with energy efficient equipment and green areas. Hungary has launched new training programmes for teachers with a resource frame of EUR 70 million.

Some European countries take the crisis as a starting point for reinvigorating plans to reform their higher education institutions, *e.g.* Spain with its University Strategy 2015 and Portugal.

In Russia investment in human capital and education and the employment of school, university and college graduates will be a priority. The government is drafting policies to help students (*e.g.* by low interest rate student loans and state scholarships, a potential freeze of tuition fees in certain cases, free student accommodation). Some students will be transferred into government-paid programmes during the current academic year.

Training and employment: The EU is proposing a European employment support initiative, with a reinforcement of schemes for the low-skilled, counselling, intensive (re-)training and up-skilling of workers, apprenticeships, subsidised employment as well as grants for self-employment, and business start-ups. It also proposes to create demand for labour by reducing employers' social charges on lower incomes and innovative solutions (*e.g.* service cheques for household and child care, temporary hiring subsidies for vulnerable groups). The United Kingdom has made employment issues a key component of their stimulus package (see Box 4). Its automotive package, for instance, includes specific support for training. Germany will allocate EUR 2 billion in 2009 and 2010 to training (in particular for those working part-time, or vulnerable groups) and in improving the staffing of the employment agency. The Netherlands is devoting almost EUR 1 billion for labour market issues relating to reintegration, reduction of work hours, and youth unemployment. Austria is supporting companies in creating new jobs with EUR 80 million (2009 and 2010) and supporting qualifying measures and human capital with EUR 70 million. Estonia focuses its measures on occupational training support via vocational education institutions.

Box 4. United Kingdom New Opportunities White Paper

The UK "New Opportunities White Paper" is proposing extending free childcare, an investment in schools and bonuses to teachers, creation of new apprenticeship places, in financial rewards for companies who recruit unemployed workers for more than six months, other financial schemes to facilitate training. It also proposes tax cuts and GBR 3 billion of capital spending, and a reduced value-added tax until end-2009.

Source: UK HM government, www.hmg.gov.uk/newopportunities.aspx.

Canada has launched its *Canada Skills and Transition Strategy* which includes increased funding for training (CAD 1.9 billion for 2009 and 2010), in particular for the low-skilled and older/younger workers. Russia is also planning major retraining initiatives. Australia has offered an investment of AUD 187 million to create 56 000 new training places in 2008-09. Japan is proposing a fund of USD 3.9 billion for the purpose of creating new jobs. The fund would nurture businesses in fields such as nursing care or catering services for the elderly. Chile has a tax credit to promote the training of workers and, in reaction to the crisis, changes have been introduced which raise the maximum cost of the training eligible for the tax credit and which grant access to the tax credit on a monthly basis. South Africa will amongst others offer training in the different areas of public sector work and through public employment programmes directed at socially useful activities, *e.g.* home-based care, renovation of schools.

Investing in and uptake of green technologies and energy efficiency

As outlined earlier, policy makers are using the crisis as an opportunity to undertake "green" infrastructure investments. The stimulus packages aim to make an impact on improving energy efficiency and speeding the move to a low-carbon economy, in particular also through support for related research, science and pilot projects (see above section on Investing in R&D and Innovation). The promotion of energy-saving and new energy technologies (*e.g.* next-generation solar power) as well as tax measures that encourage green investment or the purchase of green products rank high in these plans.

In particular Korea has centered its economic stimulus package almost entirely on the topic of green technologies designed to realise low-carbon economy green growth and create more jobs and some related new "growth engines". Its Green New Deal package focuses on energy conservation, recycling and clean energy development to build an energy-saving economy, green transportation networks and clean water supplies to upgrade the quality of life and the environment, carbon reductions and a stable supply of water resources to protect the earth and future generations, building of industrial and information infrastructures and technology development to use energy efficiently in preparation for the future and expanding "green growth" to include major sectors within the manufacturing and service industries.

The Canadian government announced CAD 1 billion in spending over five years for green energy projects. The US package plans to reduce the dependence on oil, doubling renewable energy production, fostering green technology research (in particular also advanced vehicle batteries and battery systems), renovating public buildings and transforming the US energy transmission, distribution, and production system (see Box 5). Households with modest incomes will receive aid and tax credits to better protect their homes from the weather. USD 30 billion is on spent energy initiatives such as a new, smart power grid, advanced battery technology, and energy efficiency measures. In Mexico, the recovery measures include financing to help poor families buy more energy-efficient electrical appliances.

Box 5. Innovating with an energy-efficient smart grid

The United States stimulus package gives priority to the development of a "smart grid". The central idea behind modernising the power grid's infrastructure is to use two-way communication, sensors, and advanced IT to create an intelligent and connected power grid, optimising and reducing electrical energy consumption.

