OECD Economic Outlook
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CHAPTER 3

LIFTING INVESTMENT FOR HIGHER SUSTAINABLE GROWTH

SUMMARY

- Total OECD real investment, and in particular housing investment, dropped precipitously at the peak of the crisis and its recovery has been sluggish. Weak investment has depressed productivity growth and will, if it persists, entrench low equilibrium growth and poor job prospects in the short and longer term.

- Recent investment developments should be considered in the context of important structural changes:

  – Part of domestic business investment in advanced economies may have been relocated to other countries. However, whether capital spending abroad replaces or complements domestic capital outlays remains uncertain.

  – The structure of advanced economies has shifted from highly investment-intensive industrial sectors to less investment-intensive services.

  – This was accompanied by a rising share of ICT and intangible/knowledge-based investment, which depreciates faster, reflecting technological progress and changing global specialisation in production.

- Weak aggregate demand, both domestic and foreign, through the accelerator mechanism, explains most of the weak non-housing investment since the onset of the crisis. Therefore, more balanced global demand could propel investment to a higher level equilibrium, particularly if accompanied by reduced uncertainties and market reforms.

- Surprisingly, falling real tax-adjusted interest rates and high equity prices (supported by monetary policy) have had relatively little pass-through to real investment, especially in the case of countries where credit supply has been constrained by an incomplete repair of bank balance sheets.

- Uncertainty dissuades investment. Although by some measures, economic uncertainty has fallen over the past three years, long-standing uncertainties persist, including how population ageing and climate change will be dealt with.

- Recent regulatory reforms in product markets in some countries and generally improved corporate balance sheets should boost the prospects for investment, although there is more to do.

- Public and infrastructure investment has been cut in a number of countries to meet fiscal consolidation objectives. A revival of public investment, with particular attention to reducing the dispersion of regulatory barriers in network industries would increase the quantity and quality of infrastructure investment to support both demand and supply.

- Increases in capital spending are needed to push economies onto a higher growth path and this calls for decisive policy actions. Macroeconomic policy to address deficient demand and a reduction in policy-related uncertainty need to be accompanied by structural policies that increase longer-term economic growth. Translating investment into effective and sustained growth requires attention to low-wage workers, as well as addressing the consequences of rising inequality for education, a key factor undermining potential growth in the longer term.

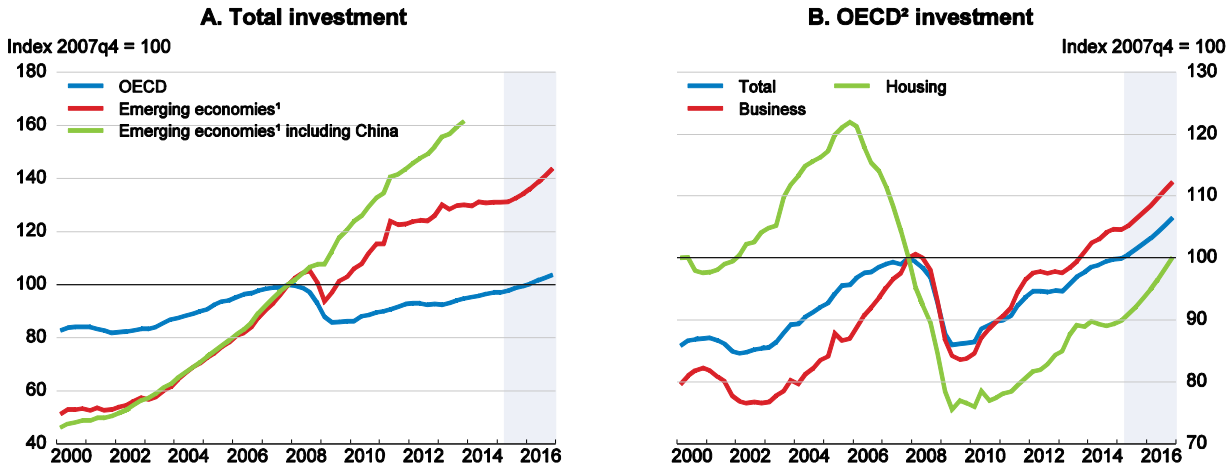
Introduction

Soft investment in advanced economies in recent years has gone hand in hand with the weak recovery and has reduced potential output growth. To escape this low equilibrium setting and push economies onto a higher growth path, it will be necessary to raise capital spending. This paper examines the potential reasons for current weak investment, against the background of secular trends, such as the shift of the location of investment to emerging market economies (EMEs), the growing importance of intangible investment and the declining share of investment-intensive sectors in the economy. The determinants of business investment are also examined: weak aggregate demand, cost of capital, economic and policy uncertainty, and regulatory constraints. The drivers of government and infrastructure investment are also considered. The paper concludes with an examination of the policy implications of the analysis to achieve a high-growth and high-investment equilibrium, with higher quality employment and enhanced innovation diffusion – that is, higher potential output.

The evolution of fixed capital investment

Total real gross investment in the OECD as a whole dropped precipitously at the peak of the crisis and only returned to the pre-crisis level by 2014 (Figure 3.1). The decline in housing investment was considerably larger than in business investment, but with important cross-country differences. Among advanced countries, the investment compression was particularly striking in the euro area (Figure 3.2). In contrast, in large EMEs excluding China, the decline in investment in 2009 was much smaller and shorter lived. However, investment growth in these countries has lost steam in the past four years, though with notable divergence across the different economies. Investment in the large EMEs as a whole has grown at an uninterrupted and fast pace over the past decade due to robust investment in China, India and Indonesia,

Figure 3.1. Evolution of global investment



1. Covers Brazil, India, Indonesia, Mexico, Russia, South Africa and Turkey.

2. Covers only 17 OECD countries for which series on housing and business investment are available.

Source: OECD Economic Outlook 97 database; and UN National accounts Main Aggregates database.

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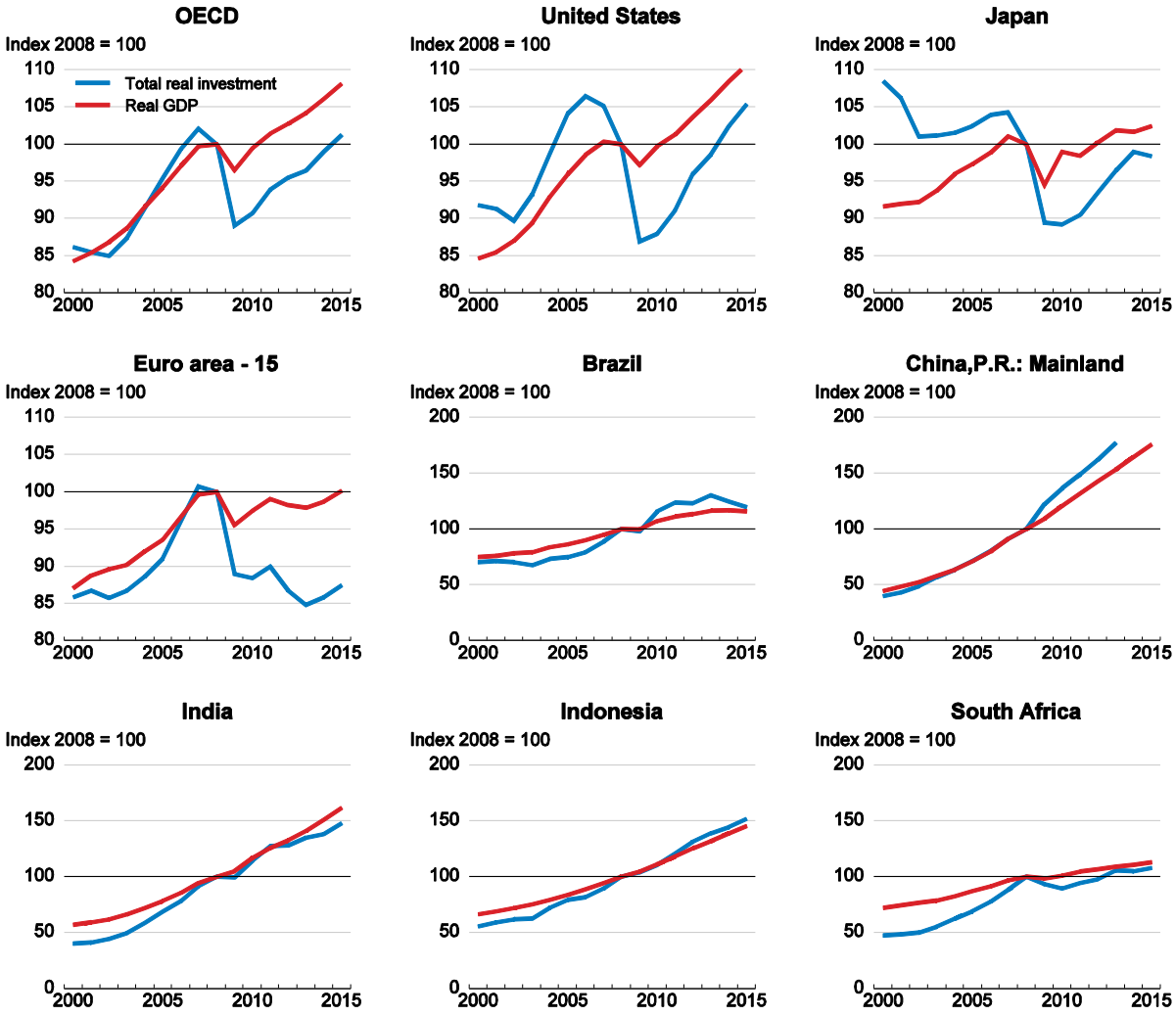
Figure 3.2. Real gross investment



Source: OECD Economic Outlook 97 database; and UN National accounts Main Aggregates database.

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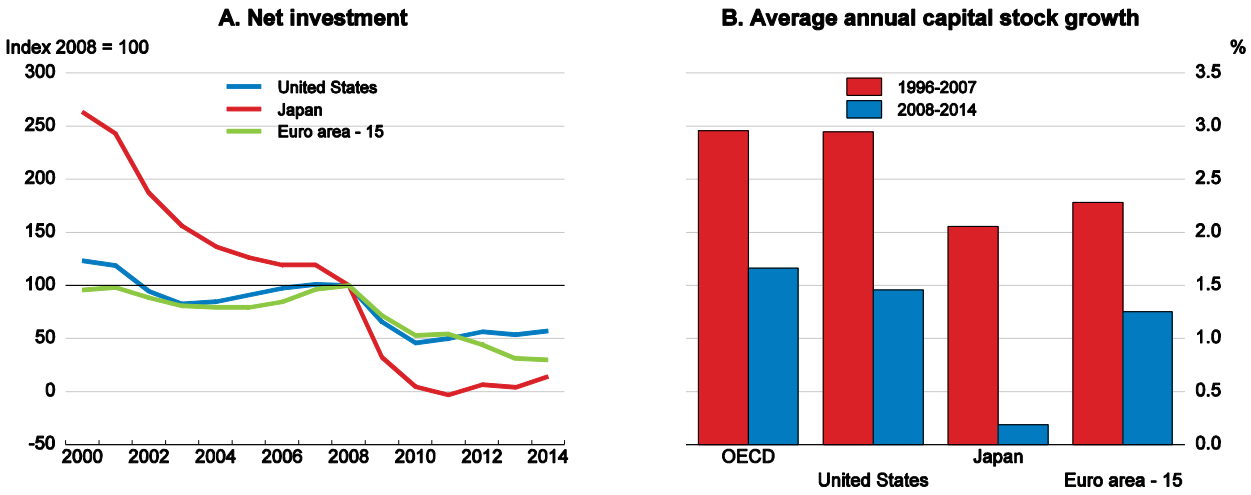
among others. As a result, the ratios of investment to GDP have been on the rise in many EMEs, in contrast many advanced economies, in particular the euro area. Looking forward, the pace of growth in gross investment is projected to exceed that of GDP, thus raising the capital-output ratio for these economies, which is appropriate for some but not for all at current stage of development.

As average depreciation rates have risen over time, reflecting the growing share of fast-depreciating information and communications technology (ICT) equipment and intangibles in total capital, gross investment would need to be higher than historical benchmarks in order to avoid a fall in net investment and the capital stock. Estimates of real net investment for business and government combined, derived from new OECD estimates of the real productive capital stock, suggest that they are much lower than prior to the crisis (Figure 3.3). Overall, the net productive capital stock has been growing at a much slower rate than before the crisis and has not been keeping up with modest output increases in the recovery in the United States, Japan and the euro area. This is an important contributory factor behind the post-crisis weakness in potential output growth (Box 1.3 in Chapter 1).

Figure 3.3. Net investment and capital stock growth have been weak following the crisis



Source: OECD Economic Outlook 97 database; and OECD calculations.

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The changing global distribution of investment

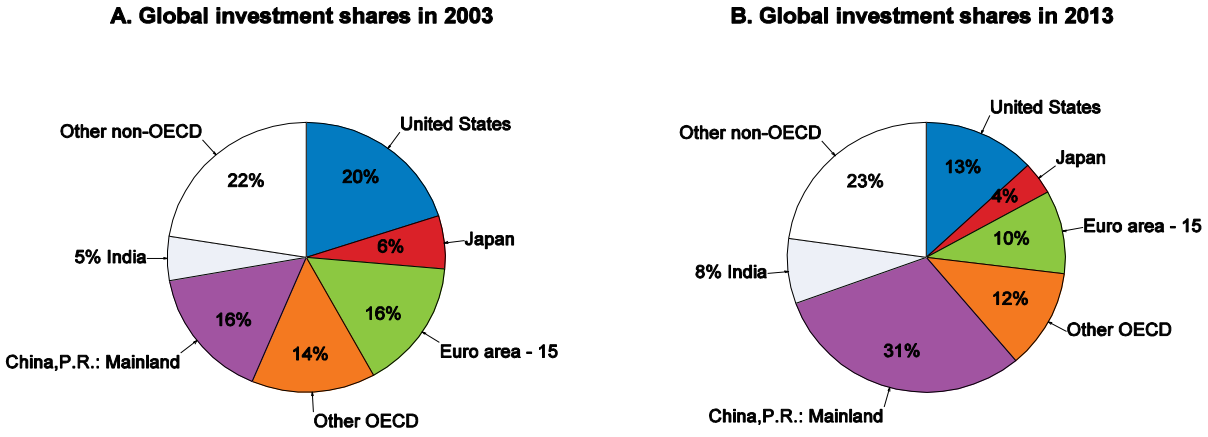
The share of global investment located in EMEs has risen dramatically over the past decade (Figure 3.4). This reflects a range of factors, including the relatively strong growth in these economies, their investment-led development paths and the changing international specialisation of production. The change in the share accounted for by China is particularly striking. Considering all types of investment and investors, China now accounts for around 16½ per cent of global output (in PPP terms), but over 30% of global capital spending, with around one-sixth of Chinese investment being in housing. At the same time, China has become the leading location for international foreign direct investment (FDI) flows (see below).

Considering the movement of global investment across borders, there are a number of different indicators and measurements. The most commonly used are FDI flows and stocks, which are available for all economies and on a bilateral basis. These data measure financial flows across national borders that represent an ownership and control commitment. While importantly driven by mergers and acquisitions, these data also account for actual fixed capital investments undertaken by multinational enterprises (MNEs).[1] Additional information is provided by new "greenfield" FDI projects (a subset of total FDI) and, for those countries that have data, direct information on fixed investments by MNEs.[2] Changes in the geography of ownership and control could have implications for the level of investment in the advanced economies, in particular by raising the extent to which investment decisions in one economy are dependent not only on developments in that economy, but also on global demand and the relative costs of investing in other economies (Young, 1999; Belderbos et al., 2012). At the same time, this could raise the overall rates of return on investment by MNEs in advanced economies.

1. Specifically, FDI flows in balance-of-payment accounts equal the sum of equity flows from home to abroad, including mergers and acquisitions and greenfield investments, inter-company debt flows from parents to subsidiaries, retained earnings reinvested in those subsidiaries, and extensions of capital to existing affiliates and investments for financial restructurings (e.g. for debt repayment or loss reduction; see OECD (2008) for more information). These methods of measuring foreign investment make FDI flows a better measure of the financing of overseas operations through the use of internal capital markets rather than the actual capital expenditures of foreign subsidiaries.

Figure 3.4. Global fixed capital investment has shifted to emerging market economies

In per cent of world gross fixed capital investment



Note: Calculations based on PPPs.

Source: World Bank; and OECD calculations.

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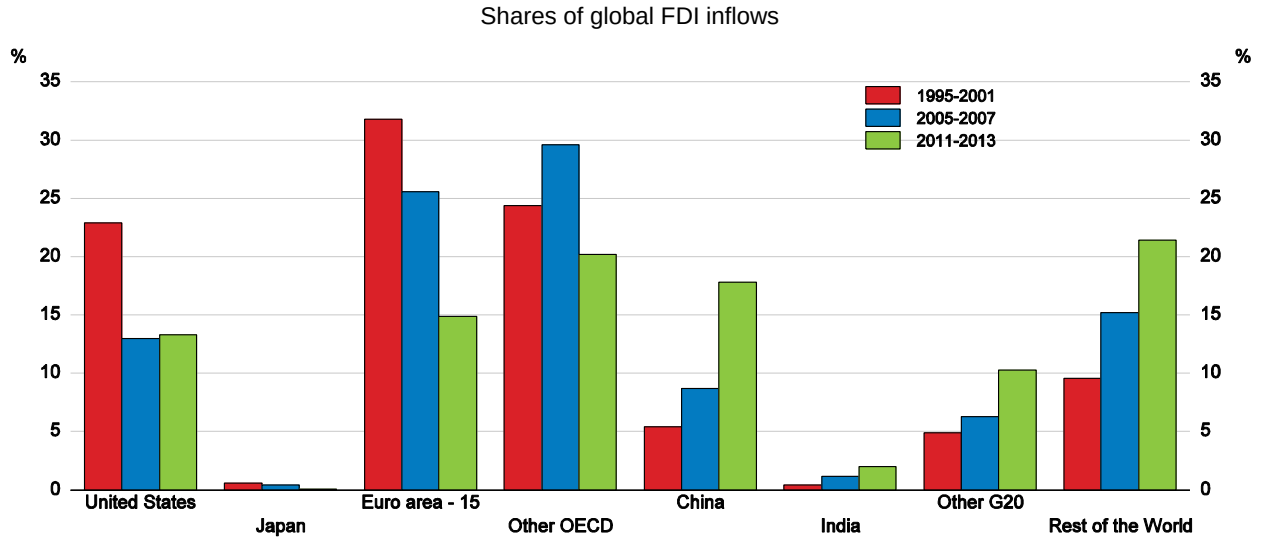
The global distribution of inward FDI flows – considering both mergers and acquisitions and greenfield – has shifted somewhat over time, with the OECD economies receiving less than one-half of total flows in 2011-13, down from around four-fifths of total flows in the latter half of the 1990s (Figure 3.5). Since the crisis, this decline in share has been particularly marked in the euro area. At the same time, the share of inflows to China and a number of EMEs has risen sharply. This is largely driven by EMEs' positive growth differentials, cost differentials and narrowing regulatory gaps vis-à-vis advanced countries (Arbatli, 2011).

- The majority of new greenfield FDI projects are also located outside OECD economies, but the distribution has been relatively stable over time (Figure 3.6). China remains an important location, but only receives around 10% of new greenfield FDI projects. In the OECD economies, the share of new projects located in the United States (and also the United Kingdom) has risen since the crisis, whereas the share in the euro area economies has again declined, possibly reflecting differences in the pace of recovery between these economies.
- China has also become an important source of FDI flows. According to UNCTAD data, after accounting for less than 1% of global FDI outflows for most of the past two decades, China's share of global outward FDI flows has risen rapidly since 2008, and accounted for over 7% of global outflows in 2013. Nevertheless, China accounts for less than 1% of the FDI stock in most OECD countries (its share is slightly higher in Australia, Canada, Korea, Norway and Sweden but still below 3%).

Figure 3.5. FDI flows are increasingly to non-OECD countries



Source: OECD FDI databases; and OECD calculations.

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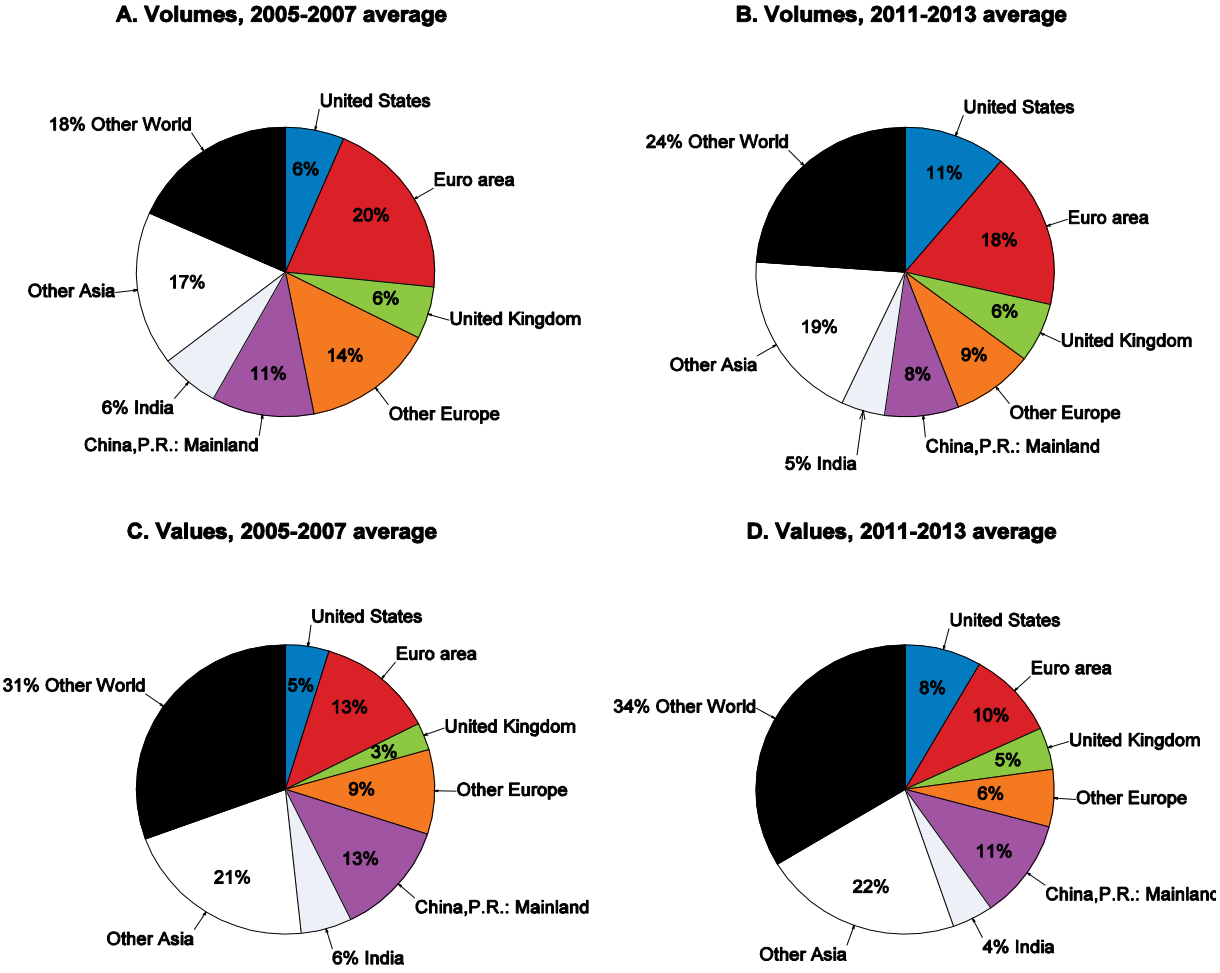
- Economy-wide information on the capital investments of MNEs is largely confined to fixed tangible capital investments by foreign-owned firms in host countries. Considerably less information is available on investments abroad by the affiliates of domestic companies (Box 3.1). In the majority of OECD economies for which data are available, investments by foreign-owned firms in tangible assets represent somewhere between 1 and 2½ per cent of domestic GDP, though in a handful of smaller open economies in Europe this rises to somewhere between 4% and 6% of GDP (Figure 3.7).[3] Japan stands out as having a comparatively low level of investment undertaken by foreign-owned firms. It seems unlikely that the investment decisions of foreign-owned firms can account for the softness of investment in all OECD economies since the crisis, as their investment has risen in around half of the countries considered (as a share of GDP), including the aggregate of those euro area economies for which data are available for both 2006 and 2012.

The international mobility of fixed capital broadens the range of factors that affect fixed investment in each location. Outward FDI, or fixed capital investments by the foreign affiliates of domestic companies, could have implications for the total level of fixed investment in the home country. A priori there is no clear theoretical impact, with the linkages depending on a broad range of factors including the motivations for investing abroad, the impact of investing abroad on foreign market size and whether firms have financial constraints. The existing empirical literature is ambiguous about whether FDI flows replace or complement domestic investment (Globerman, 2012).

3. The share of foreign-owned firms' tangible investments in total domestic tangible investments in 2012 ranged widely across countries, from around 4-6% in France and Italy, to 9-10% in the United States and Germany, close to 20% in the United Kingdom, 30-35% in Hungary and the Slovak Republic and over 50% in Ireland.

Figure 3.6. The location of greenfield FDI projects

Shares of global greenfield FDI



Source: UNCTAD; and OECD calculations.

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- Horizontal MNEs are multi-plant firms that produce related outputs in both home and host countries, thus economising on any costs of exporting. Such firms are more likely to occur when the host countries are of similar size (to avoid the costs of having costly capacity in small markets), have similar factor endowments, and there are positive costs to market entry via trade. Such investments are more likely to substitute directly for domestic activity if exporting previously took place. The findings of aggregate cross-country studies, using saving-investment relationships, that have typically found evidence of substitution, with outbound FDI tending to reduce domestic investment one for one (Feldstein, 1995; Desai et al., 2005) could reflect the importance of investment by horizontal MNEs.[4,5] Firm-level evidence of substitution, particularly

4. Even if outward and domestic investment are substitutes, the relatively modest investment levels of foreign affiliates of US and Japanese companies in EMEs relative to home-country business investment or GDP levels (Box 3.1) might imply that they have had only a modest negative effect on domestic investment. Such a reallocation of investment would still generate benefits for both source and destination countries – higher profits for companies in the source economies, which could in turn feed back into corporate investment, and higher inward investment with technology transfers in the EME destination countries.

for investments in lower cost economies, is found for Japan (Belderbos et al., 2013) and for those US companies who have made layoffs as a result of shifting production abroad (Monarch et al., 2014).[6]

- Vertical MNEs fragment stages of the production process and tasks across different countries in global value chains, with the location of stages depending on relative costs and other factors such as taxes and regulations. Such investments have an ambiguous effect on domestic investment. A negative impact could arise if firms are shifting the location of activities that have been performed domestically. However, once the production process has been split up, foreign and domestic activities are likely to complement one another, both via the production of intermediate inputs and by permitting greater exploitation of the knowledge-based firm-specific assets that multinational firms possess. Evidence of such complementarity is found for the United States, with Desai et al. (2009) estimating that a rise of 10% in foreign investment is associated with an additional 2.6% domestic investment.

