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STRENGTHENING ECONOMIC RESILIENCE: INSIGHTS FROM THE POST-1970 RECORD OF SEVERE RECESSIONS AND FINANCIAL CRISES

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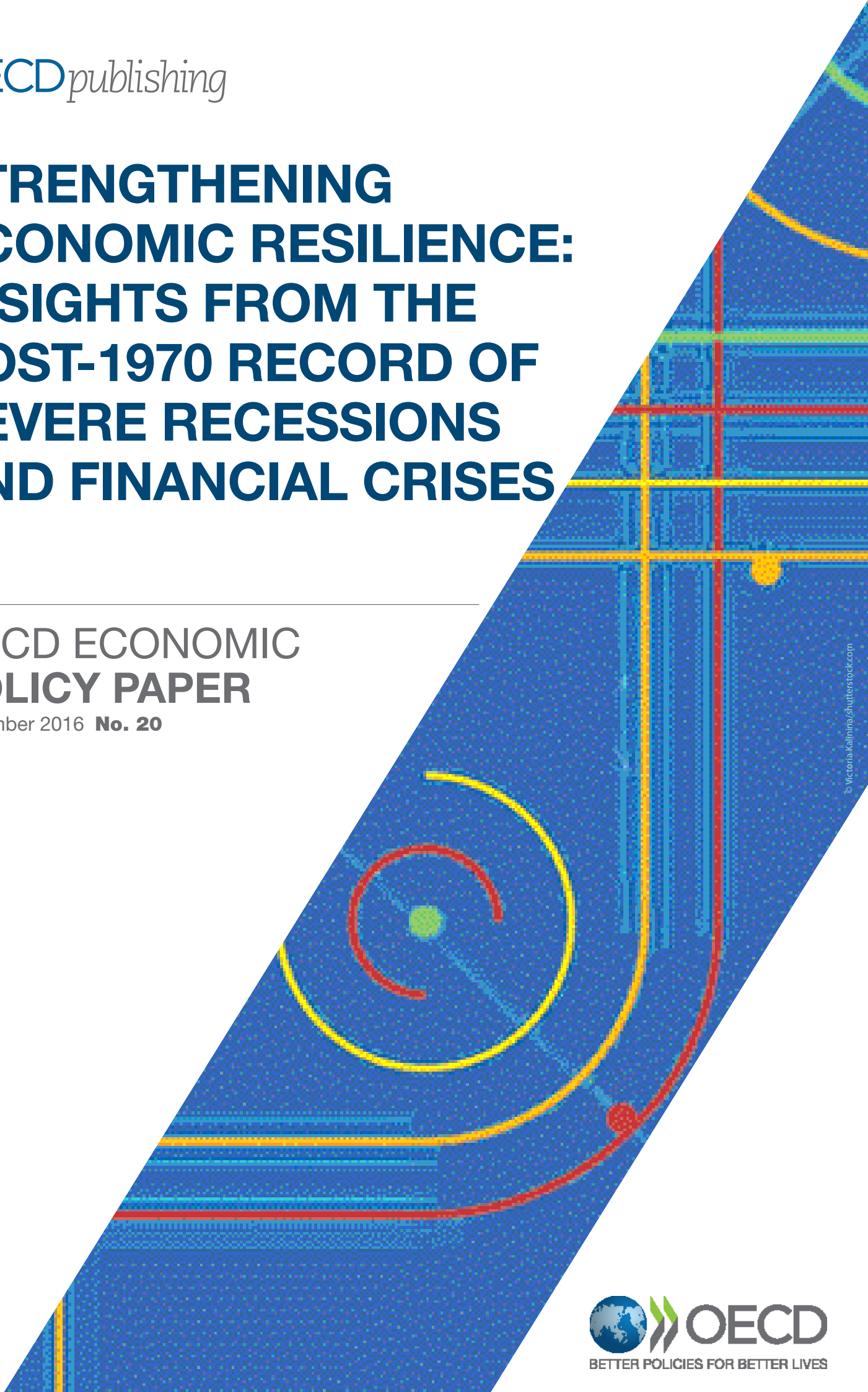

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Strengthening Economic Resilience:

Insights from the Post-1970 Record of Severe Recessions and Financial Crises

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Abstract/ Résumé

Strengthening economic resilience: Insights from the post-1970 record of severe recessions and financial crises

Considering the deep and long-lasting impact of severe recessions, such as the 2008-09 financial crisis, it is important that measures be taken to minimise the risk of such event. But in doing so the benefits need to be balanced against the potential costs in terms of lower average growth that some of the actions to lower vulnerabilities to bad events could entail. Insofar as the risk-mitigating measures can involve a trade-off between growth and crisis risk, the most cost-effective actions need to be identified, spanning both macro and structural policies. The work summarised in this paper has explored this issue using two complementary empirical approaches, both providing insights on the impact of various policy settings on average GDP growth on the one hand, and either crisis risks or GDP growth at the (negative) tail end, on the other. The results indicate that pro-growth product and labour market policies generally have little impact on the exposure to crisis. More significant trade-offs between efficiency and crisis risk arise in the case of financial market policies.

JEL codes: E02; E61; F32; G01

Keywords: resilience, financial crisis, severe recession, GDP tail risk, financial liberalisation, prudential measures, economic growth, financial stability, quantile regression

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Renforcer la résilience économique : Quelques enseignements des épisodes de profondes récessions et crises financières depuis 1970

Au vu de l'ampleur et des conséquences prolongées des profondes récessions, dont la crise de 2008-09, il est important que des mesures soient prises pour minimiser les risques de tels événements. Toutefois, il est également important que le choix de mesures pour y arriver tienne compte du fait que certaines d'entre elles puissent avoir un impact négatif sur la croissance. Dans la mesure où le choix d'action implique un possible arbitrage entre la réduction des risques de récession sévère et le taux de croissance moyen du PIB, les mesures les plus efficaces par rapport à leur coût doivent être retenues. Le travail présenté dans cette étude a examiné cet enjeu à partir de deux approches empiriques complémentaires, lesquelles apportent un éclairage sur l'impact des politiques publiques sur la croissance moyenne d'une part, et sur les risques de crise économiques ou sur les épisodes de forte croissance négative du PIB, d'autre part. Les résultats indiquent que les politiques publiques du marché des biens et services ainsi que du marché du travail et qui favorisant la croissance n'ont, de manière générale, que peu d'impact sur les risques de récession sévère. En revanche, des arbitrages plus importants sont identifiés dans le cas des politiques des marchés financiers.

Classification JEL : E02; E61; F32; G01

Mots clés : risque négatif, régression quantile, stabilité financière, croissance économique, résilience, sévère récession, crise financière, mesures prudentielles.

Strengthening economic resilience: Insights from the post-1970 record of severe recessions and financial crises

Key messages

- Major global crises such as the 2008-09 episode are rare**,** but severe recessions have been quite frequent over the past four decades, entailing significant costs in terms of foregone income and persistently high unemployment.

- It is important that measures be taken to minimise the risk that such events occur. However, in doing so, the benefits need to be balanced against the potential costs in terms of lower average growth that some policy measures could entail.

- When risk-mitigating measures involve a trade-off between growth and crisis risk, the most cost-effective actions need to be identified, spanning both macro and structural policies.

- The analysis reported in this paper summarises evidence from OECD work based on experience from a large sample of OECD and non-OECD countries over the period 1970-2014 and that sheds light on possible growth- financial fragility trade-offs from two angles: i) looking at the extent to which pro-growth policies can make economies more vulnerable to severe recessions and ii) assessing the impact on growth of risk-mitigating (prudential) policies.

- Countries with higher-quality institutions (more effective government, greater voice and accountability, better control of corruption, etc.) benefit from both higher growth and fewer occurences of severe recessions.

- Product and labour market policies that are conducive to higher productivity (*e.g*. through higher competition) and employment generally have little impact on crisis risks, *i.e*. they do not reduce the likelihood of severe recessions, but do not raise it either. There are two exceptions:

  – Stronger active labour market programmes result in both higher average growth and fewer occurences of severe recessions.

  – Lower barriers to trade have a favourable impact on average growth through increased trade openness, but also through lower crisis risk.

- More significant trade-offs between growth and crisis risks arise in the case of financial market policies, especially in countries with less developed financial sectors.

  – Financial market liberalisation often yields stronger growth, but also higher risks of banking crises and hence severe recessions. In the cases where liberalisation essentially leads to the development of private credit – in particular bank credit -- as opposed to equity-based financial instrument, the impact on growth diminishes and can even turn negative as bank credit expands relative to GDP.

  – Greater capital flow openness raises growth, but also increases the risk of banking and currency crises. However, among the different types of capital flows, only debt is

associated with higher crisis risk. Foreign direct investment and the equity portion of portfolio investment are both found to have a positive impact on growth, without any significant incidence on crisis risk.

  - The risk of crises can be mitigated through prudential policies. Indeed, greater use of prudential policies is associated with fewer occurrences of severe recessions. At the same time, it may come at a cost in terms of lower average growth.