Goals are to deliver power more efficiently as utilities utilise real-time data from sensors and advanced meters throughout the power grid to better understand specific supply and demand requirements, and allow for a better resource management. The smart grid will enable the use of new technologies including plug-in hybrid electric vehicles, distributed generation, and energy storage solutions cars. The stimulus bill is allocating funds for "smart" technologies, including smart meters and a total of about USD 11 billion for the smart electricity grid.

The EU stimulus plan includes calls on member states to improve the energy efficiency of the housing stock and public buildings and promote the rapid take up of 'green' products. A fund for energy, climate change and infrastructure projects is planned. Innovative financing models will be elaborated. Performance requirements and measures to promote green products are a priority. Norway's package includes a new and increased allocation for environmental purposes of NOK 1.6 billion (EUR 183 million). This comprises measures and increased funding for more effective energy utilisation, the development of carbon capture technologies, charging stations for electric vehicles, amongst other measures. Sweden is proposing loan guarantees that are directly linked to supporting more environmentally friendly production systems.

The United Kingdom has put forward plans for a new fund to financially support low carbon investments (GBP 250 million, USD 364 million), GBP 50 million (USD 72.85 million) for the Technology Strategy Board to support innovation and research in advanced manufacturing, low carbon tech and life sciences; and GBP 10 million (USD 14.6 million) for UK Trade and Investment to help promote UK expertise at home and abroad. Italy is funding zero/low-carbon technologies disseminations through low interest rate loans (*e.g.* substitution of old industrial electrical engines). The Netherlands has various support schemes for sustainability projects, sustainable entrepreneurship, energy-efficient housing, windmills at sea and others (with a total investment of about EUR 1.45 billion). Luxembourg has put schemes in place to improve greater energy efficiency of housing and financial support to incentivise the purchase of energy-efficient household appliances and renewable energy. Poland is developing financial mechanisms to support investments in renewable energy sources despite the increased risk, *i.e.* by mid-2010 a related fund will include approximately PLN 1 billion. Estonia has factored in new energy saving measures for housing, including loans for improving the energy efficiency of apartment buildings by at least 20%, awareness raising activities and energy audit support (EUR 51 million).

In the field of green technologies, most OECD countries are also implementing an array of non-financial measures: *i.e.* stricter energy efficiency requirements (sometimes related to public investments, *e.g.* in the case of buildings) and the setting of mandatory energy efficiency targets for production and new infrastructure. Korea plans to introduce a "Basic Act on Green Growth" to provide a legal and institutional framework supporting low-carbon green growth.

Many OECD governments prioritise the support of their automobile industry (*e.g.* France, Germany, Italy, Japan, Portugal, Spain, United Kingdom, and the United States) but tie this aid to the condition of the development of more environmentally friendly automobiles – low carbon-emitting vehicles or offer incentives to scrap older, more polluting cars (see Box 6).

Box 6. Stimulus for the fuel-efficient car

OECD governments ready to come to the rescue of their automobile sectors are making credits, tax breaks, special investment schemes, etc. available. However, in return many are demanding the production of more energy-efficient engines and cars or giving incentives for the purchase of new cars (see table below).

The EU proposes to launch a 'European green cars initiative', involving research on a broad range of technologies and smart energy infrastructures essential to achieve a breakthrough in the use of renewable and non-polluting energy sources. The United Kingdom has announced a EUR 2.3 billion guarantee scheme for loans going into low carbon projects (measures to support training schemes for car workers, grants for green R&D, etc.). France is also providing EUR 6 billion of loan guarantees or soft loans to the auto industry. In the US, electric transportation shall be fostered and the federal government will replace older vehicles with alternative fuel automobiles. The Australian New Car Plan for a Greener Future investment promotes R&D and the achievement of better environmental outcomes. The Korean government is increasing its R&D spending for the development of technology in green cars.

Governments are also putting in place financial compensation schemes to prompt businesses and households to discard old cars and buy new ones. In France, owners of vehicles older than ten years will receive EUR 1 000 when buying a new car. In Germany, owners of cars older than nine years will receive EUR 2 500 for the purchase of a new car and the vehicle tax is now calculated on the basis of emissions caused. Spain has a fund endowed with EUR 1.2 billion to encourage the replacement of vehicles of more than ten years by new vehicles. Portugal has in force incentives to scrap light cars older than 8 or 13 years and buy new ones and is preparing new stimulus to introduce electric vehicles on the market by 2010. In Japan, taxes have been reduced for purchases of eco-friendly cars. Italy is introducing a financial incentive for the exchange of old cars for new eco-friendly cars. Overall the focus currently seems to be on a more fuel-efficient but not a "green car" (e.g. hybrid, electrical). The US provides a tax credit of up to USD 7 500 for families that purchase plug-in hybrid vehicles.