Box 3.1. Capital investment by the foreign affiliates of domestic corporations

Information on the capital investment of the foreign affiliates of domestic corporations is limited, with most of the data on outward investments by domestic companies relating to output and employment. Comparatively rich data sets are, however, available for the United States and Japan (Box Figure).[1]

- In the United States, the investment intensity (measured relative to value added) of both US parent companies and their majority-owned foreign affiliates (MOFAs) has declined over time, to around 18% and 15½ per cent of value added respectively in 2012. The share of total group investments in tangible capital performed by MOFAs has edged up slightly over time, especially in the non-manufacturing sector. Investments by MOFAs have also risen relative to total US business investment (tangibles plus intangibles). In 2012, MOFAs' investments were equivalent to just over 11% of total domestic business investment in the United States, up from 8¼ per cent on average over 2001-07. This may reflect an increasing tendency to locate new investments outside the United States, but it could also just reflect the stronger financial resources available to many multinational companies.
- The main location for US MOFAs' capital investment remains Europe, but the share undertaken there has declined sharply over time and the shares in Asia and Latin America have risen. Although rising rapidly in the years prior to the global financial crisis, the share of non-OECD EMEs in total capital spending by US MOFAs edged up only marginally between 2007 and 2012 (the latest year for which data are available) to just above one-third. This was equivalent to around ½ per cent of US GDP, 0.2 percentage point higher than in 2004.
- In Japan the tangible capital investments of overseas manufacturing subsidiaries of Japanese companies has risen as a share of total domestic business investment (so called "hollowing out"), especially since the global financial crisis. Capital investments have been increasingly located in Asia (the principal recipient) at the expense of Europe and North America. Overall, measured relative to GDP in Japan, foreign affiliates' investment in EMEs increased by 0.2 percentage point between 2007 and 2013, to 0.5% of GDP.

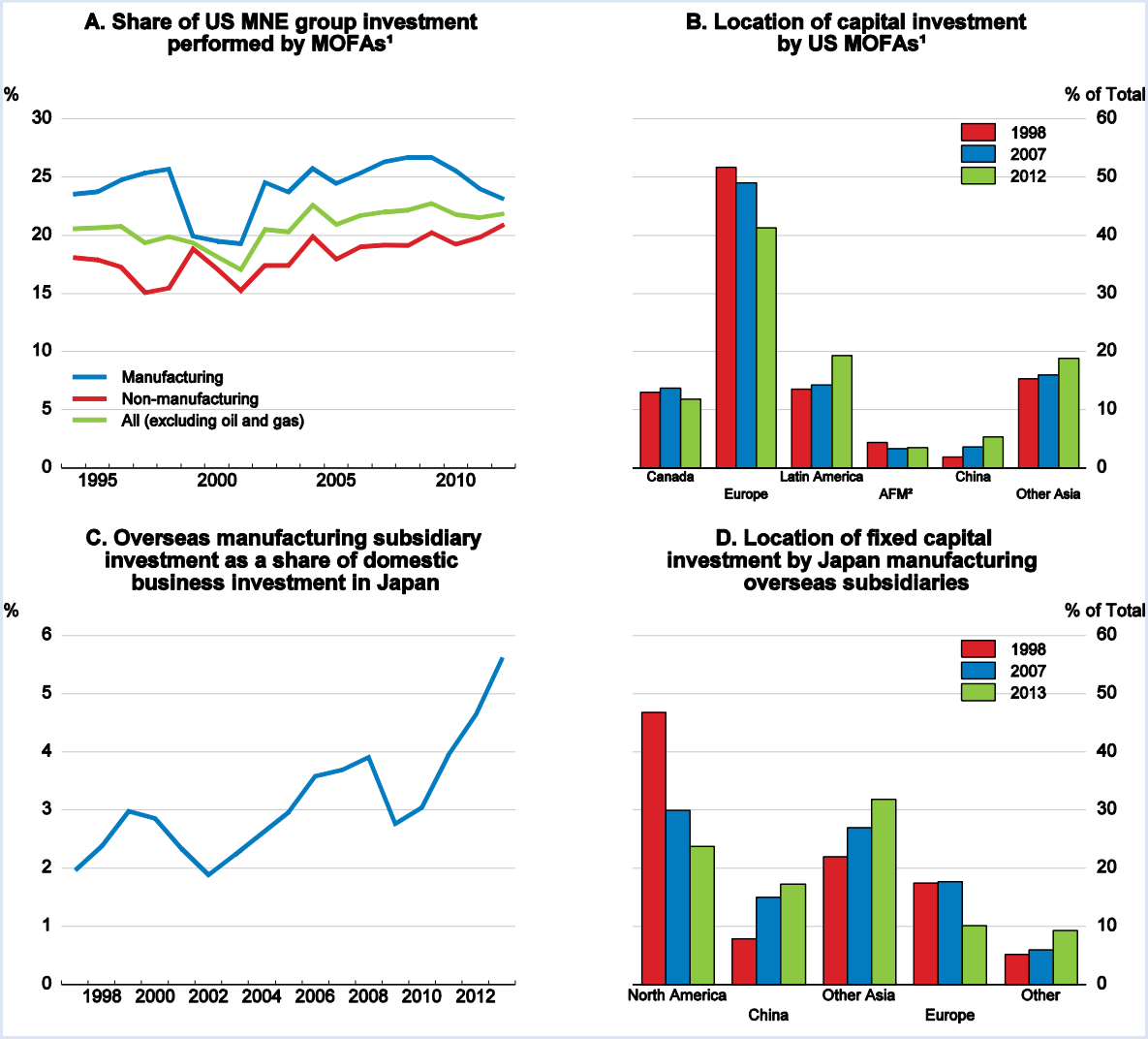
1. In Europe, estimates are available for the domestic investment by the foreign affiliates of other countries, but little is available for the investments made by outward affiliates.

5. At a country-by-country level, the evidence is mixed, with outward FDI found to have a positive long-run relationship with domestic investment in the United States and Italy, but a negative relationship in Germany (Herzer and Schrooten, 2008; Herzer, 2008). The relationship may also differ across industries (Braunerhjelm et al., 2005).

6. The sample considered covers only those firms making layoffs either via within-firm investment abroad, or via contracting with outside parties.

Box 3.1. Capital investment by the foreign affiliates of domestic corporations (Cont.)

Investment by the foreign affiliates of US and Japanese companies



1. MOFAs stands for majority-owned foreign affiliates.
2. Africa and Middle East.

Source: OECD Economic Outlook 97 database; National Statistical Offices; and OECD calculations.

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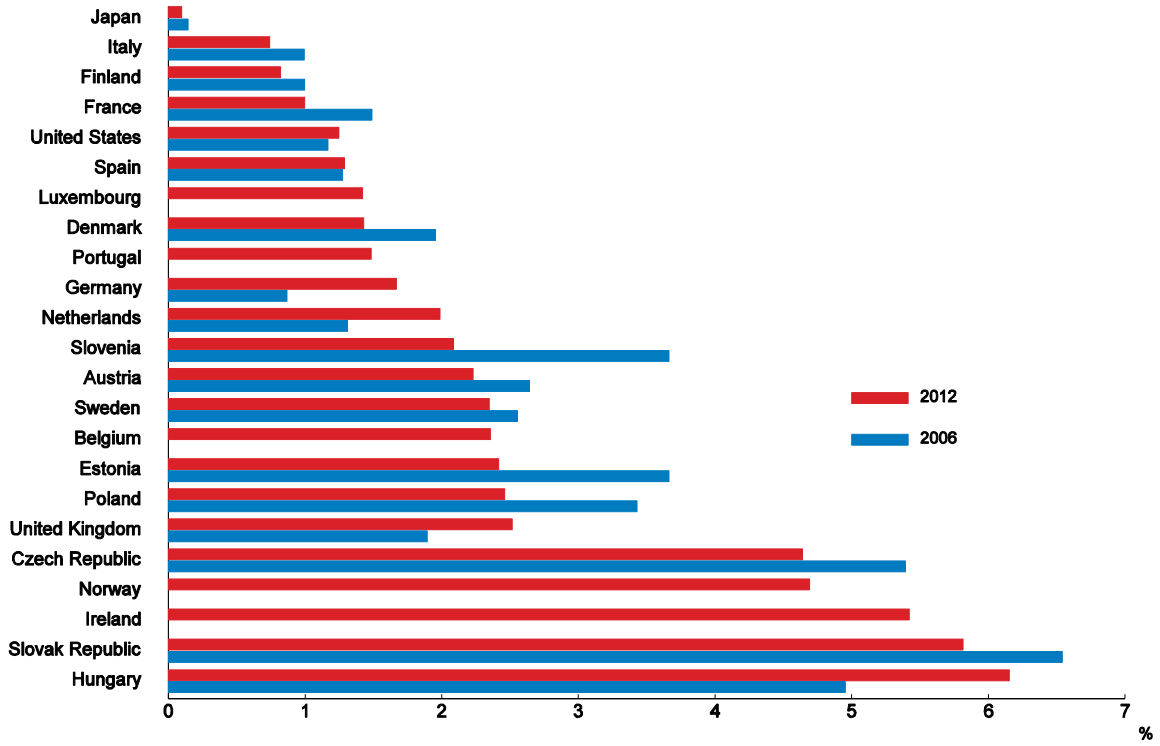
Figure 3.7. Domestic tangible capital investment by foreign-owned firms

In per cent of GDP



Note: Data refer to 2007 for Austria, the Netherlands and Poland; and to 2011 for Japan.

Source: OECD Activity of Multinational Enterprises (AMNE) database; Bureau of Economic Analysis; Eurostat; and OECD calculations.

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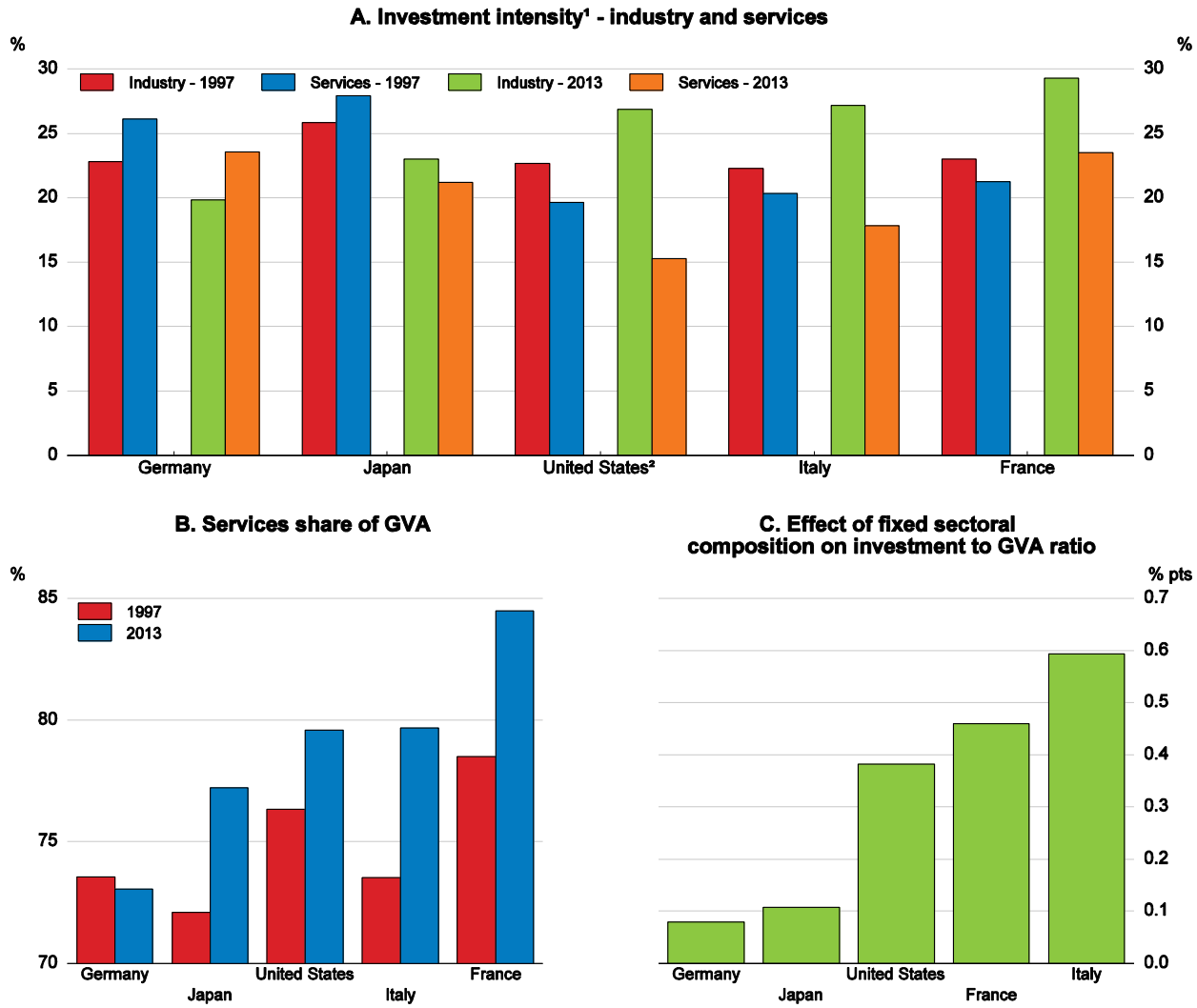
Apart from the potential impact of offshoring, capital spending in advanced economies, particularly in heavy industry, may have been weakened indirectly by developments in EMEs. Capacity expansion in EMEs has created excessive capacities in some sectors at a global level, leading to price declines in these sectors, lower profits and reductions in the profitability of additional investment (OECD, 2015c, 2015d). Excessive capacity expansion in some EMEs may have been driven by government interventions, such as administrated credit allocation or management incentive structures in state-owned enterprises, favouring capacity expansion as a goal in its own right. Low rates of return on equity of listed companies in EMEs, both relative to the cost of capital and to rates of return of the counterparts in advanced economies, could be indicative of such over-investment (Blundell-Wignall and Roulet, 2015; OECD, 2015d).

The shift to less investment-intensive services

The shift towards lower investment intensities in advanced economies could in part be explained by a shift in the sectoral composition of the economy. Less investment-intensive sectors have become bigger as a share of gross value added (GVA) at the expense of sectors that are more investment intensive. In broad terms, this is reflected by a shrinking industrial sector share, measured as the sum of manufacturing, mining and utilities, with an increasing services sector share (Figure 3.8). In the countries depicted in Figure 3.6, the investment intensity of the services sector, as measured as the share of investment in GVA, was up to 11 percentage points smaller than the investment intensity of the industrial sector in 2013. However, while the sectoral shifts have reduced the investment intensity in all the economies studied, a

comparison of actual intensities in 2013 and estimated intensities based on an unchanged sectoral composition from 1997 shows that the effects have been modest, but still amounting to around ½ percentage point in Italy and France.[7]

Figure 3.8. Changing sectoral composition has affected aggregate investment intensity



1. Investment intensity is measured as the ratio of nominal investment to nominal gross value added (GVA).
2. Data for the United States based on the private sector only.

Source: Bureau of Economic Analysis; European Commission; Cabinet Office of Japan; and OECD calculations.

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7. The comparison of nominal shares may be complicated by the faster decline in relative ICT prices, although measurement of this effect is difficult given limited information on the relative use of ICT investment by the different sectors over time.

The shift towards knowledge-based capital

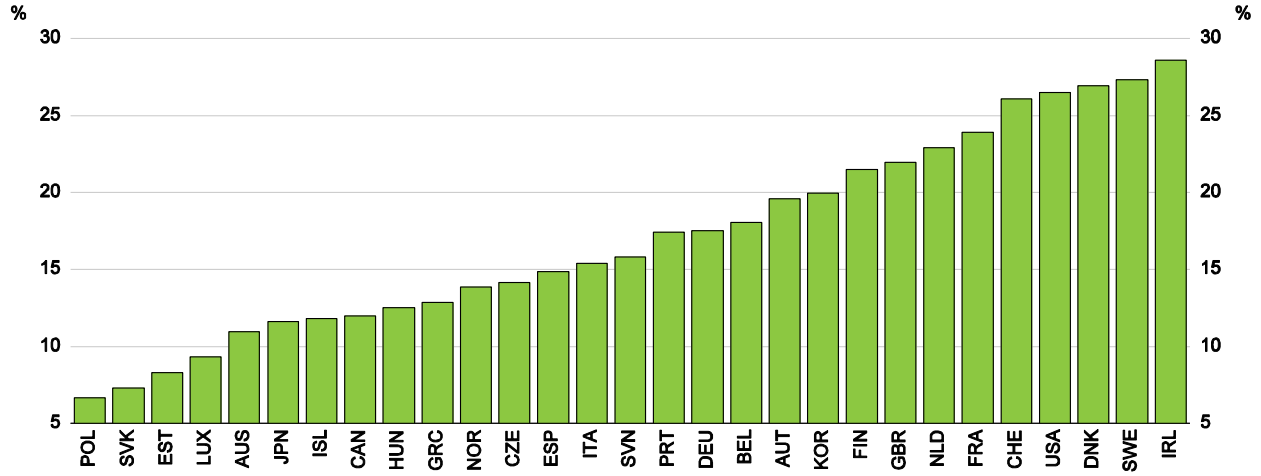
Investment in OECD countries has gradually moved away from traditional areas of physical investment to ICT and intangible/knowledge-based investments. This reflects a number of trends including technological progress, the rise of the digital economy, the shift from industry to services and the changing global specialisation in production as discussed above. This shift raises the importance of understanding the main factors behind the present subdued level of investment, since in addition to their direct impact on demand, intangible knowledge-based investments are central for the generation of new ideas and technologies and the successful diffusion of existing ones (OECD, 2015a).

New national accounts systems (SNA 2008 and ESA 2010)[8] include many intangible investments – such as R&D, software and entertainment, literary and artistic originals and mineral exploration – in fixed capital investment, and this has translated into an increase in the share of investment in GDP. Measured intangibles, together with a broader range of investment-like activities that companies use to create value, are termed knowledge-based capital (KBC). Components of KBC that are not recorded in national accounts, include investment in design, new financial products, advertising, market research, training and organisational capital. Based on estimates of total KBC investment in 2010 (Corrado et al., 2012), intangible investment in the national accounts now covers 56% of total KBC on average across countries, ranging between 34% in Luxembourg to 80% in Greece.

The inclusion of intangible investments in the national accounts has led to marked changes in registered investment levels in some economies. The share of intangible capital in total investment varies considerably across OECD countries, but accounts for over one-fifth of total investment in several countries, including Ireland, Sweden, Denmark, the United States, Switzerland and France (Figure 3.9).

Figure 3.9. Intangibles account for a significant share of investment in most OECD countries

In per cent of nominal non-residential investment



Note: Latest available annual data.

Source: OECD Economic Outlook 97 database; national statistical offices; and OECD calculations.

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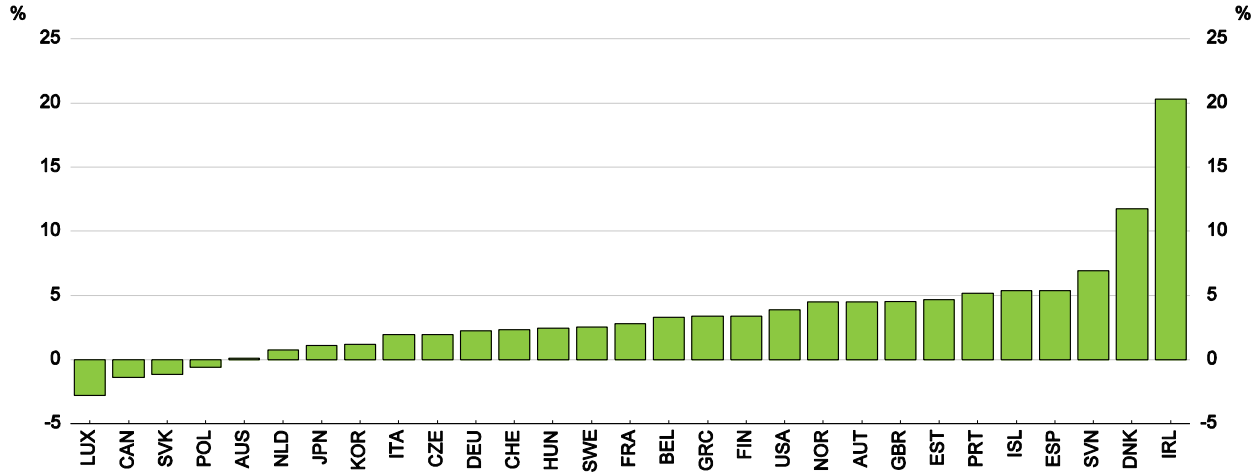
8. A few countries, including Japan, have not adopted the new national accounts system.

Figure 3.10. Intangible investment remained strong throughout the crisis

In per cent of nominal non-residential investment, change from 2007 to 2011



Source: OECD Economic Outlook 97 database; national statistical offices; and OECD calculations.

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Intangible investment affected the overall resilience of investment since the onset of the crisis. The ratio of intangible investment, as measured in the new system of national accounts, to non-residential investment increased throughout the crisis in most countries, implying that the overall weakness in total investment is generally attributable to weaknesses in tangible investments, such as structures and business equipment (Figure 3.10).[9]

The relative resilience of intangible investment could indicate that intangible investment is less cyclically sensitive than physical investment or benefited more from government actions at an early stage of the crisis. It may also reflect longer-term shifts toward a higher share of intangibles in many goods and services. Ultimately there is likely to be strong complementarity between intangible and tangible capital. For example, successful R&D investment may result in tangible investment with a lag, and business software complements capital spending on ICT capital goods. At a disaggregated level, important complementarities are found to exist between different types of investment. One example is the significant complementarity of organisational capital (not included in national accounts) and ICT capital investment (Andrews and Criscuolo, 2013).

The contribution of different sectors to the weakness of investment in advanced countries

Nominal gross investment as a share of nominal GDP is a measure of the proportion of output value that is being allocated towards capital spending. Volume measures, already discussed, measure the share of an economy's real resources that are allocated. Because the relative prices of different kinds of investment move over time (for example the declining price for ICT capital and rising prices for other types of capital) aggregate volume measures of the level of investment cannot be disaggregated for sector-level

9. Where they exist, data for intangibles not included in national accounts go only up to 2010. For many of the countries, the ratio of such intangible investment to GDP in 2010 was higher than prior to the crisis.

comparison.[10] In contrast, the nominal investment share can be disaggregated by sector, allowing the identification of the contribution of particular sectors to current shortfalls relative to pre-crisis averages.

The nominal share of gross investment in GDP has fallen relative to its historical pre-crisis average in most OECD countries. In 2014, spending on capital investment in the OECD area was still around 2% of GDP lower than its long-term pre-crisis average (Table 3.1). Different sectors of the economy have had unequal contributions to the overall shortfall of gross investment in 2014 compared with its long-term historical average in the OECD area (Table 3.1):

- Household residential investment spending (hereafter referred to as housing investment) relative to GDP accounts for the largest part of the overall shortfall despite its small share in aggregate investment.
- Government investment as a share of GDP, which rose in the initial stages of the downturn as a result of fiscal stimulus and then subsequently fell with fiscal consolidation, contributed just over a tenth of the overall shortfall in 2014.
- After gradually recovering from a sharp decline early in the crisis, business investment – the largest component of total investment – accounted for just under a third of the overall shortfall in 2014.
- As discussed above, the decline in business and government investment was concentrated on tangible investment. Indeed, intangible investment relative to GDP is now lower than its pre-crisis average in only six out of the 29 OECD countries for which data are available. The shortfall in each was small (0.6% of GDP or under).

The OECD-wide gross investment shortfall vis-à-vis its longer-term historical average, and the relative contribution of different sectors, mask significant differences across the main OECD economies (Figures 3.11 and 3.A1; CPB, 2015). In the United States and Japan the total investment shortfall compared with the pre-crisis period is larger than the OECD average, reflecting weak housing investment in the former and weak government investment in the latter. For the euro area the aggregate investment shortfall is slightly smaller than the OECD average. Other economies had more extreme departures from the average:

- A negative total investment shortfall relative to historical averages of 7% of GDP or more is seen in a few countries hit particularly hard by the crisis. In some (Greece, Ireland and Spain), the overall gaps were predominantly accounted for by housing, with only minor contributions, if any, from business and government investment shortfalls. In others (including Iceland and the Slovak Republic), weak business investment was the main contributory factor.
- A few countries, including a number of commodity exporters such as Australia, Canada and Norway, had higher gross investment ratios in 2014 than on average before the crisis. In these countries the different components of investment were generally positive or unchanged. More surprisingly, nominal gross investment exceeded historic averages in France and Belgium, despite the underlying softness of domestic demand in these economies and the weakness of investment in 2014.

10. Chained volume measures of individual components are not additive and changes in shares of different components in total investment or GDP can be very misleading when relative prices are shifting (Whelan, 2000).

Table 3.1. **Gross investment levels remain weak across OECD countries**

Per cent of GDP

	2014	Pre-crisis average (1996-2007)	Difference
Total	20.3	22.4	-2.1
Business	12.8	13.4	-0.6
Housing	4.2	5.3	-1.2
Government	3.4	3.7	-0.3

Note: Aggregate based on PPP weights. Only includes countries where component level data are available.
Source: OECD Economic Outlook 97 database.

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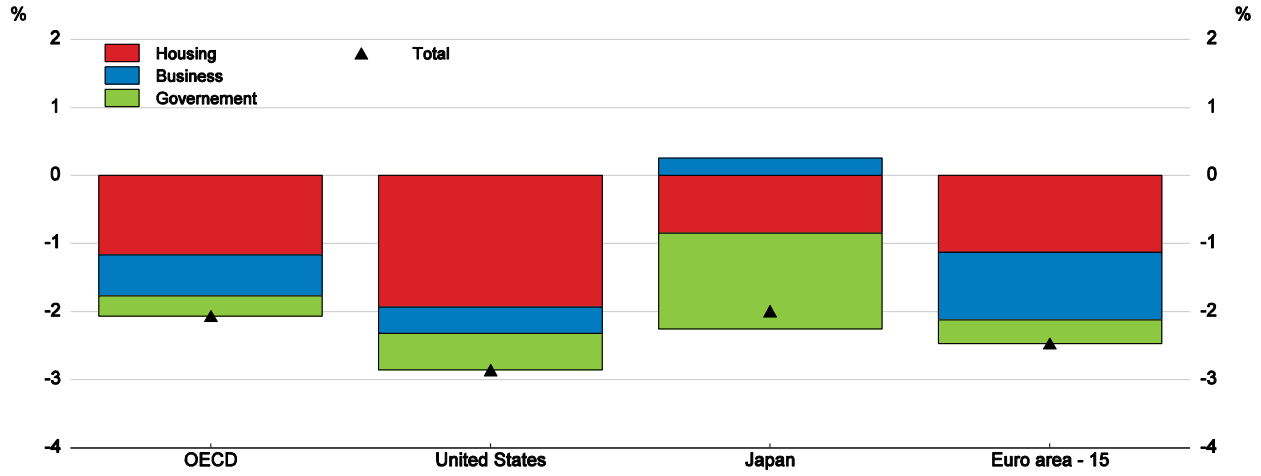
Figure 3.11. The composition of gross investment shortfalls differs across countries

In per cent of GDP, 2014 minus 1996-2007 average



Source: OECD Economic Outlook 97 database; European Commission; and OECD calculations.

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Lower investment in particular sectors compared with pre-crisis historical norms does not indicate that investment needs to attain such norms in the future. Pre-crisis investment levels may have been boosted by special circumstances. This applies in particular to housing where easy access to mortgage credit at low interest rates inflated residential construction well beyond sustainable levels in a number of countries. This set the stage for a subsequent housing collapse with serious implications for the rest of the economy, particularly employment, given the high labour intensity of residential construction. In the future, without such a housing bubble and with a slowdown in population growth or population declines in many OECD countries, housing investment is likely to be lower than prior to 2008. Population ageing is found empirically to have a significant negative impact on housing investment in the OECD countries (Lindh and Malmberg, 2008).[11] Lower housing investment may have negative implications for durable goods consumption as well as employment. Housing investment was covered extensively in earlier OECD research (Andrews et al., 2011).