- One of the main implications of the analysis is that taking measures in the financial sector to lower the risk of severe recessions is entirely appropriate, but focusing too narrowly on that sector is unlikely to be sufficient and could entail substantial costs in terms of foregone GDP growth.

- Other sources of distortions contributing to the build-up of vulnerabilities to crisis need to be addressed. Identifying the most important distortions requires knowledge about the main drivers of vulnerabilities.

  - Among the factors creating an environment prone to severe recessions, the more prominent are rapid growth of private credit, imbalances in the housing market (as proxied by real house prices and the ratios of house prices to income and house prices to rent), and, to a lesser extent, large current account imbalances.

  - This points to the need for looking at how domestic policy distortions -- notably in the areas of housing market regulation as well as taxation -- contribute to excess leverage, in particular through real estate markets and current account imbalances.

1. Introduction

The global financial crisis marked a turning point for the assessment of macroeconomic risks in developed countries. Following a period characterised by positive growth dynamics and overall macroeconomic stability, the 2008-09 economic turmoil served as a powerful reminder that economic fragility can develop beneath the surface of stable macroeconomic conditions, calling into question the adequacy of conventional tools to monitor economic risks and assess longer-term resilience.

Economic resilience can be defined as the capacity of an economy to reduce vulnerabilities, to resist to shocks and to recover quickly. It can be strengthened by exploring the role of policies that mitigate both the risks and consequences of severe crises. In the case of risks, this means developing adequate tools to detect the types of vulnerabilities that create the conditions for adverse shocks to turn into crises, and to take actions to stem the build-up of such vulnerabilities before it is too late. In turn, this implies being able to monitor home-grown vulnerabilities, but also the possible spillovers from vulnerabilities arising in other countries that could be transmitted through financial, trade and confidence channels.

Coping with the consequences of severe crises means identifying policy settings and mechanisms that can be put in place *ex ante* so as to help absorbing the impact of such events. For instance, in the case of financial markets, dealing effectively and promptly with non-performing loans and other toxic assets weighing on banks' balance sheets – and which contribute to a dysfunctional financial system – could go a long way in mitigating the consequences of a crisis and allowing that credit funds productive investment (Aiyar et al., 2015). As another example, the last crisis episode showed that countries that already had a work-time sharing scheme in place when the recession hit were more

successful at mitigating the labour market consequences of the steep recession (Hijzen and Martin, 2012).

The analysis reported in this paper focuses on the first of these aspects, *i.e*. the identification of instruments to detect vulnerabilities and the influence of policies on the risk of severe crises.[1] The financial crisis affected all countries but the severity of the initial downturn and the aftermath differed across them. More generally, the large sample of severe recessions during the post-war period and the diversity of cross-country experiences in dealing with them provide scope for analysing the role of structural characteristics and policies in determining the exposure to crisis. Such analysis helps identifying policy settings that spur growth while mitigating the risks and consequences of severe economic downturns. Insofar as the risk-mitigating measures can involve a trade-off between growth and crisis risk, the paper discusses ways to ease the trade-off.

After providing an overview of the frequency of severe recessions and financial crises in the post-war period (Section 2), this paper presents the main findings from research looking at the impact of pro-growth policies on the risk of severe recessions and of risk-mitigating (prudential) measures on growth (Section 3). This is followed by a discussion of the main policy implications (Section 4).

2. The post-1970 record of severe recessions and financial crises

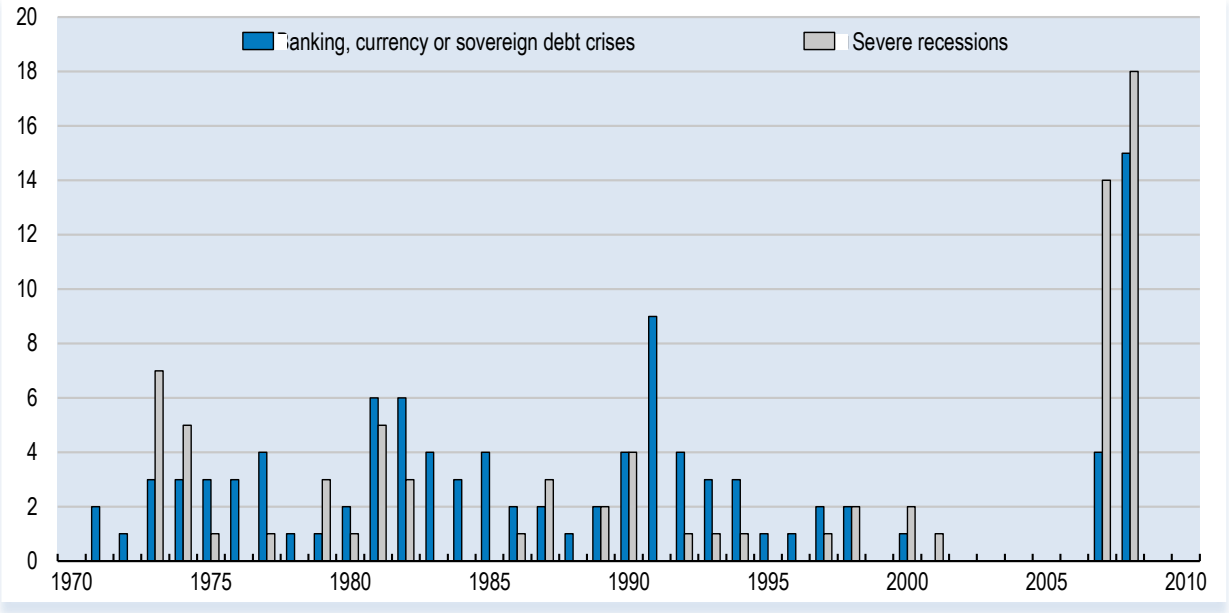
Major global crises, such as the 2008-09 episode, are rare but severe recessions have been quite frequent over the past four decades, often with a large cumulated cost in terms of foregone income and persistently high unemployment. Figure 1 shows the incidence of different crisis types (banking, currency or sovereign debt crises) and the frequency of severe recessions for OECD countries since 1970. Severe recessions are defined as episodes characterised by a peak-to-through fall in GDP exceeding the median fall across the entire country-year sample. Crisis episodes are identified using various datasets.[2]

1. Earlier research on the role of structural policies in the amplification and persistence of shocks is summarised in Sutherland and Höller (2014).

2. Crisis instances are taken from Babecky et al. (2012) who collect crisis dates from a range of studies, including Reinhart and Rogoff (2011) and Laeven and Valencia (2012). A crisis is identified if at least one study claims that a crisis occurred. Severe recessions are identified using the Bry and Boschan (1971) algorithm to identify peak and trough dates of business cycles. Severe recessions are defined as recessions with a fall in GDP per capita from peak to trough above the median fall over the entire country-year sample, which is somewhat above 3 % of peak GDP per capita.

Figure 1. Various types of crises and severe recessions have been frequent

Number of countries



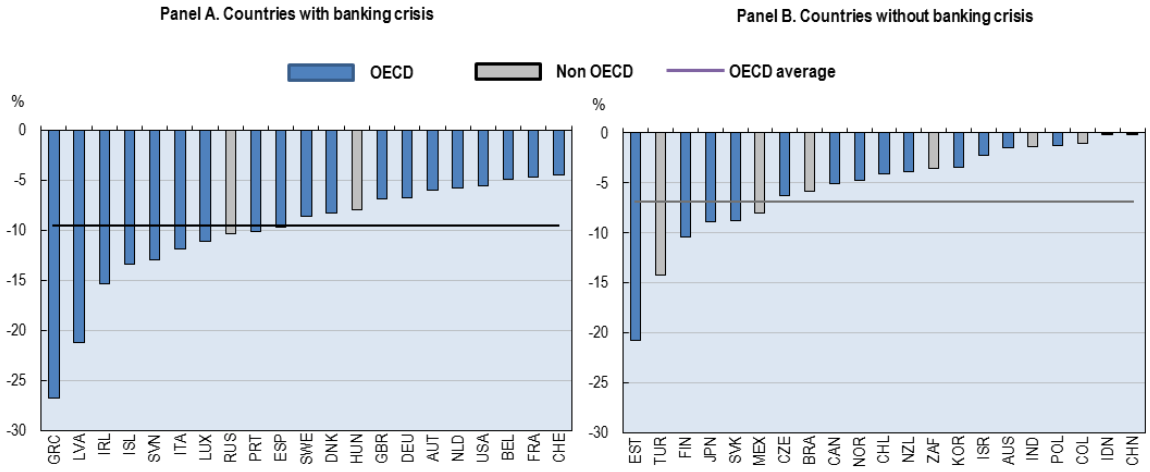
Note: The chart refers to crisis and severe recession episodes for 35 OECD countries over the period 1970Q1-2010Q4. Crisis episodes are from Babecky et al. (2012).

Source: OECD calculations based on Babecky et al. (2012) data and Hermansen and Röhn (2015) for severe recessions.