Country	Amount of package	Linked to clean technologies	Incentives for new car purchase
Australia	AUD 6.2 billion	●	
Canada	CAD 4 billion		
France	EUR 6 billion	●	●
Germany	EUR 1.5 billion	●	●
Italy	EUR 1.7 billion	●	●
Korea	KRW 2 trillion	●	
Luxembourg	EUR 4.5 million	●	●
Mexico	USD 1 billion	●	
Norway	NOK 100 million	●	
Portugal	EUR 200 million		
Spain	EUR 4 billion	●	●
Sweden	SEK 20 billion	●	
Turkey	TRY 210 million		●
United Kingdom	GBP 2.3 billion	●	●
United States	USD 17.4 billion		

Source: Table based on work for the OECD Committee on Industry, Innovation and Entrepreneurship.

Helping firms, SMEs and promoting entrepreneurship

OECD and non-OECD countries are devising schemes to help firms (and in particular small and medium-sized enterprises, SMEs) and entrepreneurship.¹¹ Measures include tax breaks for companies, initiatives intended to bridge liquidity gaps (*e.g.* ensure banks keep lending to business, government-backed loan guarantees or loans for small firms, export credit guarantees), the simplification and speeding up of administrative procedures, the promotion of start-ups and entrepreneurship, employment plans that allow SMEs to avoid lay-offs, and directing government procurement to young or smaller firms while also ensuring the rapid payment of invoices to SMEs – see Box 7 for Australia as an example.

In Austria, Finland, France, Germany, Hungary, Italy, Japan, Turkey and Spain, for example, banks have received additional public funding to help small businesses and entrepreneurs. In most of these countries, SMEs also benefit from targeted loan guarantee programmes. France has created a “Credit Mediator”, who is working with regional representatives of the Central Bank, to assist SMEs in their dealings with their banks. In addition, Canada and Spain have increased the capital for their SME agencies, while Finland and Hungary have direct measures to increase government funding of venture capital. Some countries, such as Australia, Austria, Denmark, France, Germany, Luxembourg, New Zealand, Spain, Sweden and the United Kingdom have tax measures intended to alleviate cash flow problems. These include tax reductions (VAT, corporate taxes) or delayed payment; accelerated depreciation; faster VAT refunds (monthly vs. annually); and tax incentives/grants for R&D.

Amongst others, Luxembourg is planning various measures to pull subsidy payments to SMEs forward, to reduce taxes, and to ease bankruptcies. Hungary plans to allocate USD 3.9 billion to provide lending guarantees primarily to SMEs. Spain is using tax measures and extending the available financial instruments to facilitate credit to SMEs and help their development. The United Kingdom, the United States and France have similar plans, which also include special financing schemes and the reduction of non-wage labour costs for smaller firms (also to foster job creation in smaller firms). In the EU, the European Investment Bank has been tasked to reinforce its lending to SMEs. Amongst other guarantee schemes and facilitating access to credit, Chile capitalised the Guarantee Fund for Small Companies with USD 130 millions which will leverage new guaranteed loans for more than USD 1.5 billion.

Box 7. Australian measures to help small business through the global financial crisis

In October 2008, Australia announced measures to help small business through the global financial crisis.

- Small Business Support and Advice during the financial crisis from Business Enterprise Centres and other registered business organisations, through a AUD 4 million investment over 2008-09 and 2009-10.
- A guarantee of payment for new small businesses’ contracts with Commonwealth Government Departments within 30 days, otherwise these can charge penalty interest.
- A commitment to developing standard procurement documents for co-ordinated procurement and standard approaches to make it cheaper and easier for small businesses to sell to the government.

The Australian government also introduced a Small Business and General Business Tax Break in its Nation Building and Jobs Plan, as well as a 10% investment allowance for businesses in its Nation Building Package.

11. The OECD Working Party on Small and Medium-sized Enterprises & Entrepreneurship (WPSMEE) has analysed these measures in more detail. See also the OECD WPSMEE High-level round table and conclusions at: www.oecd.org/document/31/0,3343,en_2649_34197_42116575_1_1_1_1,00.html.

Australia and New Zealand have reinforced their business development services using the Internet to provide some guidance to SMEs on how to deal with the crisis. In New Zealand tax simplification measures will be fast-tracked. Japan has introduced a scheme to postpone payment of inheritance and gift taxes in cases where a business is passed on to a succeeding owner without job cuts.