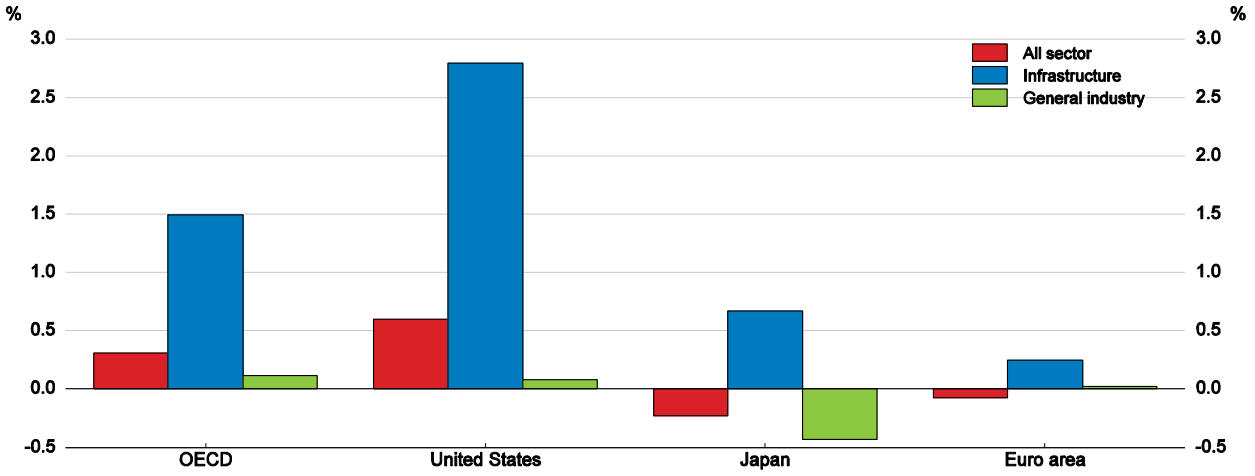
11. Reduced housing investment due to population ageing induced lower demand for housing may be mitigated somewhat by works to adapt housing for needs of elderly as well as investment in renovation.

For business and government investment, the continuation of weak capital spending will depress both current and future demand and potential growth, limiting employment prospects, undermining consumption, and reducing the capacity of economies to provide for their citizens, support diffusion of innovation, and repay fiscal obligations. The remainder of this chapter will focus on the determinants of business and government capital spending and the policies required to increase such spending.

A more nuanced view of capital spending is obtained from company data on global gross investment (expressed relative to global sales rather than value added) of OECD listed (and thus relatively large) companies. For this set of large companies, their global capital spending relative to global net sales was actually higher in 2013 than the 2002-07 average in the OECD area (Figure 3.12; Table 3.A1 shows the record for most OECD countries; OECD, 2015d). The difference from national account data (discussed above) is consistent with a number of stories. First, a large part of the shortfall in OECD countries could be attributed to relatively smaller companies that may have been more strongly affected by the downturn than their larger counterparts. Indeed, investment rates (i.e. investment relative to the capital stock) are higher for smaller companies compared to larger ones, at least in the United States (Gala and Julio, 2012). Second, the discrepancy between company data and national accounts could reflect a shortfall in investment by listed companies in OECD economies at the expense of stronger investment in non-OECD economies. The following assessment of rates of return on equity, in particular, would support this assessment, see below.

Figure 3.12. Global capital spending departure from average for OECD listed companies

Nominal gross capital spending, in per cent of net global sales, 2013 minus 2002-2007 average



Source: Datastream; and Blundell-Wignall and Roulet (2015).

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Infrastructure investment

Infrastructure investment is one area of particular attention. The societal cost of shortfalls in infrastructure could be large. Infrastructure has traditionally comprised transportation, utilities and telecommunications, but now also includes in principle knowledge and digital infrastructure, notably broadband networks.[12] Recent levels of traditional infrastructure investment are not, in aggregate, particularly low compared with pre-crisis capital spending (Figure 3.13) and the global infrastructure investment by listed companies headquartered in the OECD area is estimated to exceed pre-crisis levels (Figure 3.12). However, past infrastructure spending in many OECD countries, including the United States, has not been sufficient to make up for capital depreciation, with the result that a backlog of replacement and maintenance investment has been building up (Dobbs et al., 2013; American Society of Civil Engineers, 2013).

Additional capital spending is also required to help achieve long-term policy objectives, such as those related to climate change and environmental quality. Although future investment needs are difficult to assess (because they depend on how demand shifts in response to prices that account for externalities), these challenges are particularly likely to be present in the energy, water and transportation sectors.

- In the energy sector, the IEA estimates that in order to maintain existing infrastructure and replace plants and structures that will become obsolete in the OECD, average annual capital spending in the coming decades will need to be 1% of GDP higher than average annual spending in the 2000-13 period (IEA, 2014).[13] Improving energy efficiency will require further spending equivalent to 1.3% of GDP per year, and additional investment of 0.6% of GDP may be needed to limit the increase in global temperatures to 2° C. Furthermore, targeted investment in storage and grid management technologies will be needed to facilitate the increased penetration of renewable sources of energy to meet pre-specified government goals (Johnstone and Hascic, 2012).

- In the water sector, in order to maintain existing infrastructure and to meet the needs associated with socioeconomic and environmental factors, such as rising expectations of water quality, increased pollution abatement costs, and the disruptions to resources associated with increased climate variability, average annual investment in the OECD is estimated to have to rise to around 1.3% of GDP between 2015 and 2025 (Ashley and Cashman, 2006).[14]

- In the transportation sector, estimates suggest that there is a need to sustain average annual investment in strategic transport infrastructure of around 1.4% of GDP between 2015 and 2030 (OECD, 2012).[15] Furthermore, OECD estimates of social efficiency in the road transport sector, which take travel time, accidents and emissions into consideration, are low in a number of countries (Braconier et al., 2013).

12. The concept of digital infrastructure has been broadening over recent years, with access to spectrum and IP addresses increasing in importance. See OECD (2014b) for several digital infrastructure indicators.

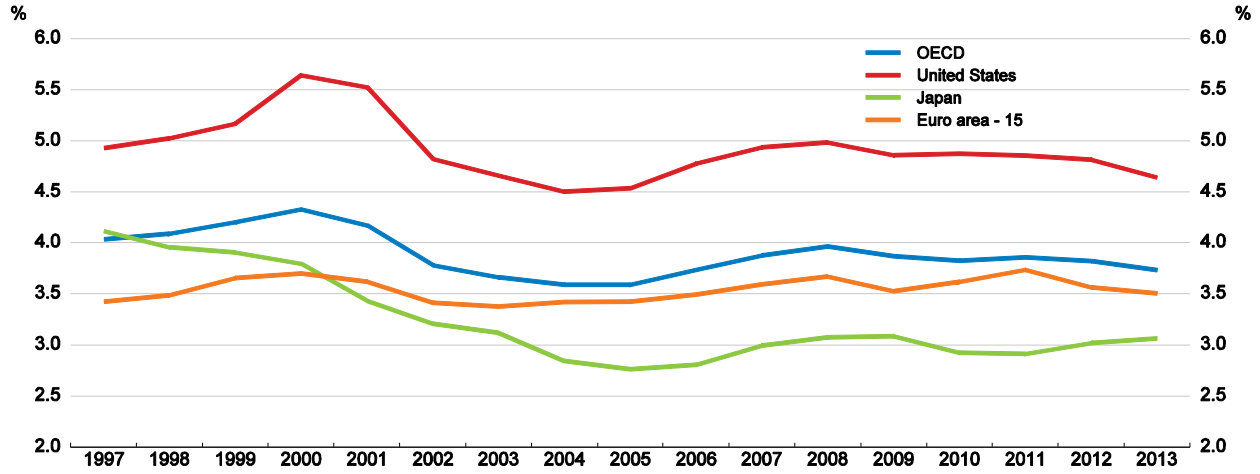
13. It should be noted that the 2013 investment level was much higher than the 2000-13 average and close to the required future level for maintenance and replacement investment.

14. For comparison, investment in water infrastructure in the United States averaged 0.2% of GDP in the 2000-13 period.

15. Strategic transport infrastructure includes airports, ports, new rail construction, and oil and gas transportation and distribution.

Figure 3.13. Infrastructure investment has been weak across the OECD

Nominal infrastructure investment share of GDP



Note: Infrastructure includes public and private investment in utilities, transportation, and communications.

Source: OECD Economic Outlook 97 database; national statistical offices; and OECD calculations.

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Infrastructure investment requirements are likely to rise in EMEs, despite the high levels of investment in some of the largest economies. As these countries continue to urbanise and industrialise at an unprecedented rate, there is an overwhelming strain and an urgent need to expand and modernise existing infrastructure networks, though, as in OECD economies, investment requirements will depend on the extent to which negative externalities will be priced.[16] For instance, average annual investment in the energy sector as a whole in the non-OECD area would need to increase by more than 60% in 2014-35 compared with average annual investment in the 2000-13 period to satisfy expanding primary energy demand (IEA, 2014).

Investment in transport infrastructure will be particularly important going forward. According to the *ITF Transport Outlook 2015* (OECD/ITF, 2015), global road and rail passenger travel will increase by between 120% and 230% and growth in global road and rail freight volumes will increase by anywhere between 230% and 420%. EMEs will account for the largest share of these increases, with 90% of all urban-dwellers living in EMEs by 2050, and China and India will account for over 50% of world surface transport by 2050, an increase from the current 35%.

Forces affecting business investment

This section reviews potential determinants of business fixed investment, the largest component of total investment, and assesses the extent to which they have been acting to constrain investment growth since the start of the crisis. The initial focus is on output growth and the user cost of capital, two of the principal determinants of investment in many empirical models (Box 3.2; Annex 3.1). Then factors related to firms' balance sheets, uncertainty and regulations are analysed.

16. The domestic market prices of fossil fuels are significantly distorted by large government subsidies in most countries. Recent IMF estimates suggest that eliminating existing energy subsidies could cut global carbon dioxide emissions by more than 20% and raise government revenue by 3.6% of global GDP (Coady et al., 2015).

Box 3.2. The drivers of business investment in advanced OECD countries

This box summarises OECD estimates of the drivers of business capital stock and its changes (Table below). The empirical investigation draws on the neo-classical model of investment. It is based on a two-stage error correction modelling framework for a panel of 15 advanced OECD economies (see Annex 3.1 for more details).

Anticompetitive regulation hampers capital accumulation in the long run

In the long run, business capital stock (capital stock excluding housing) should be related to the level of real output, the user cost of capital and product market regulation. The estimation results indicate that the output elasticity of the capital stock is close to 1, implying a stable capital-to-output ratio in the long run. The cost of capital turns out not to affect the capital stock significantly, which is in line with earlier findings (Sharpe and Suarez, 2014). Only the nominal interest rate has the expected negative sign, in contrast to the real interest rate and relative investment prices, which are included in the user cost of capital (Box 3.4). The elasticity on product market regulation, captured by the OECD's energy, transport and communications regulation (ETCR) indicator is strongly negative and increases over time. This implies that more stringent product market regulation is associated with a lower capital stock.

Accelerator effects are reinforced by foreign demand growth

Estimations of short-term dynamics in the error correction model incorporating an accelerator effect confirm the importance of domestic output growth for changes in the capital stock (net business investment, excluding housing, over lagged capital stock). They also show that foreign demand growth is positively correlated with changes in the capital stock beyond the direct impact of net exports.

Increased uncertainty and financial constraints slow down capital accumulation

Additional short-term drivers suggest that a higher level of country-specific economic policy uncertainty, an increase in global policy uncertainty and higher inflation volatility are associated with lower changes in the capital stock. Increasing financial constraints are negatively related to investment for a subgroup of European countries.

The long- and short-term drivers of business capital stock

LONG-RUN RELATIONSHIP *dependent variable = log capital stock*	1985 2013		1993 2013		SHORT-RUN DYNAMICS *dependent variable = d(log capital stock)*	1985 2013		1993 2013		1985 2013		1985 2013		1985 2013	
log real output	1.23	**	1.05	**	d(log real output) (-1 to -3)	0.467		0.309		0.249		0.462		0.264	
log long-term interest rate	-0.08	**	-0.02		d(log foreign output) (-1)	0.353	**	0.339	**	0.243	**	0.302	**	0.221	**
log ETCR indicator	-0.06	**	-0.09	**	cpi_volatility(-1)	-0.0004		-0.0004	*						
					cpi_volatility(-1)^2	-8.E-06		*							
					log economic policy uncertainty (-1)					-0.0020	**				
					d(log global uncertainty) (-1)							-0.0018	**		
					financial constraints (-1)									-0.0003	**
No. obs	1674		1239			1634		1243		1230		1644		805	
No. of countries	15		15			15		15		15		15		8	

Note: * and ** denote statistical significance at the 10% and 5% levels, based on robust standard errors. The long-term relationship includes country and year fixed effects, the short-term dynamics include country fixed effects. The full short-run dynamics including the error correction term and the lagged dependent variable is reported in Annex 3.1. The coefficient estimates for the short-run dynamics are normalised by the lagged dependent variable. d(log real output) (-1 to -3) sums up the effect of d(log real output)(-1), d(log real output)(-2) and d(log real output)(-3).

Source: OECD calculations.

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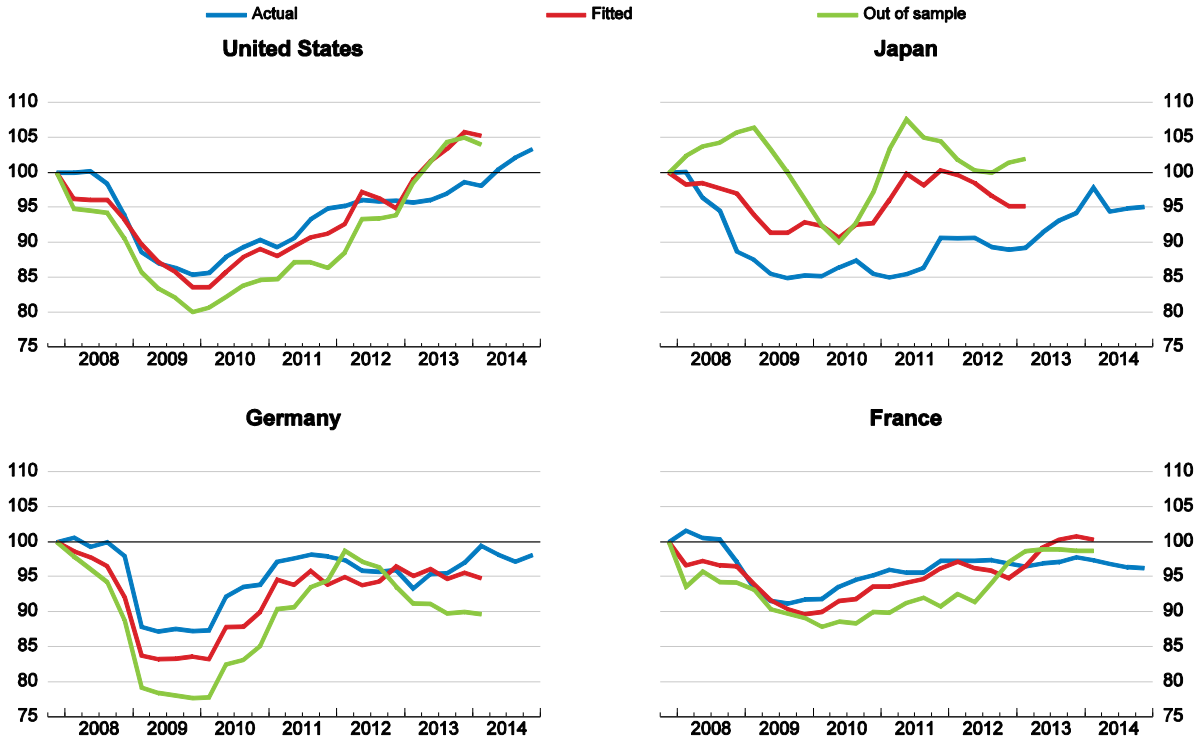
The role of aggregate demand

The modest pace of the recovery in the advanced OECD economies from the crisis has been one factor keeping investment growth in check. Empirical analyses typically find that output growth has a key role in explaining short-term swings in investment (Chirinko, 1993). New OECD empirical analysis based on a model linking investment with GDP confirms the importance of output developments in explaining movements in business investment (Figure 3.14; Box 3.2; Annex 3.1).[17] Although the findings differ somewhat across the economies examined, the model largely tracks the downturn in investment at the height of the crisis and the dynamics of investment in recent years. So, it remains that the predominant factor associated with sluggish investment since the crisis is persistently weak output developments, both domestic and global. In effect, many economies have become stuck in a low-growth and low-investment equilibrium, with persistent unemployment, stagnant wages, and non-robust consumption. The model and empirical work, however, would also be consistent with a higher-level equilibrium, whereby more robust investment generates more jobs, higher wages, and stronger consumption, which then ratifies the stronger investment. The key is how to get from the low-level equilibrium to the higher-level one.

Figure 3.14. A simple accelerator model of business investment

Index 2007q4 = 100



Note: The figure depicts out-of-sample forecast for and in-sample fit of investment estimated until 2007Q4 and 2014Q1, respectively, based on equation (1) in Annex 3.1. Actual GDP series are used to calculate forecast and model fit for the 2008-14 sample period.

Source: OECD Economic Outlook 97 database; and OECD calculations.

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17. Country-specific estimations are based on equation (1) in Annex 3.1, where the level of investment is explained by current and lagged changes in real GDP, and replacement investment. An automatic model selection is performed allowing for up to 16 lags. For Japan, the model selection gives a lag length of zero. Therefore, results shown in Figure 3.14 are based on a model including 8 lags of change in output for this country.

Subdued domestic demand growth, and thus weak investment via the accelerator mechanism, is partly due to sluggish private consumption growth. A number of factors account for weak consumption growth.

- In the near term, household balance sheets remain bloated with debt in some countries (Annex 1.1). Indeed, the savings rates have increased strongly in some countries (Chapter 1). Even as households get increased purchasing power through oil price declines or exchange rate adjustments, they use these benefits to deleverage. While necessary for household financial stability, collectively this behaviour can lead to weak consumption at the macro level.

- Slow-growth in consumption can also result from the nature of post-crisis jobs and wage dynamics. An immediate reaction to the crisis led firms in some countries to increase reliance on temporary or other atypical job contracts, with little job progression or opportunities for training. Associated, the depth and length of the crisis has led to an exceptional moderation in both nominal and real wage growth, with a substantial proportion of workers experiencing real wage declines (*OECD Employment Outlooks* – OECD, 2013, 2014c). While helping promote the competitiveness of the economy, particularly important in the context of some European economies, this significant wage moderation has likely limited consumption growth (and therefore investment) while also fuelled inequality.

There are long-run consequences of the weak labour market and unequal income climate that further feeds back to undermine investment today and potential growth in the future. Today's rising income inequality appears to hold back investments in education, a key factor in potential output growth (*In It Together: Why Less Inequality Benefits All* – OECD, 2015h).

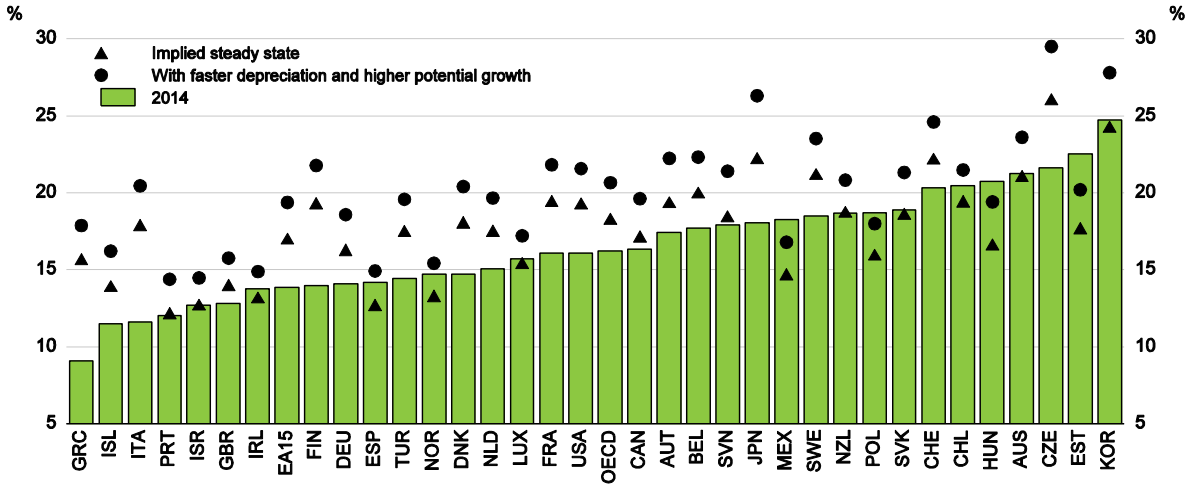
Significantly stronger investment levels are needed in most economies if potential growth – which represents the capacity to raise living standards, enhance diffusion of innovations and repay obligations – is to be increased in the medium term. An indication of the differences between current investment levels and longer-term benchmarks is provided by calibrated estimates of the steady-state investment-to-output ratio using OECD long-term projections that implicitly imply a return to pre-crisis potential growth rates for the OECD area as a whole as well as for the United States and the euro area (Lewis et al., 2014).[18] Updated estimates, incorporating intangible investment into the capital stock and non-housing fixed capital investment, suggest that current investment levels in OECD economies are below their benchmark steady-state levels. The average shortfall for the OECD is 2.5%, with one-third of the countries estimated to have larger shortfalls (Figure 3.15). These shortfalls would be even higher, for higher values of the depreciation rate or if structural reforms were to significantly boost trend output growth. If trend output growth and the depreciation rate were to be ½ percentage point higher each, the benchmark investment-to-output ratio, and hence the current investment shortfall, would be an additional 2.4 percentage points higher in the OECD, taking the total shortfall to nearly 5 percentage points.

For many large companies, global or regional demand may be as important as domestic demand for their investment decisions (Box 3.2). Equally, there may be a channel via business confidence, with depressed foreign markets undermining domestic animal spirits over and above that induced by weak exports. A weak international environment might also lower the profits of foreign subsidiaries of domestic corporations and thereby limit the internal funds available to support capital expansion at home.

18 . The steady-state level of investment to (potential) output is given by: $i^* = \frac{k^*(g+\delta)}{(1+g)}$, where k^* is the steady-state capital-output ratio, δ is the depreciation rate and g is the endogenous potential growth rate at full employment, which is dependent upon labour utilisation, physical and human capital intensity and multi-factor productivity.

Figure 3.15. Investment ratios are below benchmark steady-state estimates in most OECD economies

Non-residential investment as a percentage of potential GDP



Note: Countries are ordered by the 2014 investment ratio.

Source: OECD Economic Outlook 97 database; Lewis et al. (2014); and OECD calculations.

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New empirical and survey evidence also point to the importance of global as well as domestic demand contributing to lower investment levels. Research reported in Box 3.2 and Annex 3.1 shows that an increase in foreign growth is found to increase the level of investment in the short term by more than is already accounted for by the impact of higher export growth on domestic output growth. Respondents to the BIAC 2015 Business Climate Survey also cite insufficient global demand more often than insufficient domestic demand as a "very important" constraint on investment in their country (Box 3.3).

The user cost of capital

The user cost of capital and its components (Box 3.4 and Figure 3.16), which in theory have an important impact on business capital spending in the long run, are now unlikely to be a constraint on investment growth, at least for large companies. Indeed, only a handful of countries in the BIAC survey (Box 3.3) identify the lack of sufficient finance as a very important problem for investment.

Financing costs have recently fallen to exceptionally low levels. Both investment grade and junk grade companies can now borrow at rates not far above ultra-low government bond yields, and the cost of equity is similarly low, reflecting the recent strength of global stock markets. These developments have been driven, at least in part, by exceptionally supportive monetary policies, including policy rates that are close to zero, forward guidance and quantitative easing. Very low interest rates have also boosted equity prices, with Tobin's Q – proxied by the ratio of the stock market valuation of businesses to their net worth – rising to very high levels in the United States.[19] However, the implementation of such very supportive policy stances over a protracted period has not succeeded in reviving capital spending significantly. A further decline in financing costs was prevented by rising depreciation rates.

[19] Tobin's Q now exceeds 1.1, which is its highest level since 1945 with the exception of the dot-com boom period when it rose to 1.6. However, as mentioned in Annex 3.1, this indicator has not been successful in explaining aggregate investment.

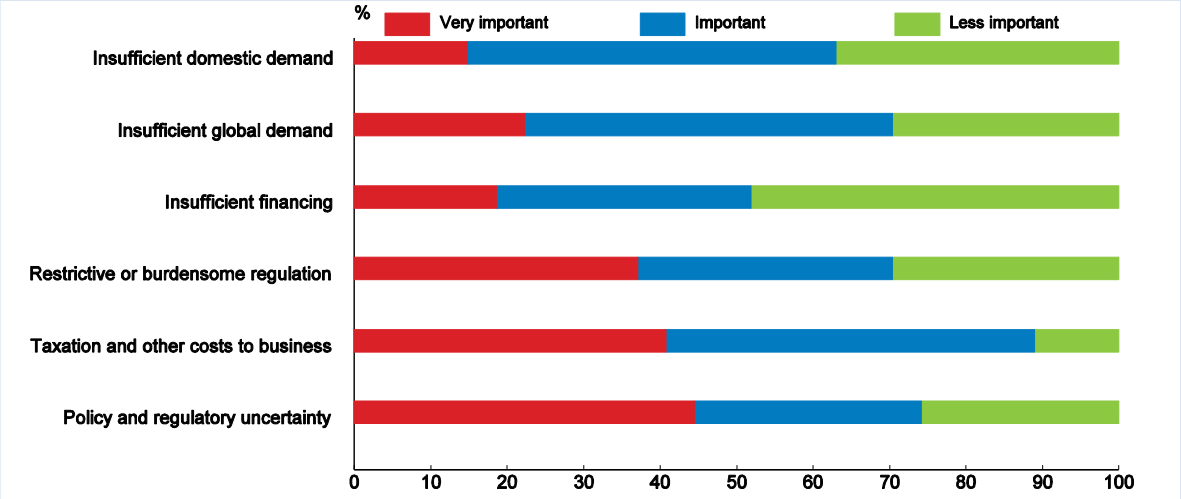
Box 3.3. The BIAC Business Climate Survey 2015

One source of information about the current factors restraining corporate investment is the Business Climate Survey undertaken by the Business and Industry Advisory Committee to the OECD (BIAC) in late March and early April 2015. The survey included a number of different questions on investment, including one in which respondents were asked to identify the main restraints on investment at present from a list of six options, covering national and global demand, insufficient financing, restrictive or burdensome regulations, taxes and other costs, and policy/regulatory uncertainty. Respondents were given the option of choosing between "Very important", "Important" or "Less important". Other questions covered the general business climate and employment prospects.

The responses to the survey differ from those to a typical business survey in that the replies were received from national business associations, thereby providing a summary overview of the conditions prevailing in their respective locations. Overall, responses were received from 27 national business associations, covering both OECD and non-member countries.

The percentage of replies received to each possible restraint on investment is shown below.

BIAC Business Climate Survey: Constraints on capital spending



Note: As a percentage of respondents to the question 'What are the most important factors that may be constraining investment in your country at present, if any?'.

Source: BIAC Business Climate Survey 2015, available at www.biac.org

StatLink http://dx.doi.org/10.1787/888933221668

Overall, respondents identify policy and regulatory uncertainty, as well as taxation and other costs to business, as being the most important investment constraints, followed closely by restrictive or burdensome regulation. A comparatively smaller share of respondents cite insufficient financing and global/domestic demand as being the most important constraint on capital spending in their country, but these are nevertheless still cited as "Very important" or "Important" by more than half of all respondents.