Of all episodes covered, the 2008-09 crisis was by far the most widespread and costly. From the beginning of the great recession, the cumulative output loss in the vast majority of countries exceeded the losses of previous post-1970 crises, with a large number of advanced economies suffering losses greater than 10% of GDP (Figure 2). However, not all economies faced the same fate. The amplitude of the downturn displayed significant heterogeneity among countries and, contrary to most previous crisis episodes, advanced economies were generally more affected than the EMEs. Also, output losses were particularly severe in countries struck by a full scale banking crisis (almost 10%) vis-à-vis countries whose financial sector avoided significant disruption (7%).

Together with the depth, the duration of the downturn also differed significantly across countries during the last crisis. The average peak-to-trough spell for OECD countries was close to 12 quarters among OECD countries facing a banking crisis, as compared to somewhat above four quarters in those without banking crisis, and only three quarters for selected non-OECD countries. Severe recessions and financial crises are a source of concern not only because of the deep shocks that they inflict on the economy, but also because of the long-lasting adverse consequences that such shocks entail. Nearly ten years after its outburst, the 2008-09 crisis still weighs heavily on many advanced economies; the recovery remains disappointingly weak and uncertain; employment rates, private investment rates and productivity growth rates are still below pre-crisis levels in many countries (Figure 3), while public debt is much higher.

Figure 2. Large falls in GDP per capita from peak to trough during the 2008-09 recession

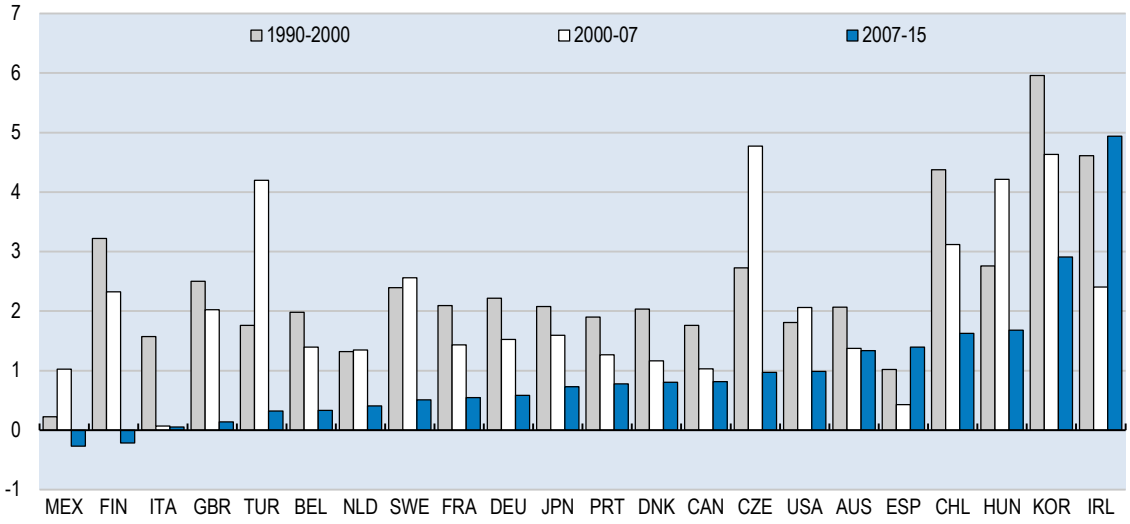


Note: The chart shows the change in GDP per capita from peak to trough as a per cent of peak GDP per capita. Some countries experienced relatively high population growth during the downturn, which tends to exaggerate the amplitude compared with the fall in the GDP level. This is the case e.g. for Norway and Luxembourg. Countries experiencing a banking crisis associated with the 2008-09 financial crisis are identified by the classification in Laeven and Valencia (2012).

Source: OECD calculations.

Figure 3. Labour productivity growth has remained weak since the 2008-09 crisis

Average annual growth rate in GDP per hour worked, percentage



Source: OECD National Accounts and Productivity Database

3. What can be done to sustainably reduce financial and economic risks? Looking at the evidence from two angles

Considering the deep and long-lasting impact of severe recessions, such as the 2008-09 financial crisis, it is important that measures be taken to minimise the risk of such events. But in doing so, the benefits need to be balanced against the potential costs in terms of lower average growth that some of the actions to reduce vulnerabilities to bad events could entail. Insofar as the risk-mitigating measures can involve a trade-off between growth and crisis risk, combinations of policies that avoid or ease the trade-off need to be identified. Recent OECD research has examined this issue from two different angles.

The first angle focuses on the medium run, disentangling the effect of pro-growth policies on growth and the probability of a financial crisis over the subsequent 5-year period. The OECD analysis in Caldera-Sánchez and Gori (2016) uses a methodology proposed by Rancière et al. (2006) and Razin and Rubinstein (2006) to examine the impact of a wide range of policy variables on three types of financial crisis episodes: currency crises, systemic banking crises and episodes where both types of crises hit a country (referred to as twin crises). The policy areas covered include financial market liberalisation, capital account openness, trade openness, exchange rate policy, the debt bias of corporate taxation, and product market regulation.

The empirical analysis is based on a sample covering 100 countries over from 1970 to 2010. In essence, the empirical approach allows for the estimation of the impact of policy and non-policy variables on GDP growth through two channels operating in opposite direction: a positive impact through gains in economic efficiency, dubbed the *efficiency* channel, and a negative impact through the risk of a financial crisis, referred to as the *fragility* channel.[3] The economic benefits from certain growth-promoting policies can be partly or wholly offset in the long run if such policies also increase the vulnerability of economies to financial crises.

The focus on financial crises is natural owing to their deep and often persistent impact on the economy. Yet, not all severe economic shocks originate from disruptions in financial markets, and policy makers should be aware of the factors behind severe recessions, regardless of their nature. The second angle examined by the OECD analysis and detailed in Caldera-Sánchez and Röhn (2016) consists in looking at the determinants of extreme negative economic outcomes (so-called tail risk) and at policies able to mitigate them. Negative tail risks are measured with respect to the (annual or quarterly) growth rates of the economy and are defined as the lower 10 percentile of the distribution for GDP growth. Therefore, the results provide an assessment of the effects of a set of policies on the maximum GDP loss (negative growth) that the economy can suffer with a given probability (90%), a measure referred to as GDP-at-Risk.[4]

This second approach is applied to a smaller sample of 34 OECD countries over a period 1970-2014. The policy areas covered include financial market liberalisation and capital account openness as in the first approach, but also macro prudential measures, the quality of institutions, labour market

3. The identification approach and other econometric details are discussed in Caldera-Sánchez and Gori (2016).

4. The links between policies and GDP-at-Risk are estimated by quantile regressions. This methodology offers a perspective not only on negative tail risk for GDP growth, but also on the rest of the growth distribution, allowing to compare the effect of a policy lever on both extreme and median economic outcomes.

policies and international reserves. Both approaches, even if following different methodologies, try to identify the *efficiency* channel of policy reforms separately from a *fragility* channel. The main results are highlighted in the next section.

4. Effects of policies on growth and fragility

Pro-growth policies outside the financial sector generally have a limited impact on economic fragility

Looking first at policies outside the financial sector, that is product and labour market policies as well as those related to the quality of institutions, there is little evidence that policymakers would face trade-offs between enhancing growth and reducing economic risks. The effect of the quality of institutions as well as product and labour market polices on growth and fragility is shown in Figure 4. Each policy is identified in the scatter plot by its effect on growth and fragility. Fragility is defined alternatively as the impact of the policy on GDP tail risk or the likelihood of a financial crisis.[5]

In the top-left quadrant fall win-win policies, those that contribute to higher growth, while also being associated with a lower risk of bad outcomes. In the lower-right quadrant fall policies found to be detrimental to the economy by reducing growth and increasing fragility. Finally, policies located in the upper-right and lower-left quadrants characterise a trade-off between growth and fragility; for policies in these areas of the scatterplot, higher growth comes at the detriment of economic stability (upper-right quadrant) or alternatively lower economic fragility comes at the expense of lower growth (lower-left quadrant).

- **Quality of institutions:** Overall, the results suggest that better-quality institutions are negatively correlated with GDP tail risk.[6] At the same time, indicators such as government effectiveness, voice and accountability, control of corruption and political stability not only reduce the risk of extreme negative GDP outcomes but also are associated with higher growth. These findings confirm that having in place a sound legal and judicial infrastructure, *i.e.* one that guarantees the enforcement of private contracts, provides adequate protection of property rights and promotes arm's length transactions is good for both growth and economic resilience. These results are consistent with the substantial literature suggesting that countries with better institutions are likely to suffer lower volatility and less severe output collapses (Acemoglu et al. 2003; Rodrik, 1998).

- **Product market policies:** Pro-competitive product market regulations are associated with higher growth.[7] These empirical results are consistent with earlier evidence showing that

5. For the purpose of the empirical analysis, financial crisis risk is alternatively measured as the risk of a systemic banking, currency or twin crisis as identified in Laeven and Valencia (2012).

6. The quality of institutions is measured using the World Bank Worldwide Governance indicators covering six broad categories: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law and control of corruption. Higher values of the indices indicate stronger institutions.