In addition, several measures have been taken to ensure that start-ups and micro-enterprises flourish. Spain is planning reforms making it possible to constitute a company in 24 hours. Similar to Australia, the Dutch government has pledged to pay small firms faster. Poland has pledged to reduce the administrative burden for SMEs and will support highly innovative enterprises and the venture capital market. Finland, Sweden, the Slovak Republic and Portugal, also, plan to increase the available seed, risk and venture capital (see *e.g.* the Swedish Innovationsbron AB, the Portuguese Venture Capital Initiative and JEREMIE of the Slovak Republic). Portugal has implemented measures to promote the creation of enterprises by the unemployed. Canada is increasing the availability of credit to small firms, providing funding to mentor young Canadians who create a new business, and to continue funding for a government information service for Canadian businesses. The Korean government will develop support measures for SMEs engaged in those business areas it has identified as new growth engines.

The Mexican government will make at least 20% of its purchases from SMEs. South Africa plans to support SMEs in vulnerable sectors, such as clothing, textiles and footwear, mining and the auto and capital equipment sectors. The Russian federal expenditures for small business support in 2009 will increase by RUB 6.2 billion, totaling RUB 10.5 billion (USD 314 million). Russia also plans to lower administrative barriers for business and to increase the share of government purchases from SMEs.

Non-financial measures

Next to non-financial measures mentioned as part of the five themes identified above (notably the measures to green the economy), most OECD countries propose a simplification and speeding up of administrative procedures, mostly with regard to starting up a company, public procurement, tendering rules and initiating construction work (including building permits, especially for large infrastructures). The reduction of administrative costs is also proposed. Some OECD countries are proposing to further adapt bankruptcy laws. Many OECD countries are also adapting rules and regulations to make the public administration more efficient (*i.e.* easing the burden on companies and introducing e-government one-stop shop procedures). Finally rules permitting flexibility of the labour market (increase of part-time work, etc.) are being adapted to avoid unemployment.

When governments are aiming to foster communication and other infrastructures, this often also involves changes to the regulatory framework (*e.g.* investment in next-generation networks, roll-out of fibre, introduction of smart grids or nanotechnology, etc.).

Project selection, co-ordination, oversight and evaluation

Details on how the stimulus packages will be governed and executed, how individual projects will be selected, how these will be co-ordinated across different government entities and levels and evaluated are only starting to emerge. In most cases the precise mechanisms of how to allocate, disburse or oversee the sums proposed through the economic stimulus packages have not been decided upon. Many plans suggest that interventions must be 'timely, tailored and targeted' and that 'shovel ready' projects are to be preferred. Yet, little concrete information on how to do justice to these objectives and how projects are being selected and implemented is currently available. Governments will have to strike the right balance between the necessary speed of translating

measures into action (*i.e.* easing of usual public procurement legislation and shortening of delays) and ensuring accountability and waste of resources. More work is needed on identifying which specific projects can be implemented in a relatively short time span to boost demand but which also meet the objective of having a supply-side effect in boosting innovation and the fundamentals for long-term growth.

Only very few existing plans give some details about the way they will be run. For example, the United States stimulus package includes pledges on transparency and accountability, such as that all contracts and grant permissions will be posted publicly, that investments will be vetted and reviewed and whistleblowers protected. Of course, most countries have public tender processes and rules on the transparency of the budgets which will apply. Appropriate co-ordination, oversight, accountability, review mechanisms (potentially also to remove ineffective or unnecessary measures) impact assessment and evaluation will however be an important success criterion. Measures to foster transparency on project plans, financial implications and timelines will increase their impact and accountability.

These fiscal stimulus plans will have international spill-overs through various channels. Smaller countries perceive only part of the global benefit provided by their action; larger countries perceive only part of the costs involved. Yet apart from the European countries for which some EU-level co-ordination has taken place, most stimulus packages have been elaborated with a national view. Co-ordinating stimulus packages internationally in particular in areas where spill-overs (*e.g.* R&D, green technology) are international or where there are specific co-ordination requirements (transport infrastructure) is important. Yet few existing national stimulus packages have explicit references to such co-ordination. In particular when it comes to the "mechanics" of how to efficiently operationalise long-term projects (including non-financial measures) best practises should be shared at the international level and the OECD will continue to act as a forum to exchange these. The involvement of non-OECD countries in these discussions is important and should be sustained.

Conclusion

As part of its strategic response to the economic crisis and the Innovation Strategy, the OECD is also focusing on measures to restore long-term growth. This paper shows how current economic stimulus packages include measures directed towards investment in research and development, a modern (smart) infrastructure, education, the greening of the economy, support to innovation and to SMEs. It is the result of a questionnaire sent to member countries and will be continually updated to reflect corrections or adjustments of ongoing stimulus packages.

This work should also help setting priorities and uncovering good practices, including in the area of evaluation and co-ordination of planned measures and increased international co-operation. It can also help debates on how to reconcile necessary short-term stimulus measures and plans to foster long-term economic and sustainable growth.

To conclude, more work will be needed to monitor the implementation and assess the impact of these economic recovery measures.