Box 3.4. The user cost of capital

The user cost of capital can be derived using a Hall-Jorgenson rental rate formula for the cost of a unit of capital services. A representative measure of the real user cost of capital, as shown in Figure 3.16, is constructed using the formula:

$$\mathrm{UCC} = \frac{\mathrm{P^K}}{\mathrm{P^Y}}(\theta(1-\tau)\mathrm{i} + (1-\theta)\mathrm{i} - \pi + \delta)\left(\frac{1}{1-\mathrm{EMTR}}\right),$$

where P^K/P^Y is the relative price of business investment to GDP; θ is the fraction of debt in corporate liabilities (using the 1999-2013 average); τ is the statutory corporate tax rate; i is the long-term government bond rate (i.e. abstracting from the differences between business and government borrowing rates); π is the change in the GDP deflator; δ is the real depreciation rate on the business and public capital stock; and *EMTR* is the effective marginal tax rate obtained from the Oxford University Centre for Business Taxation (CBT) Tax Database which allows for the deductibility of depreciation expenses, though not investment tax credits. The statutory rate is used with these data to backcast the tax wedge in those countries in which the CBT Tax Database does not have complete coverage over the sample period analysed.

The above formula can be decomposed into three components: the relative price of investment goods, financing term and the tax wedge. The financing term can subsequently be broken down into the real tax-adjusted interest rate and the real depreciation rate. As demonstrated in Figure 3.16 for G7 countries, the most cyclical component is the real tax-adjusted interest rate, which has declined to close to zero over the past year. The remaining components exhibit secular trends:

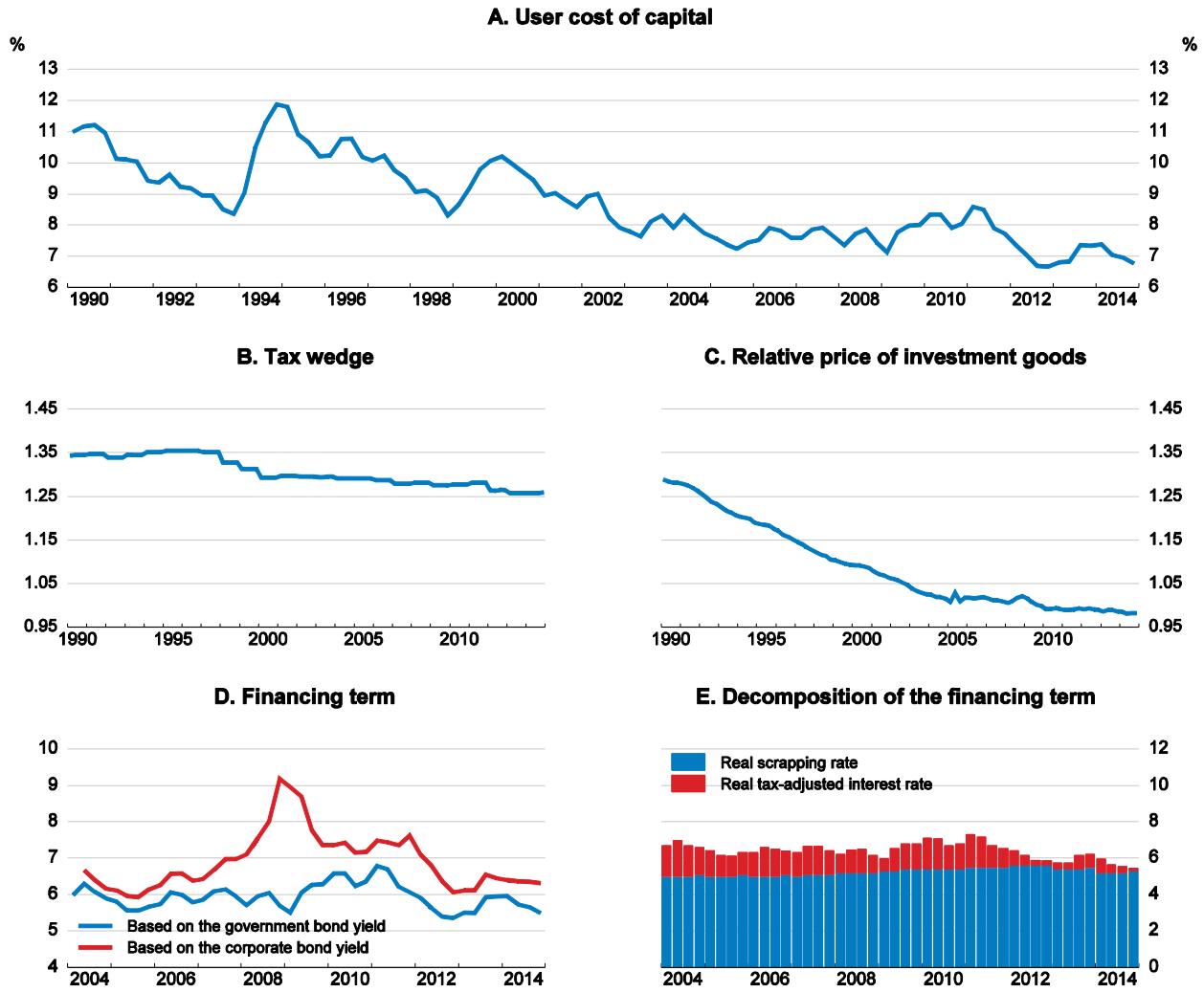
- The long-term decline in the relative price of investment goods, largely reflecting ICT-related quality improvements, appears to have slowed sharply from around 2005 onwards.
- The gradual increase in depreciation rates discussed earlier has contributed to the rise in the cost of capital. At present, average depreciation rates of around 4½ per cent are by far the biggest component of the real cost of capital in most countries.
- The corporate tax wedge has gradually drifted down over time, reflecting governments' policies to reduce corporate taxation.

For small firms and other borrowers that are traditionally dependent on bank credit, the user cost of capital is likely to be higher than shown, and possibly substantially higher, due to the constraints on credit supply arising from weak or impaired banking systems. This "credit channel" is likely to have been particularly important at the height of the financial crisis and early in the recovery, but is still present in several economies, especially in the euro area, and likely to be restraining investment (ECB, 2013; IMF, 2015; Box 3.2; Annex 3.1). Thus, the spreads between average bank loan rates and government bond yields have risen since the immediate pre-crisis period in European economies and Canada (Figure 3.17).[20] Bank lending standards are now unwinding, but have not yet sufficiently offset the substantial tightening in the immediate aftermath of the crisis, especially in the euro area (Figure 3.18). Evidence from a number of corporate surveys suggests that the constraints imposed by adverse financial conditions during the crisis have now faded to pre-crisis levels in most economies, but not in the euro area (Figure 3.19).

20. This is an imperfect proxy for the marginal cost of new funds.

Figure 3.16. The user cost of capital has declined over time

Weighted average of G7 countries



Note: The financing term incorporates the tax deductibility of debt interest payments and is inflation-adjusted.

Source: OECD Economic Outlook 97 database; Datastream; Oxford University Centre for Business Taxation; and OECD calculations.

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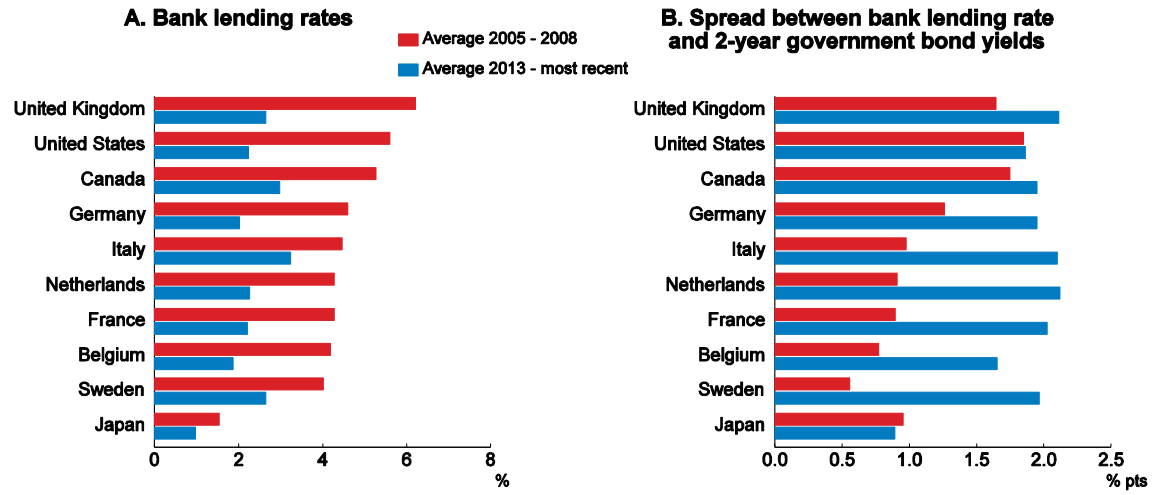
Figure 3.17. Bank lending rates have declined but spreads have risen



Note: Weighted average across all maturities. Average maturities may differ across countries. Data are lending rates (all maturities) for loans to non-financial corporations for the United States, rates for new loans to non-financial corporations and averages across member countries for the euro area, rates for new loans to non-financial corporations and households for Japan, rates for new loans to non-financial corporations for the United Kingdom, rates for new prime loans to non-financial corporations for Canada, rates for new loans to non-financial corporations for Sweden.

Source: Bank of England; Bank of Japan; Datastream; European Central Bank; Riksbank; US Federal Reserve; and OECD calculations.

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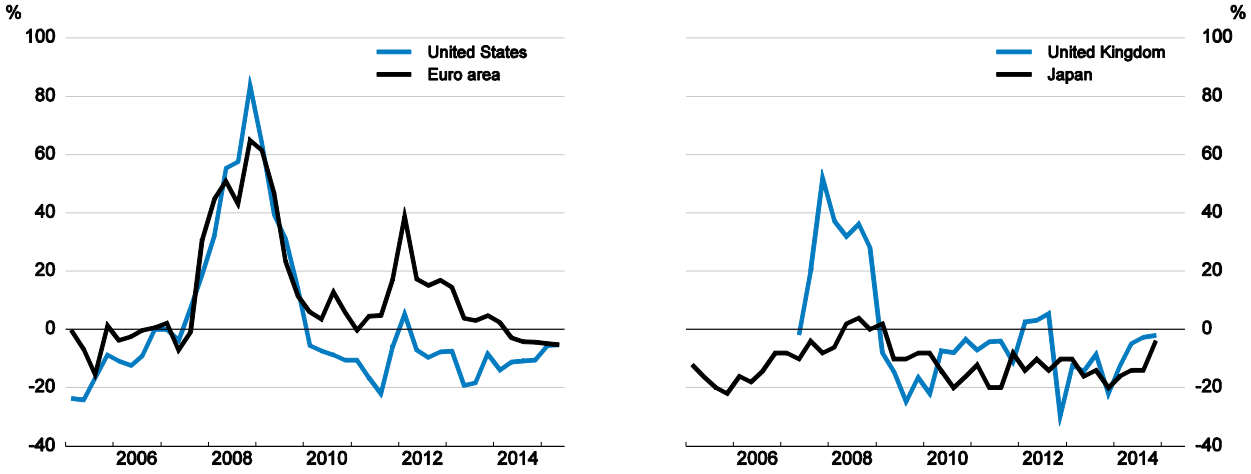
Figure 3.18. Credit standards tightened significantly in 2008-09

Net percentage of banks tightening standards



Note: Positive numbers indicate credit availability contracting and negative numbers indicate credit loosening. For the United States, the survey question relates to bank loans to large and medium-sized firms, the euro area to large enterprises, the United Kingdom to the overall corporate sector, and for Japan to large firms.

Source: Bank of England; Bank of Japan; European Central Bank; and US Federal Reserve.

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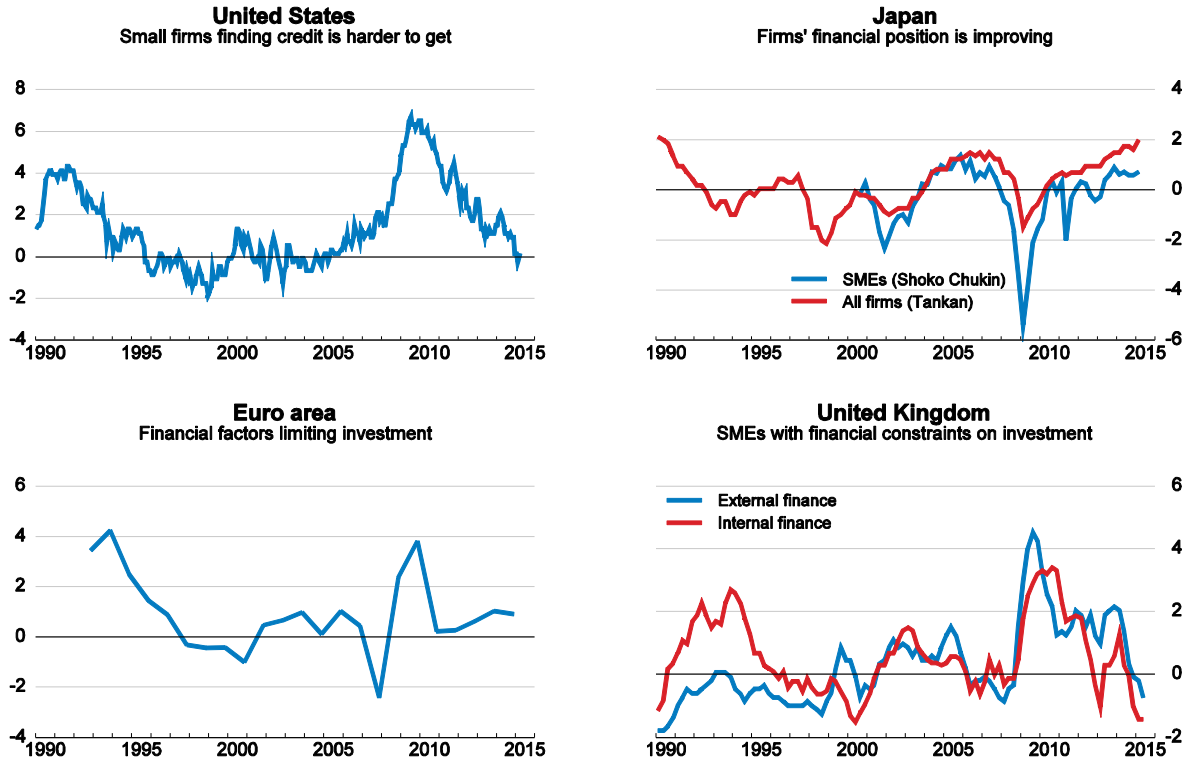
Figure 3.19. Financial factors have constrained investment in recent years

Normalised over 1996-2007; in standard deviations



Note: US data are from the NFIB survey and smoothed using a 3-month moving average. UK data are from the CBI survey and smoothed using a 4-quarter moving average. Euro area data are for manufacturing firms.

Source: Datastream; European Commission; and OECD calculations.

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Investment should have been boosted by lower corporate tax rates, in line with empirical evidence (OECD, 2010). Indeed, over half of OECD countries have reduced statutory corporate tax rates since 2007. However, in the case of multinational corporations that engage in tax-motivated profit shifting (OECD, 2015d), the investment response may have been muted. Given that they had already shifted their taxable income to low-tax jurisdictions, their effective average and marginal tax rates were already lower than domestic tax parameters would imply. Consequently, changes in domestic tax rates have had little effect on their effective rates. Indeed, recent OECD analysis finds that capital spending of such companies is significantly less responsive to changes in domestic tax systems than that of companies with limited international profit-shifting opportunities (Johannson et al., 2015). Some countries have also introduced temporary tax credits or strengthened investment allowances for a fixed period since the crisis began. This may have affected investment positively at the margin, notably by bringing forward investment plans to benefit from the temporary tax relief.

As generally measured, the relative price of investment has been broadly constant since just before the onset of the financial crisis in 2007 and thus has not contributed to lowering the user cost of capital. However, the recent stability of the relative price of investment may partly be due to quality improvements which have not yet been sufficiently incorporated into ICT prices.[21] Further work is needed to assess the extent to which this mis-measurement may be affecting the assessments of relative price and capital spending.

Corporate balance sheets and profitability

Although the composition of non-financial corporate balance sheets at the onset of the crisis depressed capital spending, it should not be constraining corporate investment significantly at present. Despite marked differences across a number of OECD economies and the aggregate euro area economies, three important features stand out (Table 3.2):

- As the crisis got underway in 2008, debt leverage (expressed relative to equity) was at relatively high levels in all economies, in part reflecting the collapse in stock markets as well as the build-up of corporate debt. High leverage contributed to the large reductions in investment volumes at the height of the crisis (Davis, 2010; Lewis et al., 2014). However, non-financial corporate leverage has subsequently declined considerably in some but not all countries. In the United States, Japan and the aggregate euro area it is now at or below pre-crisis norms for non-financial firms. Consequently, this source of balance sheet pressure is unlikely to be acting as a significant restraint on investment levels in these economies, unless companies aim at reaching even lower leverage. In contrast, in Italy and Australia, and to a smaller extent in France, Portugal and the United Kingdom, debt leverage remains well above levels at the start of the crisis, suggesting it could now be limiting new investment.

- Liquidity does not appear to be a constraint on corporate expenditure. In most big OECD economies the post-crisis share of financial assets held as currency and deposits by non-financial enterprises is presently above longer-term norms. These higher levels of liquidity imply that large companies may now have only a limited need for external finance for new investment projects. The present levels of corporate liquidity imply that many forms of corporate expenditure – including mergers and acquisitions, fixed investment and dividends – could rise substantially as uncertainty eases and private demand strengthens. For example, the reductions in holdings of currency and deposits that would occur if the share of currency and deposits in total financial assets returned from the 2014 level to the average over 1999-2007 are equivalent to 15% of the 2014 level of business investment in Japan, 7% in Germany and 3% in the United States. However, to the extent that the build-up in cash holdings reflects precautionary motives arising from continued uncertainty about demand and external financing conditions (Bates et al., 2009; Sanchez and Yurdagul, 2013), the feed-through of improved liquidity into investment and other forms of corporate expenditure could take some time to emerge.

21. Indeed, new work by Byrne et al., (2015) shows that there are large discrepancies between the published PPI price for microprocessor units when compared with prices estimated using a hedonic measure that accounts for quality improvements given the prevailing market pricing regime for semiconductors. They estimate that between 2008 and 2013, prices fell by an average annual rate of 43% compared to an average decline of 8% according to the PPI data.

Table 3.2. **Significant changes have occurred in non-financial corporate balance sheets since the crisis began**

	Debt-to-equity ratio			Share of cash & deposits in total assets (%)			Share of debt securities in debt (%)		
	Average 99Q1-07Q4	2008Q4	2014Q3	Average 99Q1-07Q4	2008Q4	2014Q3	Average 99Q1-07Q4	2008Q4	2014Q3
United States	0.62	0.87	0.58	8.88	7.81	9.21	24.25	20.80	25.84
Euro area	1.09	1.30	0.94	10.15	11.77	11.80	5.31	4.87	8.57
Japan	1.65	2.04	1.14	23.10	24.52	24.15	12.03	10.52	9.60
Germany	1.29	1.57	1.12	10.24	11.76	10.91	3.80	5.05	5.29
France	0.67	0.90	0.70	4.36	6.20	7.47	12.85	9.89	16.70
United Kingdom	0.86	1.30	0.89	22.20	21.58	31.01	16.21	13.00	17.27
Italy	0.80	0.88	1.20	21.12	24.72	17.73	4.24	4.42	8.40
Canada	0.87	1.09	0.90	15.20	20.69	20.82	24.00	18.20	21.90
Australia	0.57	0.91	0.71	35.40	41.75	44.19	28.80	22.48	22.25
Belgium	0.94	0.95	0.75	9.71	8.08	9.49	2.91	2.75	6.08
Greece	0.94	2.65	1.47	63.72	57.84	57.31	7.28	16.78	1.23
Ireland	1.19	1.75	1.00	20.14	19.12	8.25	2.98	1.51	2.86
Korea	3.41	2.75	1.37	3.41	2.75	1.37	3.41	2.75	1.37
Norway	1.22	1.25	0.94	10.91	10.97	10.10	8.99	6.77	11.46
Portugal	1.48	1.76	1.51	12.92	10.70	10.21	6.34	8.86	10.57
Spain	1.01	1.41	0.87	9.93	11.15	11.19	1.44	0.66	1.71
Sweden	0.79	1.01	0.57	6.13	7.41	5.90	7.11	7.41	10.19

Note: Main differences with Table 2 in Lewis et al. (2014) refer to changes in classification of non-financial corporations in the new system of national accounts.

1. Average ratio are for the period 2001Q2 to 2007Q4 for Japan and Ireland.
2. Latest date is 2014Q2 for Japan, Canada, Korea and Norway.

Source: OECD Financial Accounts database SNA2008; Eurostat ESA2010; OECD Financial accounts SNA1993 and OECD calculations.

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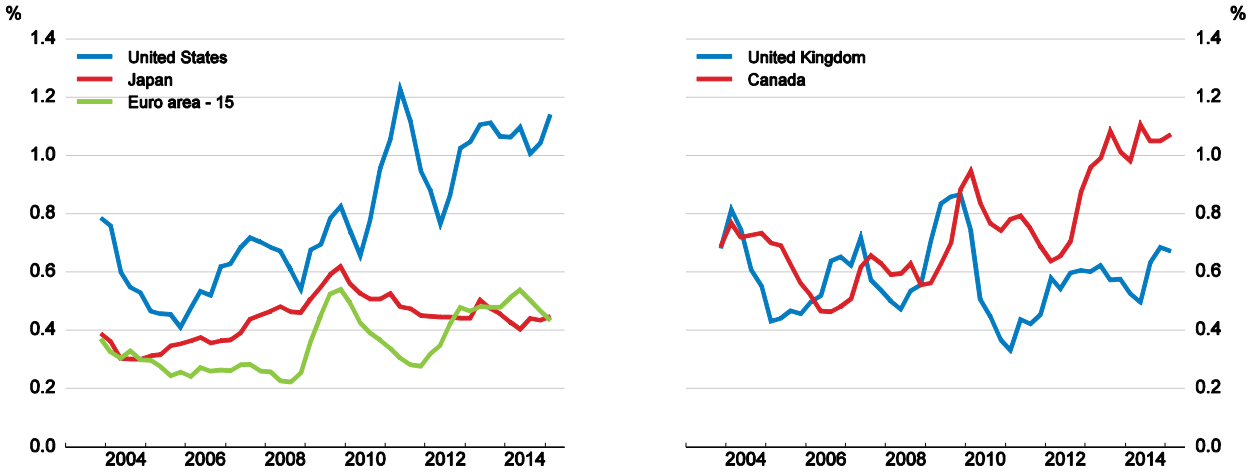
In some economies the share of debt securities in total debt has risen since the onset of the financial crisis. This development has been especially pronounced in France, Italy, Norway, the United Kingdom and the United States. In contrast, only small changes have occurred in Japan and Germany, where historically external finance has been based largely on bank credit. In the context of the low level of long-term interest rates, weak banking systems and investors' growing appetite for risk, additional corporate bond issuance has provided a means for companies in all the major countries to raise additional financing at a relatively low cost (Figure 3.20; OECD, 2015d). This should support corporate expenditure, potentially including investment.[22] However, the low cost of debt relative to equity has encouraged companies to borrow to return funds to shareholders, through buybacks and dividends (Blundell-Wignall and Roulet, 2015; OECD, 2015d). For instance, in 2014, US S&P 500 corporations bought back just over USD 565 billion of their own shares, an amount equivalent to around three-quarters of their total capital expenditures (FactSet, 2015).

22. The source of financing also affects the type of investment: risky investment in innovation is more typically financed by equity rather than debt (Andrews and Criscuolo, 2013).

Figure 3.20. Non-financial corporations' gross bond issuance has recovered

Four-quarter moving average, in per cent of GDP



Note: Gross bond issuance of private non-financial corporations in national and foreign currencies. Issuance covers publicly-offered private bonds for Japan, long-term securities other than shares at nominal value for the euro area, and non-financial corporate new bond issues for the United States.

Source: OECD Economic Outlook 97 database; Bank of England; European Central Bank; Japan Securities Dealers Association; US Federal Reserve; and OECD calculations.

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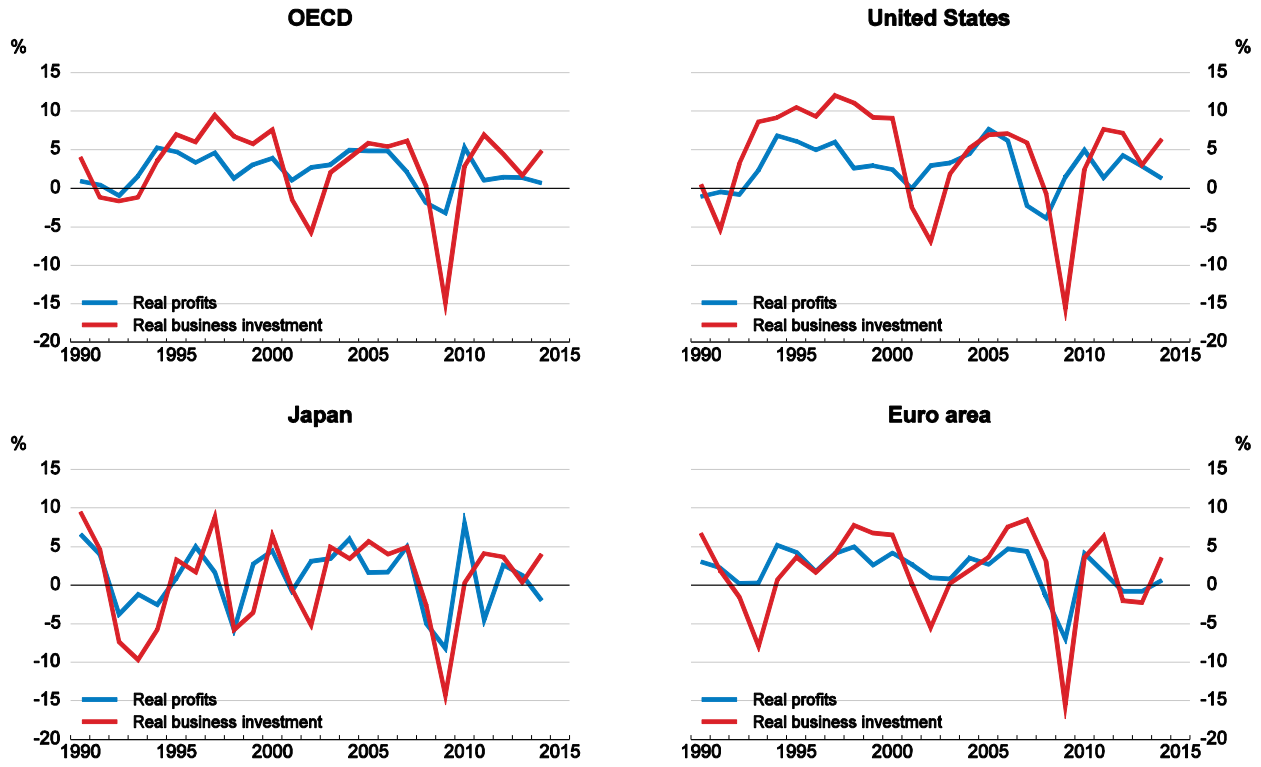
Bank balance sheets in many countries deteriorated significantly with the onset of the financial crisis with large losses threating the solvency of banking systems. Public interventions prevented a financial collapse, but the crisis left banks weak, reducing their willingness to extend credit. This was particularly relevant in vulnerable euro area countries, where banks had initially problems in funding themselves at a reasonable cost. Moreover, where the recapitalisation of banks was initially slow and banks continue to be burdened with large non-performing loans (Annex 1.1). However, according to the ECB Bank Lending Survey, over recent years, the cost of finance and balance sheet constraints have become less important in constraining the supply of credit for the euro area as a whole (ECB, 2015).