7. For the purpose of this analysis, regulatory barriers to competition are captured on the basis of two related measures. The OECD economy-wide indicator of product market regulation (PMR) measures the degree to which policy settings promote or inhibit competition in areas of the product market where competition is viable. More specifically, it measures the incidence of regulatory barriers to competition via state control of business operations and the protection of incumbents, as well as

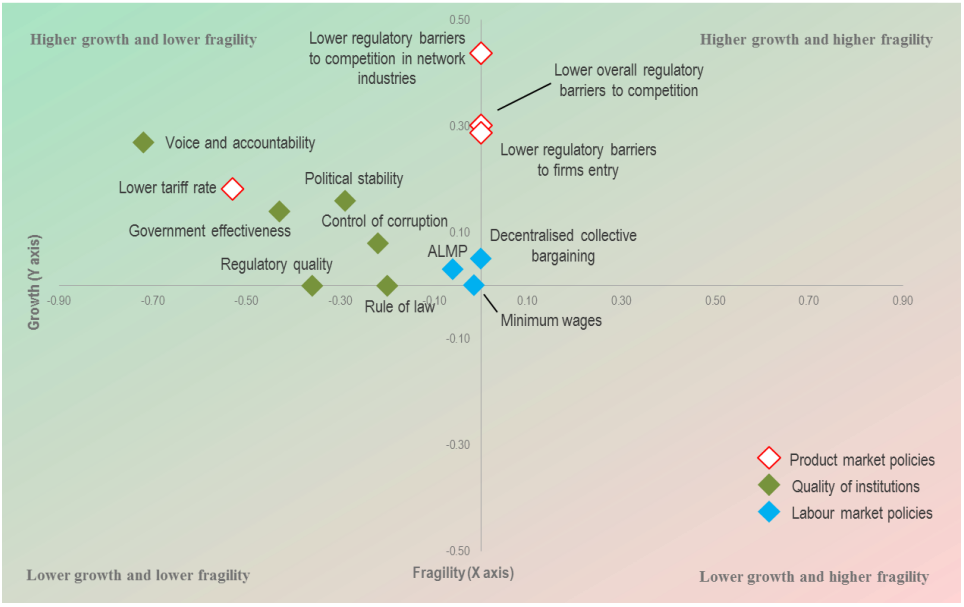
regulations that raise product market competition can stimulate productivity via a variety of channels[8] and thus boost economic performance. Furthermore, the positive impact through increased efficiency does not come at the cost of higher financial fragility, as no evidence is found on the link between product market regulations and the likelihood of financial crises or GDP tail risk. Regarding trade policy, the evidence suggests that lower tariffs not only reduce economic fragility - measured via the likelihood of a twin crisis - but also increase growth.

- **Labour market policies:** Labour market regulations and institutions are not neutral to growth; for instance, collective bargaining systems characterised by a high degree of decentralisation in wage negotiations are found to be associated with higher growth, suggesting that wage agreements determined at the firm level tend to produce better employment outcomes. On the other hand, higher minimum wages, despite having no direct impact on growth, reduce GDP tail risk. One interpretation of this result is that, in the face of a negative shock, high minimum wages prevent nominal wages at the lower end of the distribution from bearing the brunt of the adjustment, thus acting as a shock absorber. Finally higher spending in active labour market policies is associated with a lower likelihood of extreme negative growth events and with higher GDP growth. This suggests that policies increasing the efficiency of job-workers matching and facilitating the re-absorption of laid-off workers are both beneficial for growth and economic resilience.

through various legal and administrative barriers to start-ups or to foreign trade and investment. The economy-wide PMR indicator which is measured in four vintages (1998, 2003, 2008, 2013) is complemented by a set of indicators that summarise information by major economic sector -- instead of regulatory domain -- with a strong emphasis on non-manufacturing sectors, in particular energy (electricity and gas), transport (road, rail, air) and communications (post and telecoms), referred to as the ETCR indicator. The latter indicator is constructed from a smaller set of information but is available over a long and continuous time series going from the early 1980s to 2013. For more information, see Koske et al., 2015.

8. Poorly-designed product market regulation can undermine economic efficiency through a numbers of channels; anticompetitive regulations influence the productivity of existing firms by altering the incentives for technology adoption and investment in innovation among incumbents and by making the entry of new innovative firms difficult. Moreover, anticompetitive regulations may slow down the take-up of new general-purpose technologies such as information communication technologies (ICT). Finally, regulations can reduce competitive pressures and incentives to improve efficiency also in client ('downstream') sectors, increase product prices via higher mark-ups and generally establish distorting wedges between factors' returns and corresponding prices.

Figure 4. No evidence of trade-offs is found in the case of labour and product market policies



Note: The X axis plots the effect of policies on fragility; fragility is defined as a higher likelihood of a financial crisis (polices with red outline) or a higher GDP (negative) tail risk. Three types of financial crises are considered: currency, banking and twin crises. Tail risk is defined as the effect of a policy variable on the bottom 10% of the distribution for quarterly GDP growth. The chart reports coefficients corresponding either to elasticities or marginal effects, depending on the policy considered. Institutional quality indicators are associated with both growth and lower fragility, labour and product market policies generally affect growth or economic risk. Exceptions are a lower tariff rate - promoting growth and reducing financial risks - and active labour market policies having a positive effect on economic efficiency and reducing GDP tail risk.

Source: Authors' calculation based on Caldera-Sánchez and Gori (2016) and by Caldera-Sánchez and Röhn (2016).

More trade-offs between growth and crisis risk arise in the case of financial market policies

The set of financial market policies covered by the OECD analysis includes measures of financial liberalisation,[9] capital account openness and prudential regulation.

Financial liberalisation

The link between financial liberalisation and growth comes through improved efficiency and a better allocation of financial capital. A financially repressed economy curbs the efficient allocation of capital via credit controls, interest rate regulation, barriers to entry in the financial services industry and less autonomy for lenders. Financial market liberalisation on the other hand, opens the way to financial deepening, reducing transaction costs and financial constraints. Liberalisation in financial markets is thus linked to an increased mobilisation of capital and its better allocation in the economy,

9. Financial liberalisation is measured by the log of the financial reform index computed by Abiad et al. (2010). The index is built considering seven different dimensions of financial sector policy including credit controls and reserve requirements, interest rate controls, barriers to entry, public ownership in the banking sector, policies on security markets, prudential regulations and supervision of the banking sector, and restrictions on the financial account. Liberalisation scores for each category are then combined in a graded index that is normalised between zero and one, with zero corresponding to the highest degree of repression and one indicating full liberalisation.

but also to better idiosyncratic risk sharing, promoting investment in higher-return projects, and thus to higher economic performance.

However, the efficiency channel of financial market deregulation is often paired with an increase in systemic financial fragility as liberalisation episodes are sometimes linked to excessive credit growth and to boom-bust cycles in asset prices. Financial liberalisation might also lead to a disproportionate development of the financial sector with respect to its economic and social contribution. This in turn can be linked to an amplification of the pass-through of financial shocks to the real economy and also to an increase in economic instability, through the uncertainty associated with excessive financial complexity. Bank credit overextension can also exacerbate distortions that reduce long-term growth, such as effective government support for too-big-to-fail lenders (Denk et al., 2015).

The main results from the OECD analysis on the role of financial market policies are illustrated on Figure 4, which again shows the impact of policies on fragility (horizontal axis) and growth (vertical axis), in the latter case taking into account both the positive impact from enhanced efficiency and the negative effect from higher fragility, in particular the risk of a banking crisis. More specifically, the economic impact associated with a typical financial market liberalisation reform[10] is to increase growth by nearly 2 percentage points over the five years following the reform. At the same time, the reform is associated with a 10 percentage point's increase in the risk of a systemic banking crisis. As shown in Figure 5, the negative impact of the latter on growth largely offsets the positive efficiency gain, implying no clear net benefit in terms of long-term growth. Even so, distinctions can be made among specific instruments within financial market policies. Effective banking supervision and the development of capital markets (as opposed to bank-based intermediation) is found to underpin both growth and resilience.

These results provide support to the recent literature suggesting that the relationship between financial depth and economic growth might be non-linear (Cournède and Denk, 2015, Rousseau and Wachtel, 2011; Cecchetti and Kharroubi, 2012; Beck et al., 2014; Arcand, Berkes and Panizza, 2015). While this stream of literature warns that expansion of an already large financial sector can be harmful for economic growth, the findings reported in this paper can be interpreted as shedding some light on one mechanism at play; taken at face value, they suggest that excessive financial development affects growth negatively by exposing the economy to more frequent financial crises.

Capital account openness

Higher international capital mobility raises growth by reducing the cost of capital, providing access to finance to financially constrained firms and promoting investment in recipient economies. Foreign direct investment (FDI) can also promote productivity gains through the transfer of technological and business know-how to recipient countries. Finally, greater openness facilitates portfolio diversification and provides idiosyncratic risk sharing opportunities, encouraging investment in technologies with higher growth-risk characteristics. At the same time greater capital account openness can represent a threat to countries' financial stability by exposing the economy to quick reversals of capital flows and to detrimental asset price dynamics; episodes of large capital inflows may exacerbate credit fluctuations, fuelling booms and bust cycles in asset prices.