Insufficient profitability should no longer hamper capital spending by corporations in the United States, but higher profitability may still be needed in a number of other economies to support stronger investment spending. The availability of internal finance through profitability and cash flow can be important for investment (Bond et al., 2003). Weaker cash flow can exacerbate the need for external finance, and also affect the ability of a firm to borrow and the cost of credit. The available data suggest that real corporate profits (financial and non-financial enterprises) rose by an average of 1% per year overall in the past four years, compared with a four-decade average of around 3% (Figure 3.21). However, there is considerable variation across countries, with profit growth remaining comparatively solid in the United States, but with the level of profits barely changing in real terms in the euro area and Japan. With the recovery in profits, the rate of return on equity (i.e. net income as a share of shareholders' equity) of listed companies has returned to or exceeds pre-crisis levels in the United States but remains below pre-crisis levels in the euro area and Japan, and especially in EMEs (Blundell-Wignall and Roulet, 2015; OECD, 2015d).

Figure 3.21. Growth in real corporate profits has been solid in the United States but weaker elsewhere

Annual percentage changes



Note: Real profits are gross operating surplus less income from self-employment, deflated by the GDP deflator. Countries with less than 19 years of profits data are excluded from the OECD aggregate; there are breaks prior to 1996 in years where additional countries are incorporated.

Source: OECD Economic Outlook 97 database; OECD National Accounts database; and OECD calculations.

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Uncertainty

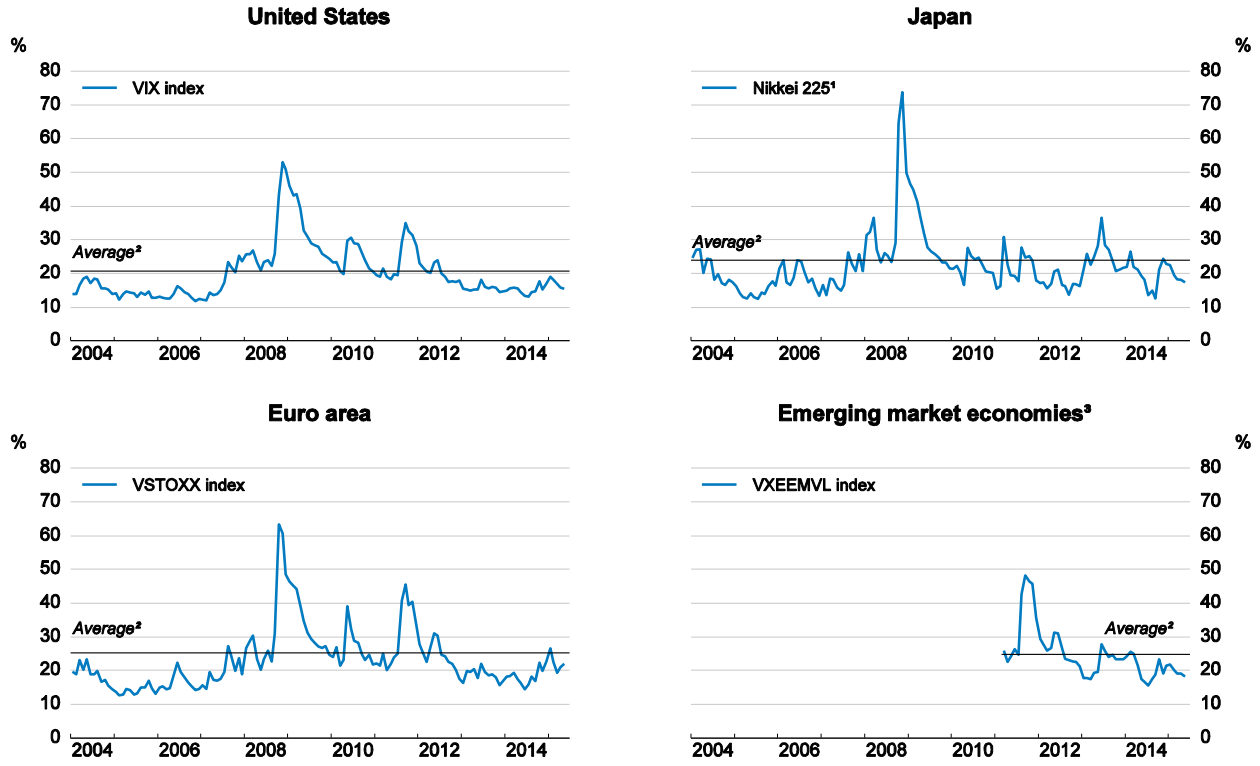
A potential explanation for weak capital spending is that perceived uncertainty about the economic outlook and policy developments may have increased markedly. At times of heightened uncertainty, postponing planned but hard-to-reverse decisions, such as fixed investment, can be a valuable option (Bernanke, 1983; Dixit and Pindyck, 1994), provided the same investment opportunity can be undertaken in the future. Thus, higher uncertainty affects investment negatively, which is confirmed in empirical studies (see Box 3.2 and below), including the experience since the recent crisis and in particular for investment in structures (Ferrara and Guérin, 2015). This is also reflected in the largest proportion of respondents in the BIAC survey (Box 3.3), identifying economic and regulatory uncertainty as being a very important constraint on capital spending.

The appropriate measure of economic uncertainty is far from clear (Davis, 2010), with a range of different indicators being used in the empirical literature.

- Financial measures of uncertainty have evolved differently in recent years after a large upward jump at the height of the crisis. One widely used measure is stock market volatility.[23] This rose extremely sharply following the failure of Lehman Brothers in 2008 and also as the euro area crisis intensified significantly in 2010 and again in mid-2011 (Figure 3.22). This is estimated to have reduced investment since the onset of the crisis in the United States, the euro area and Japan (Davis, 2010; OECD, 2011a). However, stock market volatility has been around its historical averages over the last two years, and its recent level should not have a significant negative impact on investment.

Figure 3.22. The implied volatility of share prices has moderated

Monthly averages



Note: Implied volatility can be interpreted as market expectation of risk (future volatility) and is derived from at-the-money call option prices.

1. AMEX prior July 2007.
2. Average implied volatility for the period January 1999 to May 2015 for all countries but emerging market economies where the average refers to the period March 2011 to May 2015.
3. CBOE Emerging Markets ETF Volatility Index Options.

Source: Datastream.

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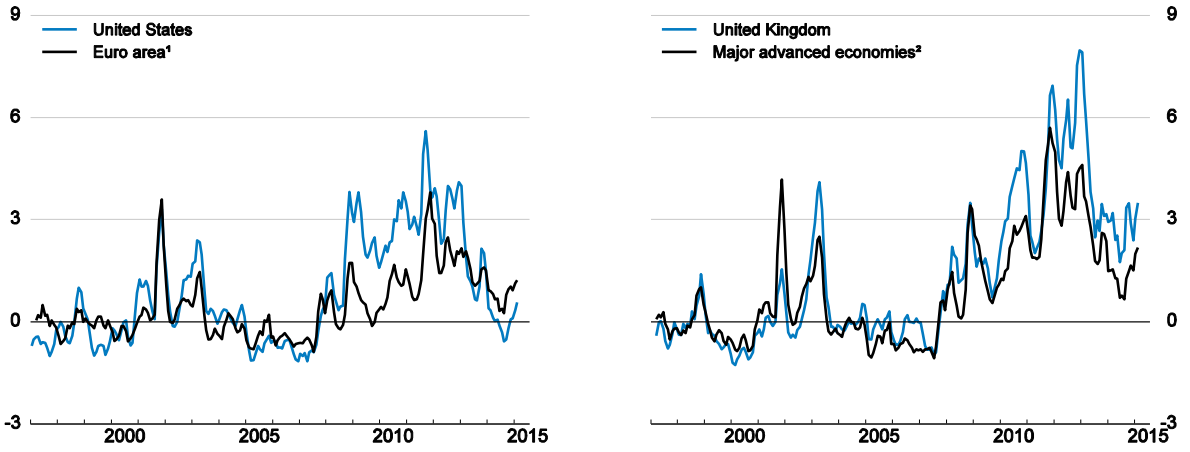
23. Empirical evidence generally suggests that increased stock market volatility, and in particular the peaks in volatility, results in the postponement of investment decisions (Bloom et al., 2007; Bloom, 2009).

- Measures of policy uncertainty have eased, but remain above pre-crisis levels. The Economic Policy Uncertainty Index (EPUI) is based on news stories related to uncertainty, the economy and policy, together with the dispersion of forecasts of inflation and budget deficits (Baker et al., 2013).[24] The relatively new literature using this index, or related variables, has highlighted possible linkages between uncertainty, investment growth (European Commission, 2013, 2014; IMF, 2015; Box 3.2; Annex 3.1) and GDP growth (Haddow et al., 2013). The EPUI points to elevated levels of uncertainty from 2007 to 2011, with a sharp rise at the start of the financial crisis and a further increase as the euro area crisis intensified in the latter half of 2011 (Figure 3.23). To this extent, measures of policy uncertainty provide a broadly similar picture to that derived from stock market volatility. However, more recently the alternative measures of uncertainty have diverged. Stock market volatility has declined towards pre-crisis norms, whereas the policy uncertainty indices have declined but have remained above pre-crisis levels, except in the United States.

Figure 3.23. Measures of policy uncertainty have fallen but remain elevated

3-month-moving average of non-seasonally adjusted data, normalised over 1997-2007, in standard deviations



1. Weighted average of the index in the three largest euro area economies.

2. Excluding Japan; first principal component calculated from the Economic Policy Uncertainty Indices for Canada, France, Germany, Italy, the United Kingdom and the United States.

Source: Scott Baker, Nicolas Bloom and Stephen J. Davis at www.PolicyUncertainty.com; and OECD calculations.

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- Survey evidence suggests that in the United States concern about regulatory and tax uncertainty remains a constraint on business activity. Uncertainty as measured by the EPUI was probably

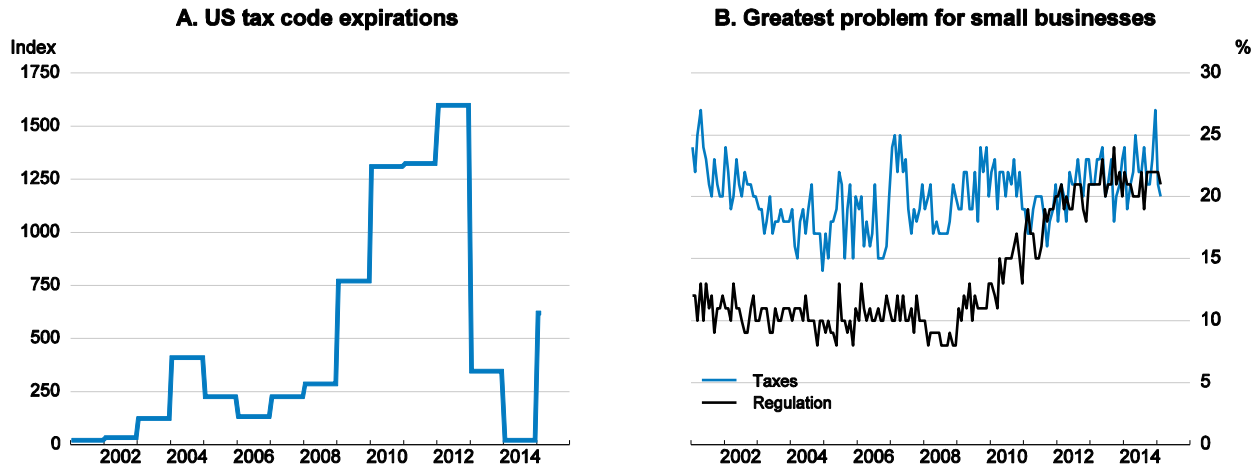
24. Measures of policy uncertainty are prone to revision. From April 2014 the EPUI changed the indices for the European countries and Canada to be based solely on the news-based measure, while the US measure continues to be based on a combination of data on news searches, dispersion of forecasts for key variables and an index of tax code expirations. The full uncertainty index for the United States is used here but it should be noted that the news-based measure has been more volatile and also remained higher than the overall policy measure.

related to expiring tax provisions and prospects for new taxes. The "tax code expiration" component of the US index rose rapidly in 2009, 2010 and 2012, reaching unprecedented levels ahead of the impending "fiscal cliff" at end-2012 (Figure 3.24). Subsequently, the resolution of US budget negotiations and the debt ceiling has removed an important source of uncertainty. However, at the turn of 2014 and 2015 the component spiked again, as many temporary tax provisions expired, possibly having a negative effect on business investment. Small businesses in the United States still highlight uncertainty about regulation as being the greatest constraint on business activity. Poor sales, taxes and regulation are currently seen as the main problems for small businesses (Figure 3.24). Concerns about growth prospects and financial vulnerabilities in EMEs are another potential source of uncertainty, and if true, undermine the global growth component important for investment decisions. The policy uncertainty indices for China and India point to heightened levels of uncertainty in recent years, particularly from mid-2011 to mid-2013 and since mid-2014. Similarly, measures of equity market volatility in EMEs suggest uncertainty was elevated during 2011 but is now closer to normal levels, notwithstanding several small bouts of higher volatility.

- A delay in concluding multilateral trade agreements also adds to uncertainty and may have delayed investment decisions of businesses in the countries involved.

Some longer-term uncertainties that could be weighing on spending on long-term projects may not be well captured by any of the indices mentioned above. These are typically associated with uncertainties about how fundamental challenges facing societies will be resolved:

Figure 3.24. Regulatory and taxation issues appear to have added to uncertainty in the United States



Note: Small business responses are a percentage of total responses from the NFIB survey. Tax code expirations are the weighted sum of the discounted total dollar amount of federal tax code provisions expiring in the following 10 years.

Source: Datastream; Scott Baker, Nicolas Bloom and Stephen J. Davis at www.PolicyUncertainty.com.

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- Population ageing is already putting pressure on public finances in many countries and the total ex ante cost to budgets due to higher pension, health and long-term care outlays could amount to 2½ per cent of GDP on average (Table 3.3), with substantially higher costs in several countries. In the absence of decisions as to how these future budget pressures will be addressed, the risk that businesses and investors will be called on to pay higher taxes to fund higher ageing-related outlays may negatively affect capital spending today. Such concerns are likely to be aggravated by the relatively high level of public debt and very low returns on safe assets, which has a negative impact on the positions of defined-benefit corporate pension schemes.

- Climate change policy goals to limit the rise in global temperature to 2° C will require significant changes in taxation and regulation at national and international levels. Uncertainty about how the global community will deal with this challenge can weigh primarily on private capital spending in the energy and transportation industries, but might also have broader effects. An early and clear resolution on this issue might spur positive capital spending as firms react to opportunities that open up as a result of measures to contain climate change.

Table 3.3. **Changes in public spending on health and pensions for selected OECD countries**

Change 2015-30, per cent of GDP

	Health care[1]	Long-term care[1]	Pensions	Total
Australia	1.2	0.2	0.7	2.1
Austria	1.3	0.2	2.3	3.9
Belgium	1.1	0.3	3.6	5.0
Canada	1.4	0.2	1.2	2.9
Chile	1.4	0.5	-0.7	1.2
Czech Republic	1.1	0.2	0.3	1.7
Denmark	1.3	0.2	0.3	1.8
Estonia	0.9	0.2	0.4	1.5
Finland	1.2	0.2	2.8	4.2
France	1.2	0.2	0.5	1.9
Germany	1.3	0.3	1.5	3.1
Greece	1.2	0.3	0.0	1.5
Hungary	0.9	0.3	-0.8	0.4
Ireland	1.2	0.1	0.7	2.0
Iceland	1.2	0.2	1.1	2.5
Israel	1.3	0.3	0.5	2.1
Italy	1.3	0.3	-0.4	1.2
Japan	1.4	0.3	..	1.7
Korea	1.7	0.4	1.4	3.5
Luxembourg	1.4	0.3	4.1	5.8
Mexico	1.3	0.4	0.4	2.1
Netherlands	1.4	0.3	2.3	4.0
Norway	1.3	0.2	2.0	3.5
New Zealand	1.1	0.1	1.9	3.1
Poland	1.1	0.2	0.2	1.6
Portugal	1.3	0.2	-0.1	1.4
Slovak Republic	1.2	0.3	1.4	2.9
Slovenia	1.3	0.3	1.5	3.1
Spain	1.3	0.4	0.2	1.8
Sweden	1.0	0.1	0.4	1.6
Switzerland	1.3	0.2	1.5	3.0
Turkey	1.2	0.3	1.5	3.0
United Kingdom	1.1	0.2	0.3	1.6
United States	1.2	0.1	0.1	1.5
OECD (unweighted) average	**1.2**	**0.3**	**1.0**	**2.5**

Note: Where projections are not available over the period 2015-30, linear interpolation has been applied.

1. Based on "Cost-containment scenario" (Oliveira Martins and de la Maisonneuve, 2013).

Source: European Commission (2012); OECD Pensions at a Glance (2011); Merola and Sutherland (2012) and Bank of Israel.

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Regulation and competition

Reductions in product market regulations across the OECD since the crisis began, particularly in the vulnerable euro area countries, should improve the prospects for future investment growth (Figure 3.25). This is in line with OECD empirical evidence which finds that anti-competitive product market regulations, particularly barriers to entry and to trade and competition, are negatively associated with investment and capital accumulation (Alesina et al., 2005; Nicoletti and Scarpetta, 2005).[25] The survey and empirical evidence reported in this paper also highlights the extent to which regulations are hampering corporate investment:

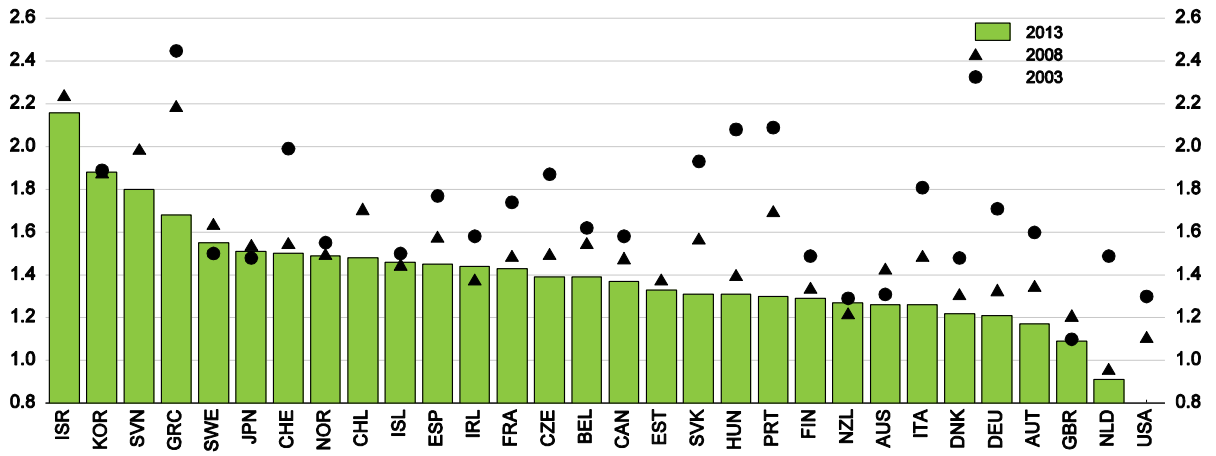
- Empirical analysis reported in Box 3.2 and Annex 3.1 indicates that product market regulation, as measured by the OECD indicator of regulations in energy, transport and communications (ETCR), depresses the level of the capital stock in the long term and investment levels in the short term.

- Survey evidence indicates that businesses consider regulations to be holding back capital spending. Thus, respondents to the BIAC business climate survey cite restrictive or burdensome regulation to be a "very important" constraint on investment in their countries to a greater extent than insufficient domestic or global demand (Box 3.3).

- With the advancement of digital technology and its potential to facilitate transactions, regulations that influence the ease at which digital platforms and other computer-mediated transactions can be introduced are likely to become more important as a determinant of investment in the future.

Figure 3.25. Product market regulation has fallen in some but not all countries

Index scale of 0-6 from least to most restrictive



Note: 2013 observation is not available for the United States.

Source: OECD Product Market Regulation database.

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25. In theory, the impact of greater product market competition on investment is uncertain. It can either increase the incentives for firms to undertake new investments to stay ahead of competitors or, by hitting the profitability of incumbents, reduce their ability to easily finance new investment.

FDI-specific regulations have a direct influence on a country's ability to attract internationally mobile fixed capital investments. The OECD FDI regulatory restrictiveness indicator provides a measure of overt national regulatory restrictions on FDI. Four main types of factors are considered: equity restrictions, screening and approval requirements, restrictions on foreign key personnel, and other operational restrictions (such as limits on purchase of land or on repatriation of profits and capital). Inward FDI restrictions have eased over time, both in OECD economies and the BRIICS countries, but still remain much higher on average in the BRIICS than in the OECD.[26]

Reforms to ease inward FDI restrictions could have a significant and sizeable positive impact on the level of inward FDI, especially in Europe (Nicoletti et al., 2003). New OECD estimates also illustrate the potential gains from further regulatory harmonisation in Europe, with a reduction of one-fifth in regulatory differences between two countries estimated to raise inward FDI by around 15% (Box 3.5). Environmental regulations can also affect the location for internationally mobile investments, particularly for greenfield investments (Bialek and Weichenreider, 2015; Box 3.1).

Forces affecting public/infrastructure investment

Public investment includes investment in economic and social infrastructure, defence equipment and on intellectual property. In addition to the direct impact that higher investment spending has on demand, there are a number of different channels through which it can also affect the long-term level of potential output:

- Empirical evidence points to significant positive effects from public infrastructure on productivity (Fernald, 1999) and also economic growth (Bom and Ligthart, 2014). These effects may, however, be non-linear, for instance due to threshold effects in network externalities (Fernald, 1999; Sutherland et al., 2009). Public spending on education and health are also estimated to have a significant positive impact on long-term potential output (Barbiero and Cournède, 2013).

- Publicly funded basic research has led to the subsequent development of many important technologies (Singer, 2014). Evidence also points to a positive impact on private sector innovative activity (Azoulay et al., 2015) and also on the growth of total factor productivity (Guellec and van Pottelsberghe de la Potterie, 2004). OECD research also suggests that high public spending on basic research enhances absorptive capacity and the ability to learn from new innovations at the global frontier (OECD, 2015a).

26 . A handful of OECD economies, including New Zealand, Mexico, Canada, Korea and Iceland, continue to have comparatively strong FDI restrictions in 2014, as measured by the OECD FDI regulatory restrictiveness indicator.

Box 3.5. The effect of PMR heterogeneity on FDI

Preliminary OECD work (Fournier, 2015b; Annex 3.3) investigates the effect of policies on bilateral FDI stocks with a gravity model (Table below). Following Santos Silva and Tenreyro (2006), a Poisson pseudo-maximum likelihood (PPML) estimator is used. As a robustness check, some regressions are also estimated by a linear estimator, with the logarithm of FDI stock as the dependent variable.

A key finding is that heterogeneity in product market regulations (PMR) has a significant negative effect on FDI. Heterogeneity is defined as the share of different regulatory settings between two countries based on the OECD PMR indicator at the question level (Fournier, 2015a; Annex 3.3). This suggests that a broad reform package that would cut the divergence of regulations between countries by one-fifth would increase FDI by around 15%.

Other findings include:

- In terms of specific policy areas, the divergence of antitrust exemptions, barriers in service provision, network sector barriers and command and control regulation all have significant negative impacts on FDI.
- FDI restrictions as measured by the FDI restrictiveness index also have a clear negative impact.
- The complexity of regulatory procedures has a negative impact on FDI. If countries that have the most complex regulatory procedures moved toward the average of the half of countries with the least complex regulations, FDI could increase by about 15%.
- There is some evidence that belonging to the EU Single Market can have a positive effect on FDI on top of the effect already captured by regulation indicators. By contrast, there is a negative effect for the NAFTA area, which may reflect a substitution effect in favour of trade (see Fournier et al., 2015, for evidence of the large positive effect of NAFTA on trade).

FDI determinants

Estimation method	Poisson			Linear		
PMR^{h}_{ijt}	**-2.09*** **	**-2.06*** **	**-0.96***	**-2.85*** **	**-3.02*** **	**-2.52*** **
Same legal system$_{ij}$	0.41***	0.41***	0.45***	0.61***	0.61***	0.61***
FDI restrictiveness$_{it}$	-0.27*		-0.28*	-0.052		-0.13
Complexity of Regulatory Procedures$_{it}$	-0.20***	-0.19***	-0.19***	-0.016	-0.013	-0.047
European Economic Area$_{it}$	-0.027	-0.092	-0.22	0.79***	0.66**	0.77***
European Economic Area$_{jt}$	0.62*	0.79**	0.24	0.30	0.35	0.30
European Economic Area$_{ijt}$	0.22	0.22	0.40	0.055	0.012	0.051
NAFTA$_{ijt}$	-1.24***	-1.22***	-0.97***	-0.88	-0.90	-1.07
N	2,063	2,063	1,999	2,063	2,063	1,999
R^2	0.879	0.876	0.907	0.820	0.821	0.822
Country and year fixed effects	YES	YES	YES	YES	YES	YES
Controls for PMR levels in seven subdomains	NO	YES	NO	NO	YES	NO
Controls for size and factor dissimilarities	NO	NO	YES	NO	NO	YES

Note: Asterisks (*, **, ***) indicate the significance level (10%, 5%, 1%) of the coefficients. i denotes the inward country and j the outward country. PMR^{h}_{ijt} = Heterogeneity of the PMR indicator; NAFTA$_{ij}$ = North America Free Trade Agreement pair dummy; FDI restrictiveness$_{it}$= PMR sub-component built with the OECD FDI restrictiveness index. Poisson = Poisson pseudo-maximum likelihood. Linear = Log-linear specification. Standard gravity model determinants and various other determinants are added on top of the variables shown in this table (Annex 3.3).

Source: OECD calculations.

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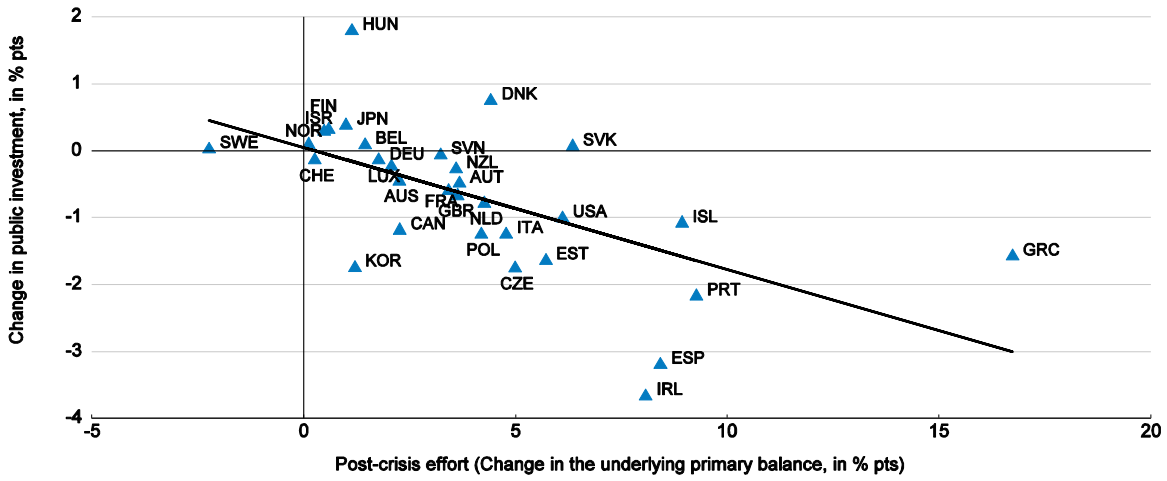
Fiscal consolidation effects

The reliance on public investment cuts to reduce budget deficits is costly in terms of demand stabilisation, with several studies suggesting that the fiscal multiplier associated with government investment spending is greater than 1 and higher than for other fiscal instruments. For example, Auerbach and Gorodnichenko (2012), using US data, find a fiscal multiplier of 1 for government expenditure in general, but 2.1 for government investment. Evidence across a range of economies also suggests that public investment multipliers are generally greater than those for government consumption and exceed 1 in some cases (Ilzetzki et al., 2011). For this reason, cutting public investment is one of the least desirable fiscal consolidation instruments (Cournède et al., 2013). This is particularly likely to be the case if public capital spending is cut in strategic areas with significant network effects, or ones in which the social rate of return is high, as such a policy would block investment in related activities.

Despite this, many governments have cut investment in fixed capital to meet their fiscal consolidation objectives in the aftermath of the crisis. Investment in fixed capital by OECD governments declined by an average of 0.6% of GDP between 2010 and 2013, accounting for about one-quarter of fiscal consolidation efforts. The decline was much larger in some countries, exceeding 2.5% of GDP in Greece, Spain and Ireland and accounting for around two-fifths of the consolidation undertaken in Spain. A relationship between a country's fiscal consolidation effort over this period and the cuts made to public fixed investment is evident – on average, 1% of GDP in consolidation has been associated with a 0.3% of GDP cut in public investment (Figure 3.26). Hence, such consolidation efforts, rather than achieve the objective of reducing debt-to-GDP ratios tend to increase it, moving the economy further away from the achievement of medium-term sustainability.

Figure 3.26. Public investment has declined the most in countries with high fiscal consolidation



Note: Underlying primary balance and public investment are expressed in per cent of potential GDP. Consolidation denotes change in the underlying primary balance since start of post-crisis consolidation (2009/10 for most countries) until 2013. Greece is not included in the chart.

Source: OECD Economic Outlook 97 database; and OECD calculations.

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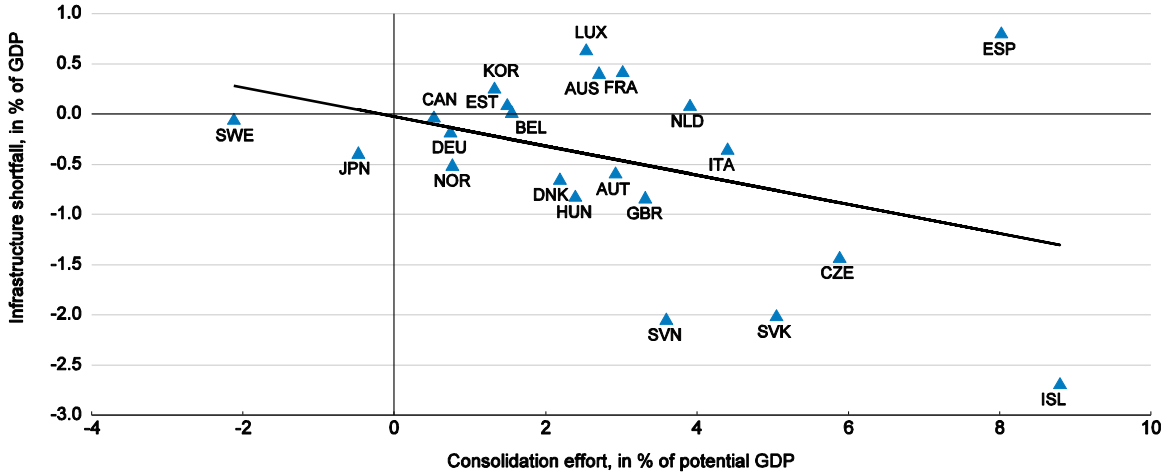
Figure 3.27. High levels of fiscal consolidation are associated with larger gross infrastructure investment shortfalls



Note: Greece is excluded from the correlation. The infrastructure shortfall is the difference between post-2009 and 1997-2007 averages.

Source: OECD Economic Outlook 97 database; national statistical offices; and OECD calculations.

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Post-crisis fiscal consolidation efforts also appear to be linked to post-crisis infrastructure investment shortfalls (Figure 3.27).[27] These shortfalls are measured as the share of infrastructure investment in GDP since 2007 relative to a long pre-crisis period average. While the negative correlation is weaker than with government fixed investment spending (shown previously), a few countries that have carried out relatively large fiscal consolidations also have had relatively large infrastructure investment gaps since the crisis (the Czech Republic, Greece, Iceland, the Slovak Republic and Slovenia).

Regulatory policies related to infrastructure investment

Infrastructure projects often entail large fixed costs, the investment decisions are irreversible and their provision usually reflects some kind of market failure (such as externalities or natural monopolies) that needs to be addressed by government intervention. The provision and use of infrastructure is therefore sensitive to regulation, in particular concerning the desired market structure, access regimes and pricing, and also the burden of risks. OECD estimates suggest that reducing barriers to entry in network industries can foster higher rates of infrastructure investment (Sutherland et al., 2009).

The OECD indicators of regulation in ETCR, covering seven network sectors (telecoms, electricity, gas, post, rail, air passenger transport and road freight), show a reduction in regulatory barriers across almost all OECD countries between 2008 and 2013. However, a large dispersion across countries remains when looking at individual sectors. This can hinder efficiency and investment, particularly in cross-border network infrastructure. Improvements in the quality of trade and transport infrastructure could also have a

27. Infrastructure investment includes private sector expenditure, for instance through public-private partnerships (PPPs). Moreover, some government expenditure meant for infrastructure – for instance those going through EU structural funds – may not be recorded as investment expenditure in the national accounts but rather as capital transfers. And if the funds are ultimately transferred to and disbursed by private actors, they may be recorded as private investment.

significant impact on levels of international trade in many countries, including Turkey (Ojala and Çelebi, 2015). New OECD firm-level evidence points to a negative impact on capital investment by firms operating in infrastructure sectors from product market regulations (including ETCR) and FDI restrictions (Annex 3.2).

Market failures suggest that public interventions are necessary to reduce greenhouse gas emissions. To this end, several governments have encouraged investment in clean energy, notably wind and solar photovoltaic energy, through direct subsidisation or guaranteed premium feed-in tariffs from such energy sources. This has successfully induced a significant expansion in wind and photovoltaic energy generation and also efficiency gains in the clean energy sectors. International trade and investment have played an important role in this process. However, there is concern that government interventions may at times have restrained trade and FDI in such energy generation. Indeed, recent OECD research indicates that imposing local content requirements as an eligibility condition for subsidies or premium feed-in tariffs reduces FDI in photovoltaic energy generation (Box 3.6).

The importance of cost-benefit analysis

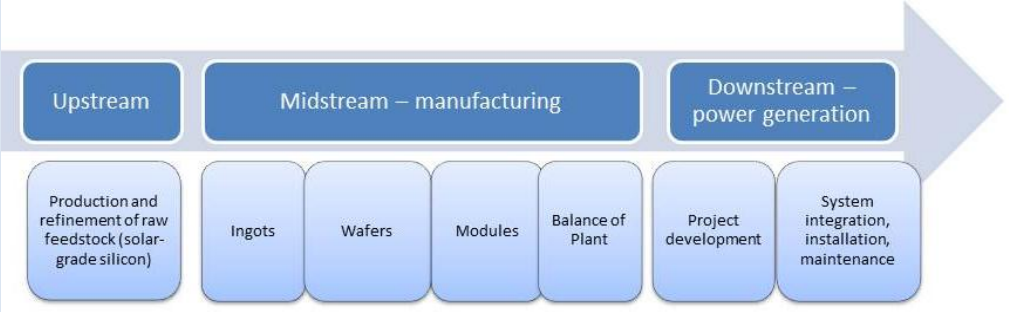
To ensure that public investment delivers long-term gains, it is necessary to select projects on the basis of a rigorous cost-benefit analysis.

- Cost-benefit analysis is already used to identify the best projects in many countries. One key component of the Investment Plan for Europe, the so-called "Juncker Plan", is to assess and provide information on the viability of proposed long-term investment projects for public policy-makers as well as potential private investors (Box 3.7).
- A particular challenge for policy-makers is to select projects under current circumstances, where the costs of investment are abnormally low and possibly exaggerate the viability of some projects.
- Due to the nature of network infrastructure, benefits may be underestimated unless there is an accurate assessment of the impact of externalities on other economic areas included in the analysis (Sutherland et al., 2009).
- The effects of climate change, and the uncertainty surrounding the global policy response, raise further cost-benefit challenges to policy-makers who need to account for externalities and unknown long-term costs.

Box 3.6. Overcoming barriers to international investment in clean energy[1]

In the past decade, governments have provided substantial support to clean energy which has benefited both domestic and international investment. Globally, public support to clean energy amounted to USD 121 billion in 2013 (IEA, 2014b). At least 138 countries had implemented clean-energy support policies as of early 2014 (REN21, 2014). While incentive schemes had to coexist with investment disincentives such as Fossil Fuel Subsidies as well as other market and regulatory rigidities that favour fossil fuel incumbency in the electricity sector, they have contributed to enhancing clean energy investment worldwide. In addition, as international trade and investment have played a major role in decreasing their input prices, the solar photovoltaic (PV) and wind energy sectors have become increasingly competitive. The value chain and the task specialisation in the solar PV sector are described in the Figure below.

Overview of the solar PV energy value chain (Crystalline silicon technology)



Source: OECD (2015e), Overcoming Barriers to International Investment in Clean Energy, OECD Publishing, Paris.

New investment in clean energy increased six-fold between 2004 and 2011, reaching USD 279 billion in 2011, before declining in 2012-13. Solar and wind energy have received the largest share of new investment flows – USD 114 billion and USD 80 billion respectively in 2013.

Since the 2008 financial crisis, however, the perceived potential of the clean energy sector to act as a lever for growth and employment has led several OECD countries and emerging market economies (EMEs) to design green industrial policies aimed at protecting domestic manufacturers, notably through local-content requirements (LCRs). Local-content requirements typically require solar or wind developers to source a specific share of jobs, components or costs locally to be eligible for policy support or public tenders. A forthcoming OECD report on Overcoming Barriers to International Investment in Clean Energy shows that such requirements have been designed or implemented by at least 21 countries, including 16 OECD and EMEs, mostly since 2009,[2] and assesses their impacts across the solar PV and wind energy value chains (Table below).

In a context of global value chains, new empirical evidence shows that LCRs have hindered global international investment flows in solar PV and wind energy. This might be related to the fact that such policies increase the cost or downgrade the quality of intermediate inputs, leading to less competitive activities in downstream segments of the value chain, which are associated with more value creation (Figure below). The estimated detrimental effect of LCRs is slightly stronger when both domestic and international investments are considered. This indicates that LCRs do not have positive impacts on domestic investment flows.

In addition, according to results from a new 2014 OECD Investor Survey on "Achieving a Level Playing Field for International Investment in Clean Energy",[3] LCRs stood out as the main policy impediment for international investors in solar PV and wind energy. Unsurprisingly, a majority of international investors involved in downstream activities of the solar and wind energy sectors selected LCRs as an impediment (Table below). More unexpectedly, a majority of international investors involved in upstream or midstream activities also identified LCRs as an impediment. This result suggests that LCRs can hinder international investment across the value chains.

Policy makers might thus want to reconsider whether or not discriminatory measures in favour of domestic manufacturers enhance job and value creation in the clean energy sector.

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1. Based on OECD (2015e).
2. As of September 2014.
3. The Survey was administered from April to June 2014 through an online questionnaire sent to leading global manufacturers, project developers, and financiers in the solar PV and wind energy sectors. Results are based on a sample of 62 respondents working for 59 companies involved across the upstream, midstream and downstream segments of solar-PV and wind-energy value chains.

Box 3.6. Overcoming barriers to international investment in clean energy (Cont.)

Summary of local-content requirements (LCR) in wind and solar energy across OECD countries and EMEs

Country	Level	Type of measure and sector(s)[1]	Year of Implementation (Status)
Brazil	National	Access to financing for wind	2009 (Ongoing)
	National	Access to financing for solar	Forthcoming - 2017
Canada	Subnational	Ontario: FiT eligibility for solar and wind	2009-2014
	Subnational	Quebec: Tender eligibility for wind	2003
China	National	Tender eligibility for wind	2003 (abandoned in 2009)
	National	Access to financing for wind	2008 (abandoned in 2011)
France	National	FiT bonus eligibility for solar	2013 (repealed in 2014)
Greece	National	FiT bonus eligibility for solar	2012 (ongoing)
India	National	Tender and FiT eligibility for solar	2010-22 (ongoing)
Indonesia	National	FiT bonus eligibility for solar	2013 (ongoing)
Italy	National	FiT bonus eligibility for solar	2012-13 (FiT expired in July 2013)
Russia	National	Tender eligibility for solar and wind	2013 (ongoing)
South Africa	National	Tender or FiT eligibility for wind and solar	2012 (ongoing)
Spain	Subnational	Galicia, Navarra, Castile and Leon, and Valencia: FiT or tender eligibility for wind	1999 for Navarra; 2004 for Galicia; Abandoned in 2012-13 via retroactive changes.
Turkey	National	FiT bonus eligibility for solar and wind	2010 (ongoing)
United States	Subnational	FiT bonus eligibility for solar and wind on state FiT or resale price of electricity in California, Ohio, Washington and New Jersey; tax rebate eligibility in Massachusetts	2012 for California and Massachusetts (ongoing); 2007 for Ohio (only in the 2007 solicitaition round); 2006 for Washington (abandoned in 2011); ongoing for New Jersey

1. FiT: feed-in tariff.

Source: OECD (2015e), *Overcoming Barriers to International Investment in Clean Energy*, OECD Publishing, Paris, forthcoming; updated as of September 2014.

Box 3.6. Overcoming barriers to international investment in clean energy (Cont.)

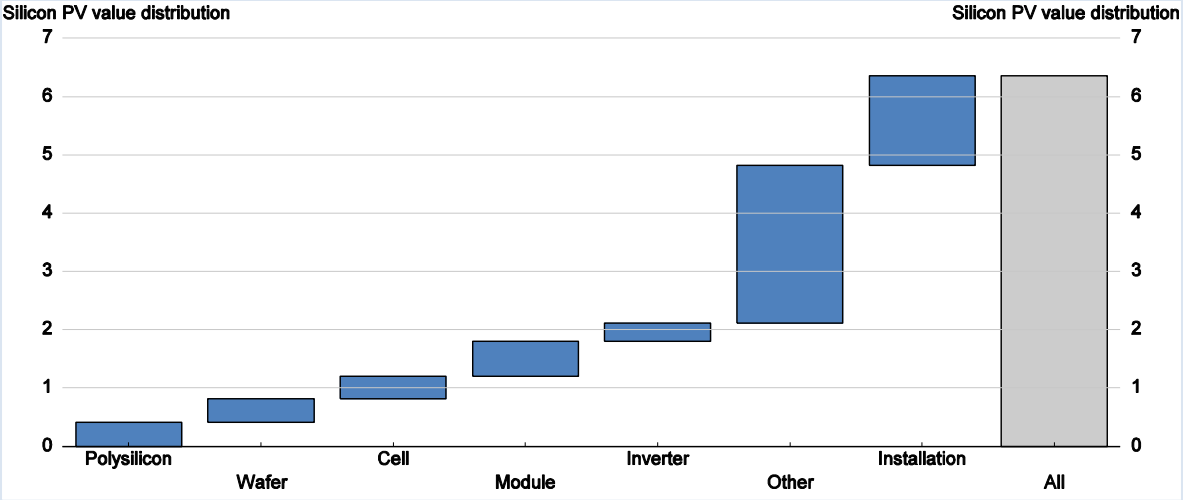
Percentage of international investors from different segments of the solar and wind energy value chains who identified LCRs as an impediment

Solar PV energy		Wind energy	
Upstream or midstream	*Downstream*	*Upstream or midstream*	*Downstream*
75%	**73%**	**70%**	**72%**

Note: Based on a sample of 42 international investor respondents. The results include responses from 8 international investors who operate across upstream, midstream and downstream segments.

Source: OECD 2014 Investor Survey, in OECD (2015e).

More than half of generated value lies downstream of module production



Source: Natural Resources Defence Council (NRDC) (2012), Laying the Foundation for a Bright Future: Assessing Progress Under Phase 1 of India's National Solar Mission, Interim Report, April 2012; quoting GTM Research, 2011; European Photovoltaic Industry Association (EPIA) and Greenpeace, 2006, 2011; Rutovitz and Atherton, 2009; The Solar Foundation, 2011; Based on unsubsidised value chain analysis of U.S. silicon PV market. Roughly similar value distribution for thin-film technologies.

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Implications for policy

Stronger investment is necessary to shift economies to a higher equilibrium growth path. Effectively implemented macroeconomic policy that stimulates aggregate demand will play an important role in reviving global investment. This needs to be accompanied by structural reforms that increase economic growth prospects in the long term and strengthen confidence and raise wealth and aggregate demand in the short term. The appropriate demand management and structural policy stances are discussed in Chapters 1 and 2. Given the finding that domestic investment responds to both domestic and global demand, effective international co-ordination of demand management policies should be promoted. Joint action produces stronger effects than piecemeal measures implemented by individual economies in isolation. Similarly, consistent structural policies that remove or reduce border protection are likely to be particularly effective in generating profitable investment opportunities. Account also needs to be taken of potentially important synergies between different types of investment that can have favourable feedback effects. For instance, strengthening the domestic research base and infrastructure could help to strengthen potential growth as well as attract internationally mobile investments (Barrell and Pain, 1999). In turn, these could boost domestic investment, both directly and indirectly through spillover effects.

Aggregate demand policies

Monetary policy in the main OECD areas is already providing an extraordinarily strong stimulus and policy is set to ease further with asset purchases in Japan and the euro area in 2015 and 2016. The associated reduction in financing costs, especially for large companies, should in principle support capital spending. Monetary policy easing beyond what is now planned needs to be assessed against potential negative side effects on future financial stability and the potential to prompt investment projects with low rates of return. Macro-prudential oversight and proper cost-benefit analysis would leave monetary policy less encumbered. And, measures to improve the transmission of monetary policy are needed, notably in the euro area, so that companies, particularly SMEs, can benefit from easy credit conditions. This will require measures to strengthen the financial solidity of banks, including steps to improve the quality and quantity of their capital.

Fiscal policy options exist to support growth and equity friendly fiscal stance.

- A budget neutral reallocation of public spending towards investment would provide a boost to demand, given that investment multipliers are usually bigger than those of other spending components (Ilzetzki et al., 2011; Auerbach and Gorodnichenko, 2012). For example, with the differential multipliers discussed above, a 1% of GDP reallocation of spending in low-multiplier categories to investment could raise GDP by up to 1%.

- There are good arguments for increasing public capital spending, even if it increases government borrowing. Infrastructure is perceived to be deficient and most governments can borrow at very low interest rates for long maturities. Public capital spending would strengthen demand in the short term, but the extent of the demand effects in the short term and the beneficial long-term effects would depend on the type and quality of government capital spending. Particularly powerful and beneficial government investment would include:

  – *Government investment that would pave the way for private investment.* Such synergistic capital spending would have social rates of return in excess of private ones. It could include, for example, additional public R&D spending in basic research that might later spur commercial R&D investment and ultimately new tangible investment, or public infrastructure spending that helps support private spending to take advantage of location. It could also involve investing in knowledge infrastructure, such as high-speed broadband networks, with potentially beneficial effects for productivity.

  – *Government investment with favourable side effects in other areas of government policies, notably climate change and the environment.* Apart from basic R&D investment in greenhouse-gas-reduction technologies, such public investment could ensure that a lack of networks (e.g. a network of recharging points for electric vehicles or a network of disposal points for special waste) does not hold back related private investment projects. Alternatively, government can provide investment subsidies or impose regulations. Such interventions are likely to be cost effective if monitoring costs are high or if pollution emitters are widely dispersed.

  – *Public-private partnerships (PPP) that leverage public investment and improve efficiency.* While there is probably some scope to expand PPP arrangements that increase investment and operational efficiency at an acceptable cost and risk to future public budgets, PPPs primarily motivated by accounting considerations should be avoided (Araújo and Sutherland, 2010). Careful consideration will need to be given as to how risk is assessed and appropriately allocated between the public and private sectors. In Europe, where investment

has been weak in a number of countries, the implementation of the Juncker Plan – with its PPPs and its aim of providing an enabling regulatory environment for investment – is a step in the right direction (Box 3.7).

Box 3.7. The Juncker Plan – Investment Plan for Europe

The Investment Plan for Europe, introduced by the European Commission led by Jean-Claude Juncker, is a package of measures aimed at unlocking public and private investment in the European Union economy over 2015-17. This box describes the plan and its potential effects on investment.

The three-pillar plan

- *Finance for investment via a new European Fund for Strategic Investment (EFSI).* The EFSI is due to be set up by the Commission and the European Investment Bank (EIB) by September 2015. Its capital will consist of a EUR 5 billion contribution from the EIB and a EUR 16 billion guarantee from the EU budget. Half of this EUR 16 billion will be paid in, in a back-loaded manner, over 2016-20 by reallocating existing budget funds. The EFSI will also be open to contributions from third parties. Contributions from EU member states to EFSI capital will be treated favourably under the European fiscal rules (see below). The fund's capital of EUR 21 billion will be used to raise around three times as much funding by issuing bonds, and the funds thus raised will be used as "first loss protection" to attract other private or public sources to finance projects of about four times the risk-bearing capacity. Hence, every EUR 1 of EFSI capital is expected to result in about EUR 15 of real investment, with estimated total investment volume of EUR 315 billion (2.2% of 2014 EU GDP).
- *Providing a pipeline of projects at the EU level and technical assistance.*
  - A pipeline of projects will be established, to provide readily available and regularly updated information on viable projects. A Commission/EIB task force has identified around 2 000 potential projects with an investment volume of EUR 1.3 trillion, including projects worth EUR 500 billion that could be carried out over 2015-17. Key areas to be supported are: knowledge, innovation and the digital economy; energy union; transport infrastructure; social infrastructure; natural resources and the environment. About a quarter of the funds are dedicated for SMEs and mid-cap companies. Key project selection criteria are: EU value added (though not necessarily cross-border projects); economic viability with priority given to projects with high socio-economic returns; and projects that can start within the next three years.
  - A European Investment Advisory Hub for technical assistance will be established for project promoters, investors and public managing authorities. Use of innovative financial instruments, such as loans, equity and guarantees, as opposed to traditional grants, or high-quality securitisation will be encouraged, e.g. under the existing European Structural and Investment Funds.
- *The creation of an investment-friendly environment by the removal of regulatory and financial barriers to investment*. The Commission has committed itself to a more investment-friendly environment by providing greater regulatory predictability, removing barriers to investment across Europe and further reinforcing the Single Market. Key issues that need to be addressed are: the creation of a Capital Markets Union to reduce fragmentation in the EU's financial markets and to complement still dominant bank financing, to reduce funding costs and increase access to financing for SMEs and mid-caps; establishment and/or full implementation of the European Energy Union and Digital Single Market; and further integration of telecommunications and transport markets. Increased unification and reduction of barriers in other services and product markets are also important.

The impact on investment

The plan focuses on infrastructure, network industries and innovation, which have strong positive externalities and hence potential to spawn private sector investment. The EFSI will be managed independently and project selection will be based on pre-defined criteria without any regional, national or sectorial bias, which should help ensure high socio-economic returns. This and the application of state aid rules should also prevent crowding-out of private investment by ensuring that only high-risk projects, that could not otherwise be carried out, will be supported. However, it remains to be seen whether the supported projects are able to generate a high enough financial rate of return to attract enough private co-funding, if social value added is one of the main selection criteria as this is usually associated with lower financial returns and/or returns generated over much longer periods.

Box 3.7. The Juncker Plan – Investment Plan for Europe (Cont.)

The plan could help catalyse private investment using public support by a targeted relaxation of some of the fiscal constraints. EU member states' contributions to the EFSI capital will be treated favourably in the application of the Stability and Growth Pact (SGP). They will not affect structural positions, since they would effectively constitute one-off measures. In assessing deviations from debt and deficit targets, the contributions will be treated as a relevant mitigating factor (similarly to European Stability Mechanism contributions), if the excess over the target can be deemed small and temporary. So far, however, no country has expressed interest in contributing directly to EFSI capital. Four countries to date have committed to contributing through their national promotional banks via co-financing of platforms or projects that would receive funding from the EFSI, with France, Germany and Italy committing EUR 8 billion each, Spain EUR 1.5 billion and Luxembourg EUR 80 million.[1] The national promotional banks are usually classified outside the public sector, so their operations do not affect public finances. If, however, such project co-financing contributions were made directly by a member state, the favourable application of the SGP would only be possible if the country is eligible for the so-called "investment clause" application.[2]

1. Representing, respectively, about 0.4%, 0.3%, 0.5%, 0.15% and 0.2% of national nominal 2014 GDP. The actual annual GDP shares would be lower depending on how the contributions are spread over time.
2. This applies when the country's GDP growth is negative or its negative output gap is greater than 1.5% of GDP, the headline deficit does not exceed the 3% of GDP reference value and a safety margin to this reference is preserved, and the total public investment cannot decrease (i.e. EFSI co-financed expenditure is not a substitute for nationally financed investments).

Indirect fiscal mechanisms also offer potential to stimulate private investment, for example, by introducing temporary tax credits or accelerated depreciation of capital equipment for tax purposes. These have been used in many countries since the onset of the crisis (see above). Examples include the temporary 100% expensing for business investment in the United States enacted in 2010 and temporary corporate tax relief in Japan in 2014 and in the United Kingdom and France in 2015. Temporary tax breaks, such as a temporary acceleration in depreciation deductions can, in principle, have powerful effects by advancing capital spending (House and Shapiro, 2008; Eichfelder and Schneider, 2014), but may also be associated with deadweight costs. The effectiveness of such measures when underlying investment is very weak remains an open question, although they may play a particularly effective role to loosen financial constraints for SMEs

Reducing uncertainty

The authorities have a particular responsibility to reduce policy-related uncertainty that is found to weigh on the investment decisions of corporations and investors. This requires action in several domestic areas:

- On the fiscal front, some countries need to focus on legislating credible strategies to deal with fiscal positions that are unsustainable at (and in some cases, nearly unachievable) current growth rates. This implies attention to both sides of the fiscal ledger, announcement of a credible path, and believable approaches to accounting for growth and the consequences of structural policies for inclusiveness as well as growth.
  - Because of historical deviations from stated budget paths, some euro area countries will find the reward for a credible path less than what others, with less of a history, receive in the market. Dealing with the political ramifications of this differentiation may add to uncertainty.
  - In Japan, fiscal sustainability must be ensured to reduce an important source of uncertainty. In this respect, a credible fiscal consolidation plan as well as faster output growth through bold structural reforms, including those in Japan's growth strategy, are required.

  - Uncertainty related to how the fiscal costs of ageing and higher health-related spending will be funded would be reduced with early reforms that set out and legislate on how benefit and service entitlements, taxes and contributions will evolve in the future.

  - In some countries there is a need to ensure that budget brinkmanship does not generate uncertainty. Repeated episodes of tensions linked to the raising of the debt ceiling and other budget milestones in the United States have dented confidence, and complex budget rules and the ad hoc granting of exceptions in the euro area have reduced the credibility of fiscal frameworks.