10. This quantification is based on the average change in the index proposed by Abiad et al. (2010) associated with each financial reform surveyed by Williamson and Mahar (1998).

The research reported in this paper suggests that, similarly to domestic financial market liberalisation, higher international capital mobility is associated with faster growth but, at the same time, with greater vulnerability of an economy to twin (*i.e.* simultaneous currency and banking) crises. More specifically, a typical rise[11] in the degree of capital account openness is associated with a 1.75 percentage point increase in growth over the 5 years following the reform. However, the likelihood of a twin crisis increases by about 1percentage point over the same period. The latter is corroborated by evidence that higher capital account openness increases GDP tail risk, making the economy more vulnerable to extreme negative GDP shocks. Even so, the net long-term effect of greater capital account openness on overall growth is positive (Figure 4), implying that the efficiency gains from greater capital account openness exceed on average the costs from increased fragility.

Furthermore, the composition of capital flows has a significant effect on the impact of capital account openness on the likelihood of twin crises. As shown on Figure 5, when decomposing between different types of capital inflows, results suggest that the impact of net international financing on the likelihood of a twin crisis originates from portfolio investments rather than foreign direct investment. This evidence is consistent with Furceri et al. (2011), Ahrend, Goujard and Schwellnus (2012) and Ahrend and Goujard (2012a,b) who find that portfolio, and more specifically portfolio debt flows, have a strong positive impact on the likelihood of financial crises.

Portfolio flows are less stable and more prone to reversal than FDIs flows, possibly exacerbating the destabilising effect of international sources of financing on recipient economies. In light of these results, the benefits of international financial openness are best harnessed by focusing on opening domestic markets to longer-term FDI flows and shifting the exposure away from debt to non-debt related flows. This could be done, for example, by improving the quality of institutions and trade openness (Faria et al., 2007) rather than making use of capital account restrictions, which might hamper the development of beneficial flows (such as FDIs) and represent only temporary and second best solutions to cope with international financial fragility.

Macro-prudential policies

Macro-prudential policies may affect GDP tail risks through at least two channels.[12] First by reducing systemic threats to financial stability arising for example from excessive credit, leverage and asset price growth. Limits on debt-to-income and loan-to-value ratios and limits on credit growth and foreign currency lending can be effective in reducing leverage during boom times. The second channel through which macro-prudential policies may affect GDP tail risks is via an increase in the shock absorption capacity of the financial sector. For instance, capital and liquidity buffers increase the distance to default in the case of an adverse shock. Counter-cyclical buffers (such as reserve

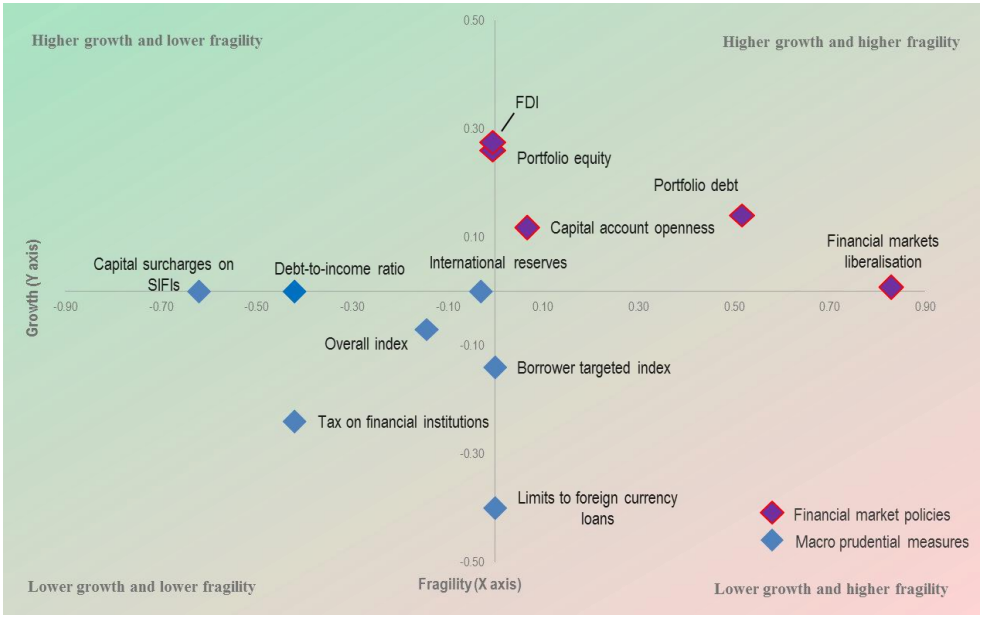
11. The quantification of a typical impact of a capital account liberalisation on growth and crisis risk is inferred by estimating the average change of the international financial openness index proposed by Chinn and Ito (2008), associated with each financial reform surveyed by Williamson and Mahar (1998). This index is based on the first principal component of four categories of binary variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF's Annual Report on Exchange Rate Arrangements and Exchange Restrictions (AREAER).

12. We group in this category macro-prudential policies strictly speaking and international reserves. Macro-prudential variables are from Cerutti et al. (2015). These comprise bank debt-to-income ratios, an indicator of tax on financial institutions, required capital surcharges on systemically important financial institutions (SIFIs), limits to foreign currency loans, an index of borrower targeted instruments (including constraints on households debt to income ratio and caps based on loan-to-value ratios for new loans) and an overall macro prudential index.

requirements, limits on profit distribution, and dynamic provisioning) also help to mitigate increases in bank leverage and assets. In a similar vein, foreign currency reserves contribute to better insulate the economy from an abrupt reversal in capital flows or sudden stop. Their accumulation can thus serve precautionary purposes and self-protection against currency crisis.

The results from the analysis reported in this paper suggest that, on average, prudential measures are associated with less extreme negative tail risks, but also with lower growth (see "overall index" on Figure 5). Among prudential measures, the analysis suggests that constraints on household debt-to-income ratios, counter-cyclical buffers and capital surcharges on systemically-important financial institutions would help reduce fragility without hampering growth. Other macro-prudential policies - such as taxes on revenues of financial institution, limits to foreign currency loans - might reduce growth by distorting incentives or reducing the efficiency of financial markets. In the case of the excessive accumulation of foreign currency reserves, it can be a source of distortions and possibly lead to macroeconomic risks in other countries.[13] However, these results on individual instruments need further investigation and should be taken with caution.

Figure 5. More trade-offs arise with financial market and macro-prudential measures



Note: The X axis plots the effect of policies on fragility; fragility is defined as higher likelihood of a financial crisis (polices with red outline) or a higher GDP (negative) tail risk. Three types of financial crises are considered: currency, banking and twin crises. Tail risk is defined as the effect of policy variables on the bottom 10% of the distribution for quarterly GDP growth. The chart reports coefficients corresponding either to elasticities or marginal effects, depending on the policy considered.

Source: Authors' calculation based on Caldera-Sánchez and Gori (2016) and Caldera-Sánchez and Röhn (2016).

13. For example, following the crisis that hit many countries in South East Asia in the late 1990s, governments in these countries built up vast amount of reserves which later contributed to growing current account imbalances as well as to movement of cross-border capital flows that in turn exacerbated the 2008-09 crisis.

Macroeconomic policies also play a key role in the build-up of vulnerabilities and mitigation of shocks

Both monetary and fiscal policies can have an important influence on the build-up of economic fragility, the absorption of shocks and the speed of recovery (Caldera-Sanchez et al., 2015). However, the effectiveness of macro policies in mitigating systemic risk and the impact of potentially severe recessions can vary according to the nature of the shock and, perhaps more importantly, the extent to which they are conducted in a symmetric manner in response to cyclical fluctuations.

Monetary policy is generally viewed as the first line of defence in stabilising the economy during a downturn. Empirical evidence suggests easy monetary policy during downturns leads to faster recoveries after "normal" downturns (Bech et al., 2012; Kannan et al., 2009). However, it is less effective in a financial crisis, when private sector balance sheets and the monetary policy transmission channel are impaired (Borio, 2012; Bech et al., 2012; Kannan et al., 2009). The recent global financial crisis is a good example of how money markets can freeze during a crisis impeding banks short-term financing. Frozen credit markets coupled with weakened bank balance sheets, impaired the transmission of lower policy rates to bank lending costs. This suggests that during a financial crisis short-term policy rates might need to be sharply reduced and, in some cases supported by unconventional monetary policy and discretionary fiscal policy, to effectively boost aggregate demand.

Concerted action by monetary and fiscal policies in the case of deep recessions is important because relying too heavily on highly accommodative monetary policy over a prolonged period may create vulnerabilities down the road leading to policy trade-offs (OECD, 2016). For instance, protracted monetary policy easing can delay the necessary balance sheet adjustments and prolong economic weakness (e.g. Borio, 2012; Bouis et al., 2013; Borio and Disyatat, 2010). A number of risks are related to increased balance sheets, including excessive credit expansion, financial market distortions or sovereign debt management conflicts (Caruana, 2012). And, if monetary policy is not viewed as an adequate tool to pre-empt the build-up of imbalances and bubbles (or "leaning against the wind") then the result is an asymmetric stance of policy, with a bias on the side of loosening and associated risks of moral hazard.

As for fiscal policy, it can contribute to macroeconomic stability through two main channels (Debrun and Kapoor, 2010). First, through the automatic stabilisers, which arise from parts of the fiscal system that naturally vary with changes in economic activity. Second, through discretionary fiscal policy governments can deliberately decide to adjust government spending, taxes or transfers in order to stimulate or damp aggregate demand and offset business cycle fluctuations. There is a broad consensus that discretionary fiscal policy should not be part of the first line of defence (along with monetary policy and automatic stabilisers), at least in the case of average downturns.

Discretionary fiscal policy may, however, be appropriate in some circumstances. A recent wave of research on the size of fiscal multipliers triggered by the financial crisis suggests that, under "special" circumstances, fiscal policy can have powerful effects on the economy in the short run. Fiscal multipliers are larger when monetary policy is constrained by the zero lower bound (ZLB) on nominal interest rates (Coenen et al., 2012; Blanchard and Leigh, 2013), the channels of monetary policy are impeded by a weak financial sector (Corsetti et al., 2012), or the economy is in a recession (Auerbach and Gorodnichenko, 2012).

Measuring the stance of macroeconomic policy in a way that can be captured by the empirical exercises used above is difficult. Nevertheless, specific characteristics of macroeconomic frameworks also have been found to have implications for the growth-crisis risk nexus.

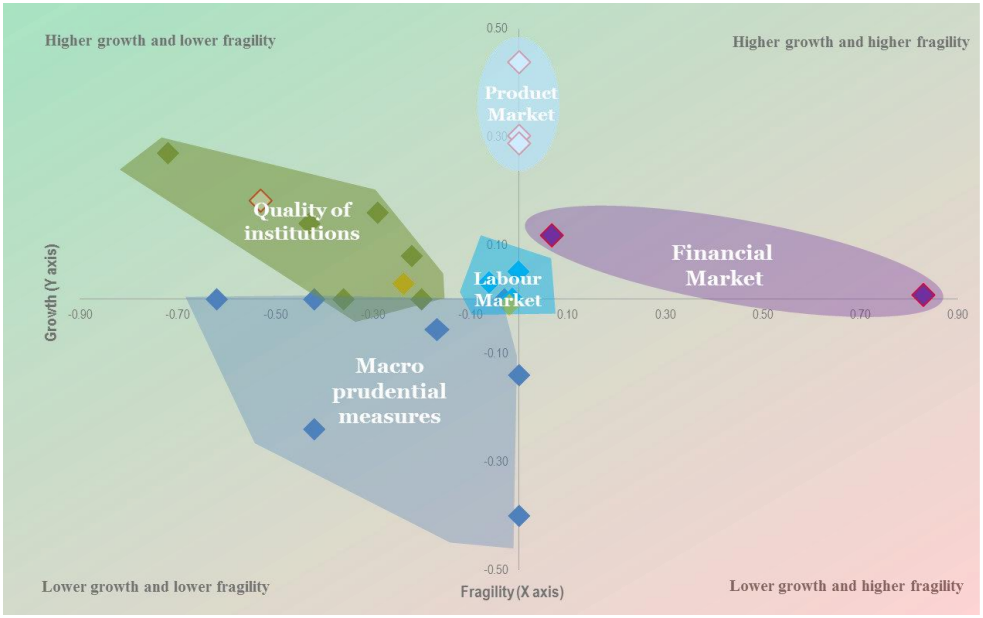
- There is evidence that countries with a floating exchange rate experience a lower probability of crisis. Exchange rate adjustments can play a powerful role as a risk sharing and shock absorbing mechanism, provided that the shock does not hit too many countries simultaneously. Also, floating exchange rate regimes are more likely to induce timely and more progressive adjustments which can help mitigate the build-up of imbalances, in contrast to the large and abrupt currency swings that often characterised delayed peg realignments brought about by market pressures.

- There is also evidence that countries with stronger automatic stabilisers experience less extreme negative tail risks. However, stronger automatic stabilisers mean high government spending, and/or high transfers, the funding of which may have implications for efficiency and growth. Indeed, the findings show that higher automatic stabilisers reduce negative tail risk but also average growth, although in both cases the effect is small.

Summing-up

To sum-up, Figure 6 and Table 1 show how the nature of the growth-fragility nexus varies according to broad policy areas. Labour and product markets policy settings that are conducive to higher productivity (e.g. through stronger competition) and/or employment have a positive effect on growth but generally little or no impact on crisis risk. They are thus located along the positive segment of the X-axis. The few exceptions include stronger active labour market programmes, which result in both higher average growth and less extreme negative tail risks, and lower import tariffs which lowers crisis risk, while having a favourable impact on average growth. Indicators of institutional quality are associated with both higher growth and lower fragility (upper-left quadrant).

Figure 6. All policy areas in a growth-fragility framework



Note: The X axis plots the effect of policies on fragility; fragility is defined as higher likelihood of a financial crisis (policies with red outline) or a higher GDP (negative) tail risk. Three types of financial crises are considered: currency, banking and twin crises. Tail risk is defined as the effect of a policy variable on the bottom 10% of the distribution for quarterly GDP growth. The chart reports coefficients corresponding either to elasticities or marginal effects, depending on the policy considered. Institutional quality indicators are associated with both growth and lower fragility; labour and product market policies generally affect growth, with little or no impact economic risk. Growth fragility trade-offs exist when considering macro prudential and financial markets policies. The yellow dot under the green area (Quality of instiutions) represents the effect on growth and fragility of a free-floating exchange rate, while the one under the light blue area (Labour market) represents automatic stabilisers.

Source: Authors' calculation based on Caldera-Sánchez and Gori (2016) and Caldera-Sánchez and Röhn (2016).

More growth-fragility trade-offs are observed in the case of financial market policies and macro-prudential measures. Financial market liberalisation and greater capital account openness stimulate growth, but also significantly increase the risk of banking crises (upper-right quadrant). On the other hand, macro prudential measures tend to reduce the risk of severe recessions, but in some cases at the expense of average growth (lower-left quadrant).

Table 1. Summary table of the effect of policies on growth and fragility

			Fragility	
Policy Area	Policy instrument	Effect on growth	Financial risk	GDP Tail risk
Financial markets	Greater capital account openness	+	+	
	Greater financial market liberalisation	+	+	
Macro prudential	Overall index of prudential (see note)	-		-
(A strengthening of)	Borrower-targeted index (see note)	-		
	Debt-to-income ratio			-
	Tax on financial institutions	-		-
	Capital surcharges on SIFIs			-
	Limits on foreign currency loans	-		
	International reserves			-
Product markets and trade	Lower regulatory barriers to competition in network industries	+		
	Lower regulatory barriers to firms entry	+		
	Lower overall regulatory barriers to competition	+		
	Lower tariff rate on imports	+	-	
Labour market	Higher spending on active labour market policies	+		-
	Higher minimum wage			-
	Decentralised collective bargaining	+		
Quality of institutions	Government effectiveness	+		-
(a strengthening of)	Regulatory quality			-
	Voice and accountability	+		-
	Rule of law			-
	Control of corruption	+		-
	Political stability	+		-
Macroeconomic frameworks	Free floating exchange rate	+	-	
	Stronger automatic fiscal stabilisers	-		-

Note: Summary of results from Caldera-Sánchez and Röhn (2016) and Caldera-Sánchez and Gori (2016). Fragility is measured as GDP tail risk or a higher likelihood of a crisis (currency, systemic banking or twin crisis). The overall macro prudential index is an aggregation of the scores of the twelve single macro prudential measures presented in by Cerutti et al. (2015). The results for this aggregated index are not robust across different specifications. The borrower-targeted index combines constraints on household's debt-to-income ratio and caps based on loan-to-value ratios for new loans.

5. What are the main policy implications?

One of the main implications of the results reported above is that taking measures in the financial sector to lower the risk of severe recessions is entirely appropriate. However, focusing too narrowly on that sector is unlikely to be sufficient and could entail substantial costs in terms of foregone GDP growth, in particular where the financial sector is still relatively under-developed. This suggests that policy makers also need to consider factors outside the financial sector which could contribute to the build-up of vulnerabilities to crisis. The analysis reported above provides little evidence to suggest that

pro-growth product and labour market policies affect the likelihood of crisis or negative tail risk in a significant manner. Thus, one question is whether other policy distortions that cannot be easily captured in the empirical framework described above could contribute to raising fragility. One way to shed light on this issue is to identify the types of economic imbalances or misalignment that seem to be most closely associated with crisis vulnerabilities. The stream of OECD research summarised in this paper also involved using a large number of quantitative indicators to assess their relative usefulness in predicting severe recessions (Röhn et al, 2015; Hermansen and Röhn, 2016).