- On the monetary policy front, greater clarity about the eventual strategy to normalise policy would help to reduce uncertainty. The US Federal Reserve, where the start of normalisation is not far off, has issued general guidance on how it intends to raise interest rates and adjust the size of its balance sheet. Other monetary authorities will need to follow suit, but can potentially benefit from the experience of US normalisation.

Moreover, actions on the international front are also needed:

- A prompt global agreement on how and where to tax profits of multinational corporations would lift a potential source of uncertainty for such entities.

- The international community also needs to complete the regulatory overhaul of the financial sector. In particular, further clarity on the resolution of cross-border financial institutions and regulations about long-term lending would help reduce uncertainty that may weigh on the lending and investment decisions of banks.

- A quick conclusion of multilateral trade agreements, in particular of the Trans-Pacific Partnership and the Transatlantic Trade and Investment Partnership, could reduce regulatory uncertainty in countries involved.

- The international community has yet to agree on how to limit future climate change and the eventual decisions will determine whether important investment projects are commercially sound or not. Continued procrastination in this area will compromise the ultimate goal and make investors more hesitant in committing long-term funds to lumpy investments where there is a strong risk of path dependency.

Structural policies to foster investment in both capital and labour for the long term

Financial policies

An appropriate framework needs to be established to ensure that financial institutions provide adequate finance to sound long-term investment projects. In principle, the incentives for the provision of such finance are strong for longer-term projects with clearly defined rates of return and allocation of risks.

- Since the crisis, global financial reforms under the aegis of the G20 and domestic reforms have aimed to increase the resilience of the financial system to shocks and to avoid a repeat of financial excesses. In the process, the cost to institutional investors of providing long-term funds for infrastructure and other long-term investment has been raised by requiring pension funds and insurance companies to have stronger capital backing for such illiquid assets. It is important to ensure that these changes do not discourage such institutions from providing long-term funds (OECD, 2014a).

- More broadly, as stressed in OECD reports to the G20, framework conditions need to be improved to encourage institutional investors to provide long-term funds. In the energy sector, when social externalities are priced inadequately and where political and project risks can be large, this could involve, for example, reducing risks associated with green bonds (i.e. bonds issued specifically to finance climate change mitigation investment) through credit enhancements that would qualify such bonds as investment grade and hence suitable vehicles for institutional investors. A comprehensive assessment of the policies needed to promote increased participation of institutional investors in funding long-term investment is provided in OECD (2014a; 2015d).

Regulatory frameworks in private product and infrastructure markets at home and abroad

The easing of entry and operational controls in markets where competition is feasible and the establishment of a well-functioning regulatory regime for infrastructure provision would support long-term investment.

- Easing restrictions and constraints in product markets is also an important area where governments can stimulate investment. Lowering entry barriers and reducing regulatory burdens would lower firms' costs of adjusting their existing capital stock (Alesina et al., 2005). Progress in this area has stalled across the OECD. As mentioned above, updated product market regulation indicators suggest that only modest reforms have been undertaken to reduce restraining regulations over the past five years (Koske et al., 2015). Addressing this area is of importance not only to investment performance but overall growth.

- Governments also play an important role in improving the regulatory environment and funding arrangements to ensure appropriate infrastructure provision. Long-term planning is particularly important in the area of infrastructure investment, where the construction period and service lives are relatively long, and where private investment may be needed to fill financing gaps through public-private partnerships (see above). In this context, exploiting to a greater degree user charges could help to ensure that infrastructure is used efficiently and identify where there are clear shortfalls (de Mello and Sutherland, 2014). Greater information sharing on the long-term financial performance of past investments in infrastructure assets and their associated risks would also benefit potential institutional investors in infrastructure.

- Government planning and a clear regulatory framework are particularly important in EMEs, where higher perceived instability and uncertainty might deter private investors from providing much needed financing. To limit uncertainty, EMEs need to ensure that proper dispute resolution, contract renegotiation policies, and land acquisition policies are in place with regards to potential infrastructure projects (OECD, 2015f). Reforming the management practices and efficiencies of large state-owned enterprises that co-ordinate and undertake a lot of infrastructure-related investment in some EMEs is also important to enable access to funding from international investors.

- Foreign direct investment flows should not be subject to barriers as an open FDI regime promotes the best allocation of global investment. Capital spending may increase in both source and destination countries when vertical FDI is involved, leading to the build-up of global value chains. Nonetheless, as measured by the OECD FDI regulatory restrictiveness index, several OECD and non-OECD economies impose overt constraints on inward FDI, as reflected in the list of reservations lodged by adhering countries under the OECD Code of Liberalisation of Capital Movements. A renewed drive to ease or eliminate such overt barriers would spur capital spending. Where the main objectives of such restraints are not to keep out foreign capital, better targeted instruments should be used for such aims.

Removing obstacles to intangibles and other knowledge-based investments

Investment in intangible assets and other forms of KBC benefit from policies that enable a fertile environment for the introduction and diffusion of frontier ideas and technologies. Many of the policy priorities identified in the OECD Innovation Strategy 2015 (OECD, 2015g) would help boost investment in KBC and capital spending more generally. Apart from measures mentioned above to establish well-functioning product and capital markets, specific policies to foster KBC investment should be implemented (Andrews and Criscuolo, 2013).

- R&D tax incentive schemes should be refundable, contain carry-over provisions or allow for payroll withholding tax credits on R&D wages so as to avoid overly favouring incumbents at the expense of young firms.
- Intellectual property rights (IPR) systems should be updated so that they are more in tune with the fast-changing nature of innovation today. For example, while well-defined patent rights can provide firms with the incentive to innovate, especially in the chemicals and pharmaceutical sectors, rising litigation costs are undermining the effectiveness of the patent system in promoting innovation in the software sector. More generally, IPR regimes need to be coupled with pro-competition policies to ensure maximum effect.
- The free flow of data should be promoted, to facilitate computer-mediated transactions and management and the associated build-up of private KBC. In particular, regulations that hinder the development of digital platforms should be adjusted, while ensuring that quality, safety and working standards are respected.
- Bankruptcy regimes that do not excessively penalise business failure are associated with more rapid technological diffusion, a higher entry rate of new firms (which are an important source for the creation of new technologies) and more efficient resource allocation to underpin the growth of innovative firms.

Ensuring the availability of human capital for long-term investment and growth

Recent work by the OECD suggests that high and rising income inequality in many OECD countries can have not only damaging social consequences but also hinder long-term economic growth, largely by hurting the human capital investment of the bottom 40% of the population (OECD, 2015h). Fostering opportunities for the bottom 40% can help move the economy and society out of a low-growth equilibrium trap in the medium and longer term. Improving the adaptability of the labour market in the near term can help underpin the investment in human capital for the longer term. Measures to shore up the incomes of low-wage workers vary by country depending on current circumstances and existing policies, but could include changes in statutory minimum wages, in-work benefits and tax policies directed toward low-income households. (OECD, 2015i).

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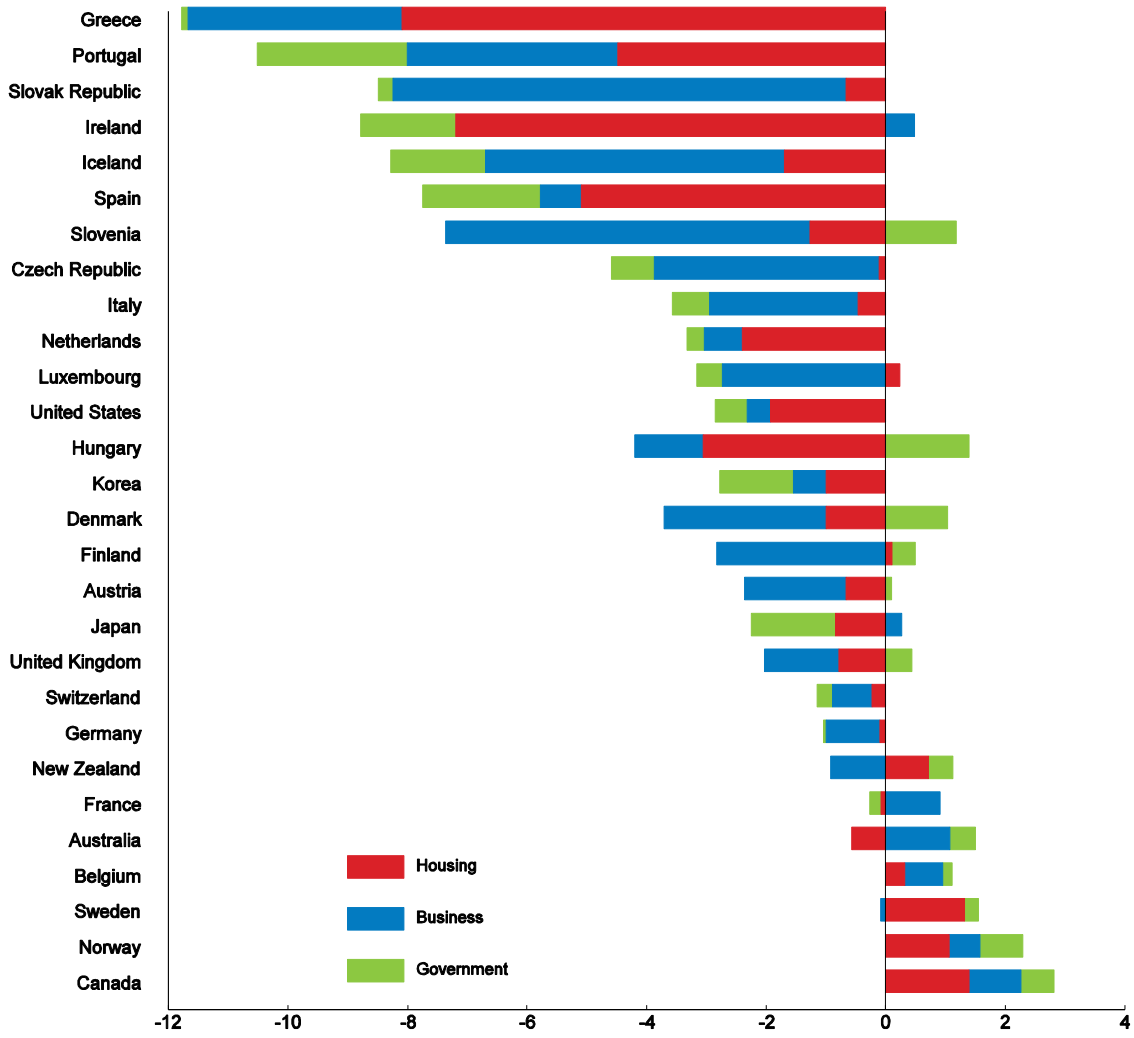
Figure 3.A1. The composition of investment shortfalls differs across countries

Per cent of GDP, 2014 minus 1996-2007 average



Note: In countries where either government or housing investment data for 2014 are not yet available, OECD Economic Outlook 97 projections are used (Hungary, Ireland, Korea, Luxembourg, Poland, Switzerland). In countries where no business investment data exist, it is calculated as a residual.

Source: OECD Economic Outlook 97 database; European Commission; and OECD calculations.

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Table 3.A1. **Global capital spending shortfalls of OECD listed companies**

As a per cent of global sales, 2013 minus 2002-2007 average

	All sectors			Infrastructure			General Industry		
	Average	Latest	Gap	Average	Latest	Gap	Average	Latest	Gap
	2002-07	2013		2002-07	2013		2002-07	2013	
Australia	10.20	10.45	0.24	14.78	14.00	-0.79	9.43	9.82	0.40
Austria	10.18	9.00	-1.18	-	-	-	10.18	9.00	-1.18
Belgium	7.73	5.86	-1.87	16.03	10.26	-5.77	6.51	5.27	-1.24
Canada	11.75	14.61	2.85	25.69	27.29	1.60	8.74	11.51	2.77
Chile	10.59	9.81	-0.78	13.32	12.59	-0.72	9.87	9.42	-0.45
Czech Republic	8.80	9.32	0.51	-	-	-	8.80	9.32	0.51
Denmark	10.62	7.67	-2.95	13.85	8.98	-4.86	5.43	5.51	0.08
Finland	4.82	4.31	-0.51	-	-	-	4.82	4.31	-0.51
France	6.70	7.14	0.44	9.05	10.63	1.59	6.28	6.69	0.41
Germany	5.33	5.17	-0.17	7.87	6.98	-0.88	5.03	4.99	-0.05
Greece	9.59	6.66	-2.93	12.56	7.56	-5.00	8.14	5.89	-2.25
Ireland	4.51	2.77	-1.74	-	-	-	4.51	2.77	-1.74
Israel	10.37	6.34	-4.03	6.99	4.03	-2.96	11.94	7.10	-4.84
Italy	8.82	7.85	-0.97	12.58	11.41	-1.17	7.86	7.24	-0.62
Japan	5.64	5.41	-0.23	8.69	9.36	0.67	5.25	4.82	-0.43
Korea	7.79	5.72	-2.08	6.41	5.85	-0.57	8.04	5.70	-2.34
Luxembourg	5.48	5.96	0.48	-	-	-	5.48	5.96	0.48
Mexico	10.62	10.09	-0.52	12.91	7.84	-5.06	9.94	10.34	0.40
Netherlands	4.51	7.55	3.04	8.64	9.94	1.31	4.18	7.48	3.30
New Zealand	7.66	8.57	0.91	15.28	21.18	5.89	5.38	5.27	-0.11
Norway	10.79	12.00	1.21	21.94	16.78	-5.16	9.05	11.20	2.15
Poland	9.85	7.78	-2.07	9.90	6.31	-3.60	9.45	9.33	-0.12
Portugal	10.40	7.34	-3.07	19.65	12.47	-7.18	8.42	6.84	-1.58
Slovenia	8.40	4.40	-4.01	-	-	-	8.40	4.40	-4.01
Spain	11.29	7.63	-3.66	12.99	15.71	2.72	10.85	5.15	-5.70
Sweden	5.41	5.13	-0.28	9.75	17.06	7.31	5.08	4.42	-0.66
Switzerland	4.82	5.59	0.77	6.86	8.51	1.65	4.67	5.31	0.64
Turkey	5.68	7.23	1.55	4.48	8.69	4.21	6.04	6.81	0.77
United Kingdom	7.27	8.05	0.78	14.15	17.25	3.10	6.35	6.75	0.40
United States	6.37	6.97	0.60	12.63	15.43	2.80	5.38	5.46	0.08
Euro area	6.63	6.56	-0.08	10.24	10.48	0.25	6.10	6.12	0.02
Total OECD	6.64	6.95	0.31	11.89	13.38	1.50	5.84	5.95	0.11
Brazil	8.10	14.93	6.83	13.16	18.30	5.15	7.17	14.37	7.21
China	14.18	8.55	-5.64	28.85	20.15	-8.70	12.41	7.60	-4.81
India	10.49	10.31	-0.17	10.64	9.84	-0.80	10.40	10.70	0.30
Indonesia	11.48	10.73	-0.75	37.36	26.58	-10.78	5.46	7.98	2.51
Russian Federation	13.96	16.76	2.80	24.63	15.54	-9.09	13.39	16.88	3.49
South Africa	9.11	8.82	-0.29	16.89	10.28	-6.61	8.53	8.74	0.21
Total BRIICS	12.82	11.51	-1.31	19.14	15.67	-3.47	11.87	10.97	-0.90

Source: Bloomberg; Blundell-Wignall and Roulet (2015).

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ANNEX 3.1. THE DRIVERS OF BUSINESS INVESTMENT IN ADVANCED OECD COUNTRIES

This annex revisits and expands earlier empirical work on the drivers of changes in business capital stocks.

Modelling investment

An accelerator model is a simple and commonly used way to model investment. It assumes that (gross) investment (I_t) can be split into net investment and replacement investment. Replacement investment in period *t* equals the depreciation of the capital stock in *t-1* (δK_{t-1}, where δ is the depreciation rate). Net investment is assumed to equal to changes in the desired capital stock. In turn, the desired stock of capital (K^*) is considered to be a linear function of output (Y). Hence, real investment can be written as current and past real GDP growth and lagged capital stock:[1]

$$I_t = \sum_{i=0}^{n} \beta_i \Delta Y_{t-i} + \delta K_{t-1} \quad (1)$$

Obviously, investment can depend on more than just output growth and lagged capital stock. According to the neoclassical model, the desired stock of capital is not only a positive function of output but it also depends negatively on the user cost of capital (UCC) (Box 3.4; Chirinko, 1993; Oliner et al., 1995):

$$I_t = \sum_{i=0}^{n} \beta_i \Delta (Y_{t-i}\, UCC_{t-i}^{-\sigma}) + \delta K_{t-1} \quad (2)$$

where σ is a constant elasticity of substitution between capital and labour in the production function (Chirinko, 1993). Tevlin and Whelan (2003) argue that the capital stock is a non-stationary variable and propose a stationarised variant of equation (2) in growth rates:

$$\frac{I_t}{K_{t-1}} = \propto + \sum_{i=0}^{n} \beta_i \Delta y_{t-i} + \sum_{i=0}^{n} \gamma_i ucc_{t-i} \quad (3)$$

Fundamentally, there exists a long-run relationship linking the desired stock of capital to the level of output and the user cost of capital:

$$K^* = \alpha Y \cdot UCC^{-\sigma} \quad (4)$$

1. Equation (1) is usually estimated in constant domestic prices (Oliner et al., 1995; Lee and Rabanal, 2010; Barkbu et al., 2015; IMF, 2015).

Log-linearisation and the error correction representation give the following equation:[2]

$$\Delta k_t = \gamma k_{t-1} + \beta y_{t-1} + \delta ucc_{t-1} + \theta \Delta y_t + \pi \Delta ucc_t \qquad (5)$$

New empirical evidence on the drivers of business capital stock in advanced OECD countries

The modelling of changes in business capital stock (investment)3 in this annex builds on equation (5), which is amended along two dimensions.

- First, the level of the stringency of product market regulation, captured by the OECD's energy transport and communications regulation (ETCR) indicator, is introduced to the long-run relationship. Tighter regulation can be expected to result in less investment and a lower capital stock in the long run.

- Second, the short-term dynamics are augmented by variables often used in empirical investment models. These variables do not exhibit a long-term trend. They include variables, which have a negative relationship with investment/changes in capital stock, such as global and country-specific economic policy uncertainty, stock market and inflation volatility and financial constraints; and a positive relationship like excess equity returns. The hypothesis is also tested whether changes in external demand (world output minus a particular country's output) affect the capital stock beyond the effect of net exports.

The testable equation takes the following form:

$$\Delta k_t = c + \gamma k_{t-1} + \sum_{i=1}^{n} \beta_i \, x_{i,t-1} + \mu \Delta k_{t-1} + \sum_{i=1}^{n} \delta_i \, \Delta x_{i,t} + \sum_{j=1}^{m} \theta_j \, z_{j,t} + \varepsilon_t \qquad (6)$$

where $\gamma k_{t-1} + \sum_{i=1}^{n} \beta_i \, x_{i,t-1}$ gives the long-run relationship including the n long-term covariates, $\sum_{i=1}^{n} \delta_i \, \Delta x_{i,t}$ are the dynamic terms of the long-run variables (output, UCC and ETCR) and $\sum_{j=1}^{m} \theta_j \, z_{j,t}$ is the additional set of m covariates entering the short-term dynamics.

Equation (6) is estimated for a panel of 15 OECD countries for 1985Q4 to 2013Q4 at quarterly frequency.[4] The estimation involves two stages.[5] In the first stage the long-run relationship linking the

2. Alternative models are Tobin's Q model and Euler equations. Tobin's Q links investment to the ratio of market value of corporate assets to the replacement cost these assets. The difficulty is that Tobin's Q at the macro level can be constructed using firm level data on listed companies. Furthermore, those data may not be representative for countries with predominantly bank finance. Euler equations are based on a dynamic optimisation problem of a representative firm wanting to maximise its present value and describe investment to its past linear and quadratic form. These models have not been very successful in explaining aggregate investment (Oliner et al., 1995; Philippon, 2009). Recent empirical work by the IMF (Lee and Rabanal, 2010; Barkbu et al., 2015) relied, however, on the Q model.

3. Business capital stock/investment is defined as total capital stock/investment excluding housing capital stock/investment.

4. Fifteen OECD countries are included: Australia, Belgium, Canada, Denmark, Finland, France, Germany, Japan, Korea, the Netherlands, New Zealand, Sweden, Switzerland, the United Kingdom and the United States.

5. The two-stage approach provides more flexibility compared with a single-equation error correction model. First, it allows for the use of country and year fixed effects in the long-run relationship and including only country fixed effects in the short-term dynamics. In the single-equation approach, one can put either only country fixed effects or country and year fixed effects both in the long-run and short-run relationships. For instance, if the measure of global uncertainty, capturing common trends, enters the short-run dynamics,

capital stock, real output, the user cost of capital and product market regulation is estimated using the dynamic OLS (DOLS) estimator.[6] The DOLS takes care of endogeneity and serial correlation in the residuals. In a second stage, an error correction model is estimated using the lagged deviation from the long-run relationship estimated in the first stage, the first differenced long-run variables[7] and variables capturing uncertainty and volatility, credit constraints and equity returns. An endogenous lag selection procedure sets three lags for real domestic output growth.

Table 3.A1.1 **The long-run drivers of the capital stock: panel unit root and cointegration tests**

OECD, 1985-2013, quarterly data

PANEL UNIT ROOT TESTS	**Im, Pesaran and Shin test**					
	null hypothesis: unit root (heterogenous unit roots)					
	p-value					
	level		**first differences**		**second differences**	
	c	**c+t**	**c**	**c+t**	**c**	**c+t**
log(capital stock)	0.076	0.889	0.807	0.003	0.000	0.000
log(real output)	0.161	0.993	0.000	0.000	0.000	0.000
log(long interest rates)	0.997	0.000	0.000	0.000	0.000	0.000
log(relative investment prices)	0.592	0.684	0.000	0.000	0.000	0.000
log(etcr)	0.999	0.785	0.000	0.000	0.000	0.000
real business investment/capital stock	0.248	0.129	0.000	0.000	0.000	0.000

PANEL COINTEGRATION TESTS	**Pedroni cointegration test**	
	log(capital stock), log(real output), log(long-term interest rate), log(etcr)	
	null hypothesis: no cointegration	
	p-value	
	no deterministic trend	**with deterministic trend**
Panel v-Statistic	0.032	0.000
Panel rho-Statistic	0.968	0.974
Panel PP-Statistic	0.956	0.988
Panel ADF-Statistic	0.960	0.985
Group rho-Statistic	0.999	0.997
Group PP-Statistic	0.992	0.996
Group ADF-Statistic	0.984	0.993

Note: c = constant included in the panel unit root test, c+t = constant and trend included in the panel unit root test.
Source: OECD calculations.

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year fixed effects cannot be used. This means that year fixed effects would not be included in the long-run relationship.

6. Capital stock considered here is total capital stock excluding capital stock in housing. The user cost of capital is decomposed into nominal long-term rates and relative investment prices (business investment deflator over GDP deflator). The tax component is not considered here due to data availability issues. The annual ETCR indicator is converted into a quarterly series by setting the four quarters of any year equal to the annual observation in that year.

7. They turn out to be statistically insignificant.

Panel unit root and cointegration tests were applied to test the order of integration of the variables and to see whether they are linked via a cointegrating vector. Panel unit root tests (Im et al., 2003) indicate that the potential drivers have a unit root in levels but are stationary in first differences. The capital stock itself seems to have a stochastic trend even though tests including a constant indicate that it might be even an I(2) process (stationary only in second differences).[8] Given the non-stationary nature of the data, it is necessary to check whether the five series of interest are linked through a cointegrating vector. Variants of the Pedroni cointegration test (except the panel v-statistic) reject the null of no cointegration (Pedroni, 1999). This confirms that a level relationship connecting the capital stock to its drivers is not a spurious one (Table 3.A1.1).

Anticompetitive regulation hampers the capital stock accumulation in the long run

The estimated long-run relationship suggests that the output elasticity is close to one, implying a stable capital-to-output ratio in the long run (Table 3.A1.2). The elasticities on nominal long-term interest rates and product market regulation are negative. Relative investment prices and long-run real interest rates tend to have positive sign: they are therefore not included in the long-run relationship.[9] This is line with earlier empirical results (Sharpe and Suarez, 2014) and may be due to the very different real interest elasticity of the components of the capital stock. Rolling window estimations indicate the interest elasticity declines and the negative elasticity on the ETCR indicator increases over time.

Table 3.A1.2 **The long-run drivers of the capital stock: coefficient estimates**

OECD, 1985-2013, quarterly data

LONG-RUN RELATIONSHIP (Dynamic OLS estimates)

dependent variable = log capital stock

	FULL	SUBPERIODS				
	1985/2013	**1986/2006**	**1987/2007**	**1989/2009**	**1991/2011**	**1993/2013**
c	**-5.58 ****	-4.36 **	-3.94 **	-1.76	-0.05	-0.49
log real output	**1.23 ****	1.19 **	1.18 **	1.10 **	1.04 **	1.05 **
log long-term interest rate	**-0.08 ****	-0.12 **	-0.13 **	-0.14 **	-0.09 **	-0.02
log ETCR indicator	**-0.06 ****	0.01	-0.02	-0.05 **	-0.07 **	-0.09 **
No. obs	**1674**	1260	1260	1260	1260	1239
No. of countries	15	15	15	15	15	15

Note: * and ** denote statistical significance at the 10% and 5% levels, based on robust standard errors. The estimations include country and time fixed effects.

Source: OECD calculations.

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8. Using output growth in the steady state and the depreciation rate of the capital stock, the gross investment-to-capital stock ratio should be constant. As a result, the capital stock could be replaced by gross investment. Nevertheless, this does not hold in practice for our sample: the gross investment-to-capital stock ratio has a unit root (Table 3.A1.1).

9. These results are not reported here. Future work should first distinguish between public and private business capital and, in a second stage, look at the different types of private business capital.

Accelerator effects reinforced by foreign demand growth

In the second-stage estimation, which looks at short-term dynamics, foreign demand growth shows, besides domestic output effects, a positive correlation to changes in business capital stock (net investment over lagged capital stock) beyond the direct impact of net exports.[10]

Uncertainty and financial constraints

Additional short-term drivers in the error correction model suggest that a higher level of country-specific economic policy uncertainty, an increase in global policy uncertainty and higher inflation volatility are associated with lower investment.[11] Increasing financial constraints, measuring the share of firms facing difficulties to access external funding based on EC surveys, are negatively related to changes in the capital stock for a subgroup of European countries (Table 3.A1.3). By contrast, stock market volatility shows little co-movement with changes in the capital stock. Excess equity returns and stock market returns have the expected positive sign.

10. Contemporaneous real output growth is not used to avoid simultaneity bias. Nevertheless, this can give rise to an omitted variable bias. Indeed, adding contemporaneous real output growth reduces the coefficient estimate on foreign output growth and often renders the coefficient estimates statistically insignificant (not reported here).

11. The country-specific and global economic policy uncertainty series are obtained from http://www.policyuncertainty.com/research.html. The country-specific policy uncertainty indicator is available only for a limited number of countries. Therefore, the following approximations were done: Germany's series is used for Denmark, Finland, the Netherlands, Sweden and Switzerland; France's for Belgium; Canada's for Australia and New Zealand; and Japan's for Korea.