Crises are difficult to predict but a number of indicators can help assess the extent of vulnerabilities

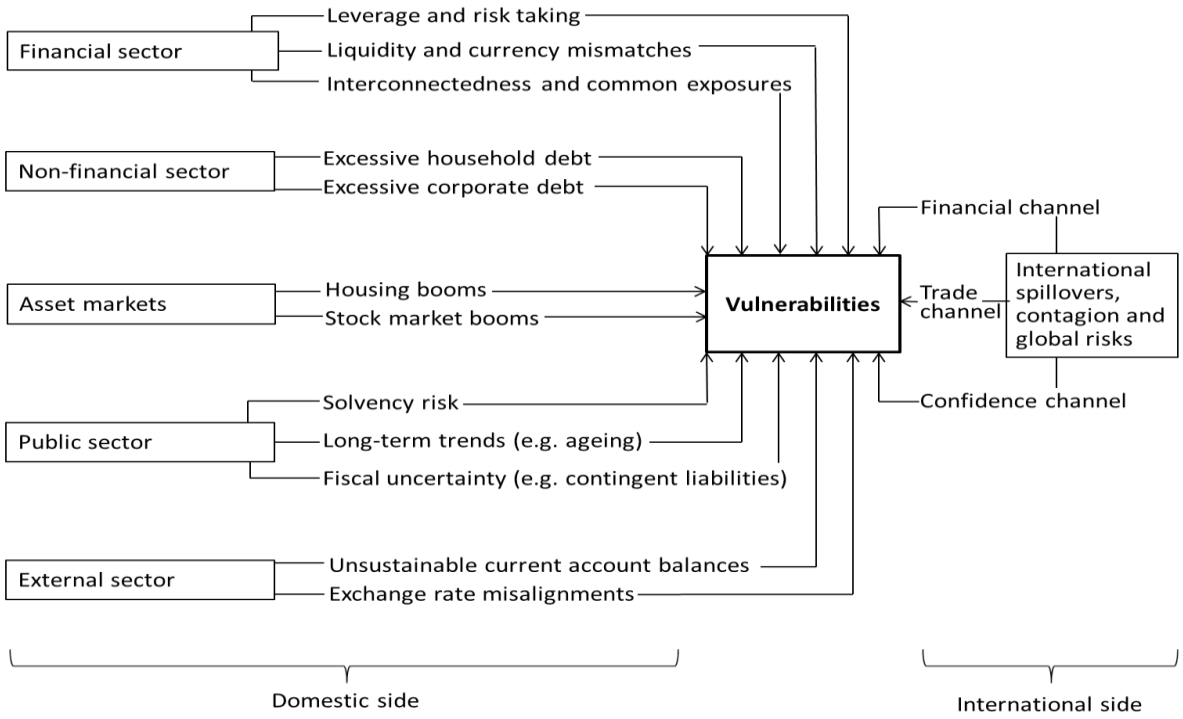
Crises are the outcome of the accumulation of various factors, some predictable, others less. The timing of crises will always remain difficult to predict with any degree of precision since they are invariably triggered by unforeseen events. But since the triggering event itself matters less than the accumulation of imbalances and other sources of vulnerabilities that have been building-up over years, the likelihood of a severe recession can be assessed with some degree of confidence by monitoring developments in a number of economic variables.

Following the recent crisis and calls to better identify risks, international organisations such as the OECD, IMF and BIS, as well as national institutions responsible for promoting financial stability have developed large sets of indicators to detect potential threats to economic and financial stability. The OECD regularly monitors and reports these dashboards in publications such as the Economic Outlook and Economic Surveys. Drawing lessons from a literature review of the voluminous early warning literature on currency, banking, and sovereign debt crises, Roehn et al. (2015) build a new dataset of more than 70 indicators assembled from a number of public data sources that could be monitored to detect vulnerabilities and assess country risks of suffering a crisis. The dataset covers, to the extent possible, the 34 OECD economies, the BRIICS (Brazil, Russian Federation, India, Indonesia, China, and South Africa), Colombia, Costa Rica and Latvia.

The large number of indicators covered in the dataset are grouped into five domestic areas: i) financial sector imbalances, ii) non-financial sector imbalances, iii) asset market imbalances, iv) public sector imbalances and v) external sector imbalances. A key insight from the Great Recession was that even countries without significant domestic imbalances were affected through international spillovers and contagion. An additional "international spillovers, contagion and global risks" category aims at capturing such spillover effects of vulnerabilities arising in one country that could transmit to another country through financial, trade or confidence channels. Figure 7 gives a stylised description of the vulnerabilities covered and illustrates some of the channels through which vulnerabilities build up.[14]

14. A detailed narrative of the source and nature of potential vulnerabilities is given in Röhn et al. (2015).

Figure 7. A stylised description of the areas covered by the vulnerability indicators



Source: Röhn et al. (2015).

The indicators included in each of these areas can shed light on rising imbalances and other developments that can put the health of the financial and economic system at risk and deserve to be monitored. However, some of them have a better track record in terms of providing advance warnings of severe recessions. In fact, the global crisis has revived the academic and policy interest in "early warning indicators" of crises (see *inter alia* Rose and Spiegel, 2011; Frankel and Saravelos, 2012). The recent OECD research has extended these efforts by providing empirical evidence on the usefulness of the set of vulnerability indicators to see which ones are best in terms of detecting risks of bad outcomes (Hermansen and Röhn, 2015).

The OECD analysis in Hermansen and Röhn (2015) evaluates the usefulness of the vulnerability indicators in assessing the likelihood of severe recessions applying a methodology commonly used in the early warning literature, the signalling approach (Kaminsky et al. 1998). According to this approach, an indicator signals a future costly economic event if it crosses a threshold. Threshold levels are set by minimising a loss function, which balances two types of errors: missing crises (so called type I errors), and false alarms (so called type II errors). The errors are weighted by policymakers' preferences for each type of error. An indicator is then considered as useful if the associated loss is lower than a benchmark case in which the indicator is disregarded.

A novelty of the OECD analysis is that it uses severe recessions as a measure of costly economic events, in contrast to most of the early warning literature, which has typically focused on particular types of economic crises, such as currency, banking crises, and more recently, broader systemic financial events. Severe recessions provide an efficient and transparent way to capture a wide range of costly economic events and overcome the difficulty of identifying economic crises in an objective way. It is also an outcome that policymakers are presumably most concerned to avoid.

To provide some illustration of the methodology, each indicator can be evaluated according to the matrix below in which crisis occurrence and warning issuance are compared. A is the number of quarters across countries and time in which an indicator provides a correct signal, B is the number of quarters in which a wrong signal is issued, that is a signal was provided, but there was no crisis. C is the number of quarters the indicator does not issue a signal despite a crisis occurring. Finally, D is the number of quarters in which the indicator does not provide any warning signal, and rightly so because there was no crisis.

Table 2. Evaluation matrix

	Crisis (within the following 8 quarters)	No crisis (within the following 8 quarters)
Signal issued	A	B
No signal issued	C	D

Source: Hermansen and Röhn (2015).

Ideally a threshold for each indicator should be chosen such that all observations fall into the A (a signal was issued and indeed there was a crisis) and D (a signal was not issued and indeed there was no crisis) cells. In reality, however, setting the threshold involves balancing two types of errors policy makers face. A high threshold would imply few crisis signals and a higher risk of missing a crisis (type I error). A low threshold on the other hand would increase the number of signals, but would also raise the number of false crisis signals (type II error).

In this framework, the usefulness of indicators in accurately signalling crisis risk is assessed by identifying the threshold value that minimises these two types of errors (minimises the cases corresponding to B and C), while taking into account the degree of aversion to severe recessions. A stronger aversion to missing a severe recession would translate in the selection of a lower threshold above which the risk of a crisis is signalled. This would indicate a greater willingness on the part of policymakers to react to signals even if it means reacting more frequently to false alarms. The higher the frequency of occurrences in A and D relative to B and C, the more useful an indicator will be in providing information about the likelihood of bad outcomes unfolding in the four to eight quarters ahead.

Which indicators come closest to being canaries in the coal mine?

Hermansen and Röhn (2016) find that the majority of indicators are useful early warning indicators of severe recessions. Most indicators issue first warning signals on average more than 1.5 years before the onset of a severe recession, providing policymakers with a sufficiently long lead to react. However, the extent of the signalling power varies across indicators and the results are sensitive to the exact specification of policymakers' preferences between missing crises and false alarms. Figure 8 shows the ten indicators that come out as providing the most useful information regarding vulnerabilities, for a given level of preference.