Table 3.A1.3 **The short-run drivers of the capital stock: coefficient estimates**

OECD, 1985-2013, quarterly data

SHORT-RUN DYNAMICS	***dependent variable = d(log capital stock)***											
	1985 2013	1987 2007	1993 2013	**1985 2013**	1987 2007	1993 2013	**1985 2013**	1987 2007	1993 2013	**1985 2013**	1987 2007	1993 2013
coefficient estimates such as estimated in the error correction model												
c	**-4.3E-05**	1.2E-04	-1.2E-05	**5.5E-04 ****	1.0E-03 **	5.4E-04 **	**4.2E-06**	1.6E-04 *	3.7E-05	**2.0E-04 ****	5.6E-04 **	2.5E-04 **
error correction term	**-0.001 ****	-0.002 **	-0.001 **	**-0.002 ****	-0.003 **	-0.002 **	**-0.001 ****	-0.002 **	-0.001 **	**-0.001 ***	-0.001	-0.001 *
d(log capital stock)(-1)	**0.960 ****	0.947 **	0.950 **	**0.950 ****	0.934 **	0.947 **	**0.958 ****	0.944 **	0.950 **	**0.919 ****	0.875 **	0.902 **
d(log real output) (-1)	**0.004**	0.003	0.004	**0.003**	0.002	0.006 *	**0.004**	0.004	0.005 *	**0.002**	0.000	0.000
d(log real output) (-2)	**0.009 ****	0.011 **	0.007 **	**0.006 ****	0.008 **	0.004 *	**0.010 ****	0.011 **	0.008 **	**0.012 ****	0.015 **	0.012 **
d(log real output) (-3)	**0.006 ****	0.007 **	0.004 *	**0.004 ***	0.004	0.003	**0.006 ****	0.007 **	0.004 *	**0.008 ****	0.011 **	0.007 **
d(log foreign output) (-1)	**0.014 ****	0.006	0.017 **	**0.012 ****	0.000	0.013 **	**0.013 ****	0.006	0.015 **	**0.018 ****	0.010 *	0.021 **
cpi_volatility(-1)	**-1.6E-05**	-1.4E-05	-2.0E-05 *									
cpi_volatility(-1)^2	**-3.0E-07**	-2.0E-07	-3.0E-07 *									
log economic policy uncertainty (-1)				-1.02E-04 **	-0.0002 **	-1E-04 **						
d(log global uncertainty) (-1)							-7.47E-05 **	-4E-05	-8E-05 **			
financial constraints (-1)										-2.19E-05 **	-4E-05 **	-2E-05 **
coefficient estimates adjusted for the lagged dependent variable: coeff(adj)=coeff(unadj)/(1-coeff(lagged dependent))												
c	**-4.E-05**	1.2E-04	-1.2E-05	**6.E-04**	1.0E-03	5.4E-04	**4.E-06**	1.6E-04	3.7E-05	**2.E-04**	5.6E-04	2.5E-04
error correction term	**-0.033**	-0.033	-0.024	**-0.042**	-0.044	-0.030	**-0.032**	-0.032	-0.023	**-0.011**	-0.007	-0.010
d(log capital stock)(-1)	**0.960**	0.947	0.950	**0.950**	0.934	0.947	**0.958**	0.944	0.950	**0.919**	0.875	0.902
d(log real output) (-1 to -3	**0.467**	0.404	0.309	**0.249**	0.217	0.253	**0.462**	0.397	0.333	**0.264**	0.216	0.191
d(log foreign output) (-1)	**0.353**	0.112	0.339	**0.243**	-0.001	0.244	**0.302**	0.106	0.299	**0.221**	0.084	0.213
cpi_volatility(-1)	**-4.E-04**	-2.6E-04	-4.0E-04									
cpi_volatility(-1)^2	**-8.E-06**	-3.8E-06	-6.0E-06									
log economic policy uncertainty (-1)				**-0.002**	-0.002	-0.002						
d(log global uncertainty) (-1)							**-0.002**	-0.001	-0.002			
financial constraints (-1)										**-0.00027**	-0.0003	-0.0002
No. obs	**1634**	1253	1243	**1230**	890	1099	**1644**	1260	1252	**805**	609	660
No. of countries	**15**	15	15	**15**	15	15	**15**	15	15	**8**	8	8

Note: * and ** denote statistical significance at the 10% and 5% levels, based on robust standard errors. The estimations include country fixed effects. Two sets of coefficient estimates are reported. The upper block gives the size and the significance of the coefficient estimates such as estimated in the error correction model. The lower block provides the coefficient estimates normalised by the lagged dependent variable: coeff(adj)=coeff(unadj)/(1-coeff(lagged dependent)). The coefficient reported on real output growth is obtained as the sum of the coefficients on d(log real output)(-1), d(log real output)(-2) and d(log real output)(-3), corrected for the lagged dependent variable. Statistical significance is not reported in the lower block, it corresponds to the ones reported in the upper block.

Source: OECD calculations.

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ANNEX 3.2. TESTING OECD STRUCTURAL INDICATORS ON COMPANY INVESTMENT DATA

The OECD has completed a major exercise of collecting company data on capital expenditure, and all the associated financial data, including inter alia, rates of return on equity (ROE) and the costs of equity (COE), for 10,000 listed companies across 75 countries over the period 2002 to 2013. The data were separated into infrastructure companies (following MSCI sector guidelines) and other general industries, and aggregated on a country basis (Box A2.1). These are the largest companies in the world and for the most part are multi-national enterprises (MNEs). In the general industrial sector, these companies operate in many countries and hence structural policies in any one will have a more diluted effect. Indeed, these companies may move parts of their business operations between jurisdictions favouring those with more profitable possibilities. This is less so for the infrastructure sector, however, where the company listed in a given country also tends to keep the majority of its operations in that country. For these companies, the structural policies of the home country will have a more direct effect on investment.

A model of capital spending for infrastructure companies was developed in Blundell-Wignall and Roulet (2015) to explain investment. It postulates that capital spending grows in line with sales (the accelerator type mechanism) but will be shifted from this trajectory by variations in several explanatory variables: ROE; COE; the cost of debt proxied by the AAA bond rate in the country; a dummy variable for the tax status of the country as an investment tax free zone (TAX); the company tax rate (CITR); an earnings expectation variable proxied by the ratio of stock market capitalisation to GDP (MCAP); and a measure of banking system openness captured by a variable based on the persistence of deviations from covered interest parity (VCIP). This base model was then used to test a number of OECD structural indicators to see whether they affected capital spending. Six structural indicators were tested with the following results:[1]

- *The effective marginal tax rates on capital (EMTR).* The estimated coefficient on this variable has an incorrect sign. However, it is highly correlated with the company tax rate (correlation of 0.7), which in the base model has the correct negative sign, but drops in value with the effective rate. Including the latter is the preferred variable.

- *The OECD employment protection legislation indicator* (EPL). The EPL is scaled from 0 (least restrictions) to 6 (most restrictions). The EPL coefficient is not significant.

- *The OECD regulation in energy, transport and communication indicator (ETCR).* The ETCR is scaled from 0 (least restrictions) to 6 (most restrictions). The ETCR has the correct negative sign and differs significantly from zero at the 10% confidence level.

1. There is some apparent interaction between the tax zone dummy variable and some of the other indicators. The TAX variable is highest in emerging markets, particularly countries in south Asia and East Asia/Pacific, East Europe and the MENA countries. It is to be expected that some of the restrictiveness indexes would be correlated with a variable associated with a ranking of emerging countries

- *The foreign direct investment restrictiveness index (FDI)*. The FDI is scaled from 0 (open) to 1 (close). The FDI coefficient has the correct negative sign and is strongly supported by the data at the 1% confidence level.

- *The OECD product market regulation indicator (PMR)*. The PMR is scaled from 0 (least restrictions) to 6 (most restrictions). This PMR coefficient has the correct negative sign and significant at the 5% confidence level.

- *The country rank number of corruption perception score (RCP)*. The RCP coefficient is correctly (negatively) signed and significant at the 1% confidence level.

When the variables with the correct signs are all included together, it is the FDI variable that dominates and it remains significant at the 1 % level. These results suggest that the variables EPL, ETCR, FDI, PMR and RCP are worth exploring further in terms of their effects on investment.

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Box A2.1. Regression model test

The regressions are run on a global balanced panel of 50 countries for the years 2002 to 2013. Individual company data for the main variables in millions of US dollars are aggregated by country for some 1328 non-financial companies operating in infrastructure sector. The model postulates that capital spending grows in line with sales (i.e. the dependent variable is global capital spending as a share of global sales) but will be shifted from this trajectory by variations in the explanatory variables.

The determinants of aggregate corporate capital spending in infrastructure sector

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
ROE	0.09 *** (3.71)	0.06 *** (3.20)	0.07 *** (3.81)	0.08 *** (4.16)	0.07 *** (3.78)	0.07 *** (3.54)	0.07 *** (3.91)	0.08 *** (4.28)
COE	0.04 (1.57)	0.02 (0.62)	0.004 (0.12)	0.03 (0.77)	0.003 (0.00)	-0.002 (-0.05)	0.005 (0.12)	0.03 (0.93)
COD	-0.17 ** (-2.15)	-0.25 *** (-3.00)	-0.26 *** (-3.12)	-0.26 *** (-3.12)	-0.28 *** (-3.17)	-0.26 *** (-3.09)	-0.26 *** (-3.10)	-0.27 *** (-3.32)
MCAP	0.01 *** (3.84)	0.03 *** (7.47)	0.03 *** (5.74)	0.03 *** (7.23)	0.03 *** (7.43)	0.03 *** (7.86)	0.03 *** (8.02)	0.03 *** (7.87)
VCIP	-0.04 *** (-4.93)	-0.03 *** (-3.18)	-0.03 *** (-2.88)	-0.05 *** (-4.85)	-0.04 *** (-3.99)	-0.03 *** (-3.06)	-0.03 *** (-2.97)	-0.06 *** (-6.27)
CITR	-0.12 *** (-2.88)	-0.65 *** (-8.97)	-0.17 *** (-3.68)	-0.13 *** (-2.99)	-0.10 *** (-2.49)	-0.13 *** (-2.91)	-0.16 *** (-3.72)	-0.07 * (-1.70)
TAX	0.04 *** (3.15)	0.09 *** (2.36)	0.10 *** (3.08)	0.17 *** (6.52)	0.23 *** (4.39)	0.15 *** (3.88)	0.05 (1.48)	0.30 *** (5.60)
EMTR	-	0.55 *** (9.77)	-	-	-	-	-	-
EPL	-	-	0.002 (0.45)	-	-	-	-	-
ETCR	-	-	-	-0.82 * (-1.81)	-	-	-	-0.34 (-0.57)
FDI	-	-	-	-	-0.23 *** (-5.56)	-	-	-0.28 *** (-4.78)
PMR	-	-	-	-	-	-0.01 ** (-2.10)	-	-0.004 (-0.68)
RCP	-	-	-	-	-	-	-0.0005 *** (-4.88)	-0.0001 (-0.38)
C	0.12 *** (6.22)	0.11 *** (5.29)	0.11 *** (3.55)	0.09 *** (3.87)	0.05 ** (2.29)	0.10 *** (4.55)	0.16 *** (8.55)	0.03 (0.77)
R^2	0.67	0.69	0.69	0.69	0.69	0.69	0.69	0.69
F-Stat	103.21	91.30	89.26	87.54	90.69	89.43	89.47	66.71
Prob(F)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Durbin-Watson stat	1.34	1.14	1.12	1.13	1.14	1.12	1.13	1.15
Total Obs.	462	373	373	367	373	373	373	367

Note: ROE: return on equity; COE: cost of equity (dividend yield plus the trend rate of growth of earnings); COD: cots of debt (yield of AAA-rating corporate bond index by country minus 1-year government bond yield); MCAP (market cap to GDP as an equity bullishness expected earnings variable); CITR (corporate gross income tax rate of the host country); TAX (the % of countries in the region that offer tax holidays & exemptions); EMTR (effective marginal tax rates on capital of the host country); EPL (OECD employment protection legislation indicator,); ETCR (regulation in energy, transportation and communication indicator); FDI (FDI restrictiveness index,); PMR (product market regulation indicator); and RCP (country rank number of corruption perception score).

Source : Bloomberg, PMR database, Oxford University Centre for Business Taxation, Transparency International, OECD calculations

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ANNEX 3.3. DOES THE HETEROGENEITY OF PRODUCT MARKET REGULATIONS AFFECT FOREIGN DIRECT INVESTMENT?

This annex provides an overview of the methodology and the data used for the estimation of the effects of economic policies and other factors on foreign direct investment (FDI) stocks. It also provides empirical results.

Modelling foreign direct investment stocks

A gravity model is used to estimate the effect of policies on bilateral FDI stocks. This empirical approach is commonly used in the international trade literature, building on the theoretical foundations of Anderson and Van Wincoop (2003). Head and Ries (2008) provide a theoretical foundation of gravity models for cross-border investment in which inward FDI stocks are determined by the characteristics of countries and a vector of pair-specific variables reflecting monitoring costs.

Following Santos Silva and Tenreyro (2006), a Poisson pseudo-maximum likelihood (PPML) estimator is used due to a number of benefits that it has over linear estimation of a gravity equation. Santos Silva and Tenreyro (2006) show that a linear estimation of the log-linearised gravity equation relies on a specific assumption about the distribution of the residuals that does not necessarily hold in practice. In particular, estimates can be biased in the presence of heteroskedasticity. In addition, the Poisson model makes it possible to take into account cases where the dependent variable is equal to zero. The gravity equation specification is as follows:

$$FDI_{ijt} = \exp(\beta_1 ln(Y_{it}) + \beta_2 ln(Y_{jt}) + \sum_k \beta_{3,k} d_{ij}^k + \beta_4 \ln(R_{it}) + \beta_5 \ln(R_{jt}) + \sum_k \beta_{6,k} X_{it}^k + \sum_k \beta_{7,k} X_{jt}^k + \beta_8 FTA_{ijt} + \beta_9 FTA_{it} + \beta_{10} FTA_{jt} + \beta_{11} EA_{ijt} + \gamma PMR_{ijt}^h + u_i + v_j + \alpha_t) + \varepsilon_{ijt}$$

FDI_{ijt} denotes the inward FDI position of country i from country j in year t, Y_{it} denotes GDP, d_{ij}^k refers to a set of four variables typically included in gravity models: geographical distance, contiguity, the existence of a common language and a dummy variable equal to one if the host and investing countries share the same legal system. R_{it} denotes remoteness, defined as the GDP-weighted average of the distance between a country and its partners and X_{it}^k is a set of country-specific variables. FTA_{it}, FTA_{jt} and FTA_{ijt} are dummy variables to identify if individual countries are in free-trade areas or if country pairings are in the same free-trade area, and EA_{ijt} is a dummy that takes value one if the country pair is in the euro area. PMR_{ijt}^h denotes the bilateral heterogeneity of the Product Market Regulation (PMR) indicator. u_i, v_j and α_t denote the host country, investing country and year fixed effects respectively. ε_{ijt} denotes a zero-mean error.

To check that the results do not depend on the type of estimator, also a linear estimator in which the dependent variable is the logarithm of FDI is used. In alternative regressions, factor dissimilarity, human capital dissimilarity and size similarity are added as control variables as these can also be determinants of FDI (Markussen et al., 1996 and Markussen, 1997). To check that there is no bias due to the omission of country-specific features that can vary over time, a robustness check is carried out with time-varying host country (u_{it}) and investing country (v_{jt}) dummies. Such time-varying fixed effects capture the effect of the

stringency of regulation, of any type of country-specific policy setting that can change over time (e.g. taxation) and of country-specific macroeconomic developments (e.g. exchange rate changes).

$$FDI_{ijt} = \exp(\sum_{k} \beta_{3,k} d_{ij}^{k} + \beta_{8} FTA_{ijt} + \beta_{11} EA_{ijt} + \gamma PMR_{ijt}^{h} + u_{it} + v_{jt}) + \varepsilon_{ijt}$$

Measuring the heterogeneity of product market regulations and FDI stocks

The bilateral heterogeneity of regulation is measured as the share of regulatory settings that differ between two countries, making use of the OECD PMR indicator as outlined in Fournier (2015b). This indicator is an economy-wide indicator measured every five years between 1998 and 2013 that covers a wide range of goods and service sectors (Koske et al., 2015). The methodology is similar to the one used by Kox et al. (2004). For each question considered in the questionnaire, a country pair is assigned the value 1 if the answer is different and 0 otherwise.[40] The data are aggregated using the same weights as in the overall PMR indicator. For a given country, its heterogeneity with respect to each other OECD country can be calculated, and an average of each of these bilateral measures provides insight how much a country differs from other OECD countries. The resulting economy-wide measure is a lower bound of regulatory heterogeneity as even when the answer is the same, regulation can differ for some aspects that are not captured in this questionnaire (e.g. a different design in the implementation of the same regulatory setting).

In the following estimations, inward FDI stocks in value (US dollars) reported in the OECD FDI databases are used. FDI is the category of international investment that reflects the objective of an entity to obtain a lasting interest in an enterprise resident in another country. The direct or indirect ownership of 10% or more of the voting power is considered as evidence of the existence of such a lasting interest: small participations that are typically not associated with a significant influence are not included. These FDI positions can be the result of greenfield investments or of mergers and acquisitions. The FDI stock is net: it is measured as the market value share capital and reserves plus debt due to the direct investors minus debt due to subsidiaries. The FDI bilateral data exhibit slightly more than 10% of zero stocks that are kept in the sample. In the log-linear estimations the log of FDI is replaced by zeros in these cases.

New empirical evidence on the drivers of foreign direct investment

The effect of the heterogeneity of product market regulation on FDI is clearly negative because the divergence in product market regulations generates costs that affect firms' decisions to invest abroad (Table 3.A3.1). The introduction of a broad reform package that would cut the divergence of regulations between countries by one-fifth would increase FDI stocks by around 15%. In terms of specific policy areas, the divergence of antitrust exemptions, barriers in service provision, network sector barriers and command and control regulation all have significant negative effects on FDI (Fournier, 2015a). The negative effect of overall heterogeneity remains when one controls for the stringency of product market regulation (Table 3.A3.1, column 2 and 5), for non-policy dissimilarity indicators (Table 3.A3.1, column 3 and 6) and when one uses a linear, rather than the Poisson estimator (Table 3.A3.1, column 4 to 6). In addition, the alternative regressions with time-varying country fixed effects (Table 3.A3.2) show that this effect is robust to the control for any kind of country-specific change. Additional robustness checks provided in Fournier (2015a) show that the negative effect of regulatory heterogeneity on FDI stocks is also robust when one excludes countries with the highest FDI flows in relation to GDP, or when one uses a heterogeneity indicator based on the World Bank's Doing Business database.

40. A few questions required some specific adjustments, see Fournier (2015a) for more detail.

These estimates also shed light on the effect of other policy determinants:

- In particular, the stringency of product market regulations itself matters in specific fields, on top of the effect of regulatory heterogeneity: the estimation with the Poisson model shows a negative effect for the complexity of regulatory procedures on FDI.

- As expected, FDI restrictions as measured by the OECD FDI restrictiveness index (Kalinova et al., 2010) reduce FDI.

- There is some evidence that belonging to the EU Single Market can have a positive effect on FDI on top of the effect already captured by the regulation indicators. This Single Market effect is not only present for FDI within the Single Market: FDI between Single Market countries and other OECD countries are boosted as well. By contrast, there is a negative effect for the NAFTA area, which may reflect a substitution effect in favour of trade (see Fournier et al., 2015, for evidence of the large positive effect of NAFTA on trade).

- The estimates show a positive effect of trade barriers, suggesting that FDI can be used to by-pass such barriers.

- Finally, employment protection legislation (EPL) can deter cross-border investment by impeding the restructuring associated with mergers and acquisitions. More evidence on the effect of EPL on FDI stocks is provided by estimates over a longer period in Fournier (2015a).

Table 3.A3.1 **FDI determinants: baseline results**

Estimation method	**Poisson**			**Linear**		
$\ln(Y_{it})$	1.23***	1.40***	0.70**	0.98***	1.23***	0.93***
	(0.27)	(0.28)	(0.30)	(0.33)	(0.36)	(0.35)
$\ln(Y_{jt})$	1.50***	1.22***	0.87***	1.17***	1.01***	1.06***
	(0.32)	(0.38)	(0.27)	(0.29)	(0.37)	(0.29)
$\ln(dist_{ij})$	-0.68***	-0.68***	-0.61***	-1.12***	-1.13***	-1.13***
	(0.10)	(0.10)	(0.095)	(0.11)	(0.11)	(0.11)
$Cont_{ij}$	0.072	0.061	0.19	-0.11	-0.11	-0.12
	(0.16)	(0.16)	(0.14)	(0.22)	(0.22)	(0.22)
Same legal $system_{ij}$	0.41***	0.41***	0.45***	0.61***	0.61***	0.61***
	(0.088)	(0.089)	(0.086)	(0.11)	(0.11)	(0.11)
Common official $language_{ij}$	0.057	0.064	0.060	0.50**	0.50**	0.60***
	(0.14)	(0.14)	(0.13)	(0.20)	(0.20)	(0.21)
PMR^{h}_{ijt}	-2.09***	-2.06***	-0.96*	-2.85***	-3.02***	-2.52***
	(0.59)	(0.68)	(0.57)	(0.79)	(0.82)	(0.81)
European Economic $Area_{it}$	-0.027	-0.092	-0.22	0.79***	0.66**	0.77***
	(0.24)	(0.24)	(0.26)	(0.27)	(0.26)	(0.26)
European Economic $Area_{jt}$	0.62*	0.79**	0.24	0.30	0.35	0.30
	(0.35)	(0.38)	(0.38)	(0.33)	(0.32)	(0.34)
European Economic $Area_{ijt}$	0.22	0.22	0.40	0.055	0.012	0.051
	(0.26)	(0.26)	(0.25)	(0.18)	(0.18)	(0.18)
Euro $Area_{ijt}$	0.13	0.12	0.20	0.12	0.093	0.19
	(0.15)	(0.16)	(0.13)	(0.16)	(0.17)	(0.16)
$NAFTA_{ij}$	-1.24***	-1.22***	-0.97***	-0.88	-0.90	-1.07
	(0.28)	(0.28)	(0.27)	(0.68)	(0.68)	(0.69)
$\ln(\text{Nominal exchange rate}_{it})$	-0.57	-0.67*	-0.44	-1.06**	-1.04**	-0.86*
	(0.39)	(0.39)	(0.38)	(0.43)	(0.43)	(0.46)
$\ln(\text{Nominal exchange rate}_{jt})$	-0.91**	-0.46	-0.22	0.065	0.26	0.047
	(0.43)	(0.46)	(0.46)	(0.32)	(0.35)	(0.32)
Employment Protection $Legislation_{it}$	-0.28	-0.38*	-0.17	-0.24	-0.44**	-0.26
	(0.17)	(0.20)	(0.16)	(0.19)	(0.20)	(0.20)
Employment Protection $Legislation_{jt}$	-0.39	-0.21	-0.28	-0.28	-0.058	-0.25
	(0.28)	(0.27)	(0.26)	(0.26)	(0.26)	(0.27)
$Tariff_{it}$	-0.075		-0.085	0.34***		0.29**
	(0.12)		(0.10)	(0.13)		(0.13)
$Tariff_{jt}$	0.25**		0.23*	-0.036		-0.038
	(0.12)		(0.12)	(0.11)		(0.12)
Complexity of Regulatory $Procedures_{it}$	-0.20***	-0.19***	-0.19***	-0.016	-0.013	-0.047
	(0.050)	(0.046)	(0.042)	(0.066)	(0.066)	(0.066)
FDI $restrictiveness_{it}$	-0.27*		-0.28*	-0.052		-0.13
	(0.14)		(0.15)	(0.13)		(0.13)
Constant	-21.2**	-19.2*	4.66	-18.8	-18.8	-14.5
	(10.4)	(11.7)	(10.6)	(14.3)	(15.6)	(14.6)
N	2,063	2,063	1,999	2,063	2,063	1,999
R^2	0.879	0.876	0.907	0.820	0.821	0.822
Controls for remoteness	YES	YES	YES	YES	YES	YES
Country and year fixed effects	YES	YES	YES	YES	YES	YES
Controls for PMR levels in seven subdomains	NO	YES	NO	NO	YES	NO
Controls for size and factor dissimilarities	NO	NO	YES	NO	NO	YES

Note: Asterisks (*, **, ***) indicate the significance level (10%, 5%, 1%) of the coefficients. i denotes the inward country and j the outward country. Standard errors adjusted for country-pair clusters are in parentheses. $Dist_{ij}$ = geographical distance, $Cont_{ij}$ = contiguity dummy, PMR^{h}_{ijt} = Heterogeneity of product market regulation, NAFTAij = North America Free Trade Agreement pair dummy; Nominal $exchange\ rate_{it}$ = Nominal dollar exchange rate, $Tariff_{it}$ = PMR indicator of trade tariffs. Poisson = Poisson pseudo-maximum likelihood.

Source: OECD calculations.

Table 3.A3.2 **FDI determinants: robustness check with time varying fixed effects**

Estimation method	**Poisson**			**Linear**		
$\ln(dist_{ij})$	-0.47***	-0.36***	-0.47***	-1.05***	-1.07***	-1.03***
	(0.097)	(0.11)	(0.096)	(0.10)	(0.10)	(0.10)
$Cont_{ij}$	0.26*	0.45***	0.28**	-0.020	-0.041	0.0053
	(0.15)	(0.14)	(0.14)	(0.21)	(0.21)	(0.21)
Same legal $system_{ij}$	0.31***	0.35***	0.28***	0.67***	0.66***	0.70***
	(0.092)	(0.086)	(0.085)	(0.10)	(0.11)	(0.11)
Common official $language_{ij}$	0.092	0.033	0.039	0.42**	0.54***	0.42**
	(0.12)	(0.12)	(0.12)	(0.20)	(0.20)	(0.19)
PMR^{n}_{ijt}	-2.66***	-2.10***	-3.02***	-2.23***	-1.88**	-1.97***
	(0.67)	(0.61)	(0.69)	(0.72)	(0.73)	(0.74)
European Economic $Area_{ijt}$	0.28	0.44**	0.32	0.042	0.012	-0.085
	(0.20)	(0.22)	(0.22)	(0.18)	(0.18)	(0.18)
Euro $Area_{ijt}$	-0.089	-0.071	0.072	0.077	0.15	0.12
	(0.17)	(0.15)	(0.16)	(0.18)	(0.18)	(0.19)
$NAFTA_{ij}$	-0.82***	-0.76***	-1.01***	-0.89	-1.12*	-0.63
	(0.25)	(0.23)	(0.26)	(0.63)	(0.65)	(0.65)
Human capital $dissimilarity_{ijt}$		0.088			0.019	
		(0.39)			(0.48)	
Factor $dissimilarity_{ijt}$		-0.50***			0.14	
		(0.18)			(0.090)	
Size $similarity_{ijt}$		0.25***			0.27***	
		(0.045)			(0.060)	
Constant	12.4***	11.9***	12.7***	19.5***	12.4***	12.5***
	(1.28)	(1.34)	(1.22)	(1.87)	(1.38)	(1.14)
N	2,741	2,665	2,124	2,746	2,670	2,129
R^2	0.881	0.900	0.900	0.845	0.846	0.847
End of sample	2013	2013	2008	2013	2013	2008
Time varying country fixed effects	YES	YES	YES	YES	YES	YES

Note: Asterisks (*, **, ***) indicate the significance level (10%, 5%, 1%) of the coefficients. i denotes the inward country and j the outward country. Standard errors adjusted for country-pair clusters are in parentheses. $Dist_{ij}$ = geographical distance, $Cont_{ij}$ = contiguity dummy, PMR^{h}_{ijt} = Heterogeneity of product market regulation, Human capital $dissimilarity_{ijt}$ = absolute difference of the logarithm of the average number of years of schooling, Factor $dissimilarity_{ijt}$ = absolute difference of the logarithm of GDP per capita, which is a proxy for the capital stock per worker, Size $similarity_{ijt}$ = variable that captures the similarity of the size of GDP. Poisson = Poisson pseudo-maximum likelihood.

Source: OECD calculations.

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