- Indicators of global risks consistently outperform domestic variables in terms of relative usefulness.[15] In particular, measures of the global credit-to-GDP ratio (growth and gaps from

15. Global indicators are defined as weighted averages across all OECD countries using GDP (in PPP) weights.

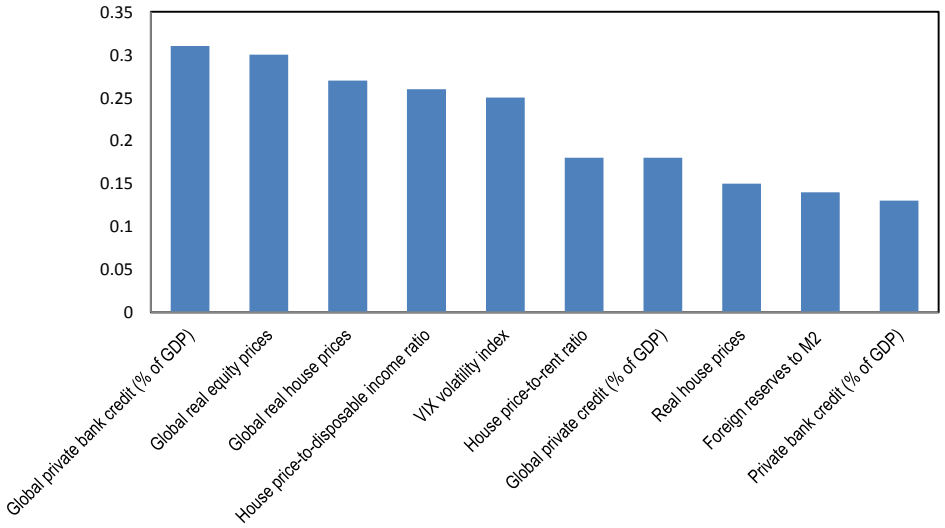
a trend), a global equity price gap and a global house price gap perform well. This highlights the importance of taking international developments into account when assessing a country's vulnerabilities. In an increasingly integrated world economy, vulnerabilities that build-up at the global level potentially transmit to countries around the world.

  - The good performance of the global indicators is however subject to a caveat: as the indicators do not vary across countries they are particularly suited to pick up recessions that affect a large number of countries simultaneously, such as the global financial crisis in 2008/09. The good performance of these indicators is hence partly explained by the fact that the global financial crisis constitutes a large share of all severe recessions in the sample and our choice of the global financial crises as a test of the out-of-sample performance.

- Among indicators measuring domestic developments, those that reflect asset market misalignments (real house and equity prices, house price-to-income and house price-to-rent) perform consistently well and therefore come up on top. Variables related to domestic credit also appear particularly useful, especially in signalling upcoming banking crises. Although not featuring among the top ten, the usefulness of indicators of external imbalances such as current account balances, official reserves and foreign currency exposure also comes out strongly in some specifications. In contrast, fiscal imbalances are generally not found to be useful in signalling severe recessions and crises.

Figure 8. Vulnerability indicators typically providing the most reliable warning

0-1 scale with 0 meaning no predictive value and 1 perfect prediction



Source: Hermansen and Röhn (2016).

Various policy distortions contribute to excess demand for credit, in particular housing-related credit

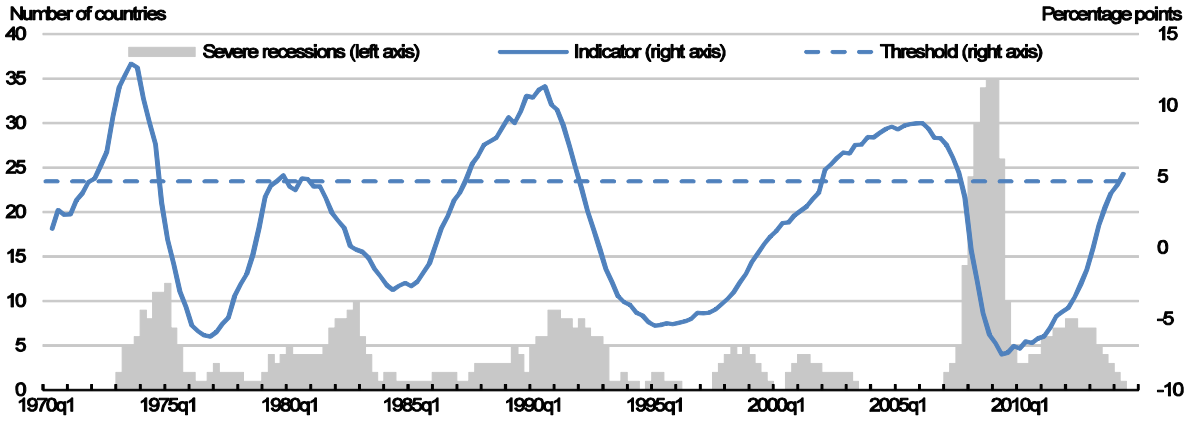
Taken together, the results from the early warning methodology indicate that among the factors creating an environment prone to severe recessions, some of the more important include excess leverage, in particular in the form of rapid growth of private credit. This is consistent with earlier

OECD work showing that at least among advanced economies, more private credit is associated with lower long-term growth, while stock market financing is associated with more growth (Cournède and Denk, 2015). Furthermore, among the different source of credit, bank lending is found to be much more negatively associated with growth than bonds. Finally, it is found that among the different types of loans, household credit exerts a stronger drag on growth than business credit.

The main findings from the early warning methodology are also consistent with the fact that the functioning of the real estate market is at the heart of most severe recessions. For instance, severe recessions over the past four decades have often been preceded by significant misalignments (i.e. deviations from trend) in average housing prices across countries (Figure 9). The combination of inelastic housing supply, partly due to natural constraints (Saiz, 2010), with the virtually boundless capacity of financial institutions to expand credit makes the housing sector particularly prone to boom and bust cycles. These characteristics of the housing market are often exacerbated by policy distortions. In a majority of countries, the tax treatment of housing, which is biased in favour of both ownership and debt financing, is conducive to excessive mortgage borrowing and leverage. At the same time, regulations and other distortions which restrict the supply of housing further contribute to house price bubbles.

Prudential measures can help to reduce financial fragility either by restraining household credit and the built-up of vulnerabilities (e.g. limits on loan-to-value or debt-to-income ratios) or by enhancing the banks'capacity to absorb a deterioration in their loan portfolio (e.g. higher reserve requirements, counter-cyclical capital or liquidity buffers). However, the growing importance of real estate as a source of wealth in most advanced economies raises the sensivity of aggregate consumption and investment to changes in prices. Hence, given the prevalence of the sector as a source of vulnerabilities, measures to address the distortions on the supply side should also be given attention. The diverse experience across countries with respect to housing policies and land use regulations may provide the scope for identifying practices that appear more successful at achieving objectives of affordability, sustainability and financial stability (OECD 2017, Hilber and Schöni, 2016; Kim and Park, 2016).

Figure 9. Housing price cycles have often been associated with severe recessions
Global real house price index



Note: Grey areas represent the number of countries identified as being in a severe recession (from peak to trough). The global real house price index is constructed as a GDP-weighted average across OECD countries is measured in deviation from trend.

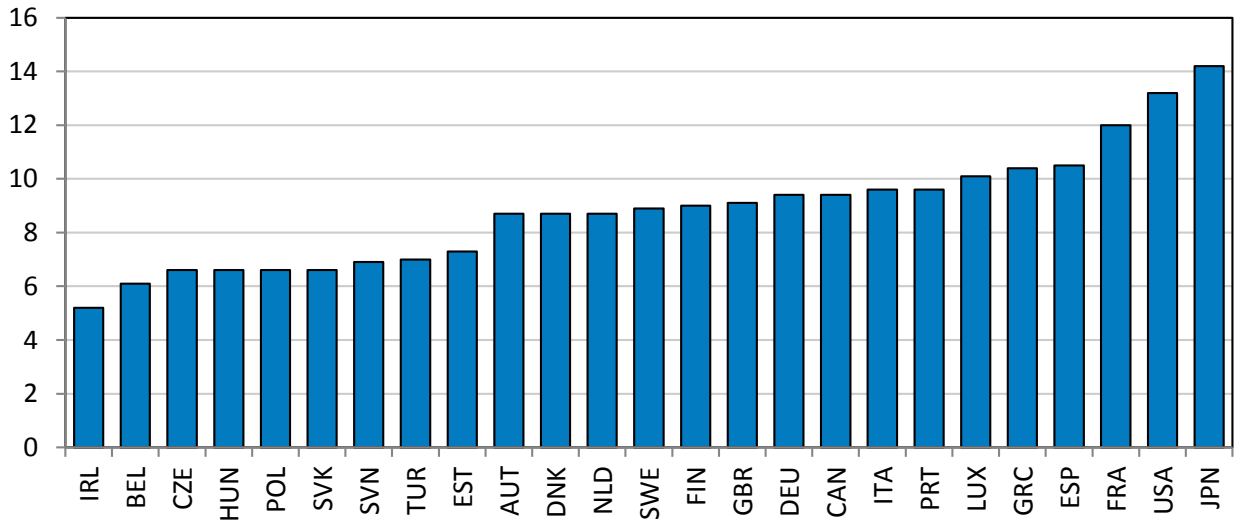
Source: Hermansen and Röhn, 2016.

Outside housing, in the non-financial corporate sector, tax systems in most countries are also favouring debt over equity financing (Figure 10), further contributing to excessive credit

accumulation, which generates risk and reduces average long-term growth. Effective average tax rates on stock market finance generally exceed those on debt finance, primarily because interest expenses are cost-deductible. The economic literature and earlier OECD work identified that the debt bias in corporate taxation generates costly economic distortions (OECD, 2007; De Mooij, 2012; Devereux et al., 2015). For example, corporate tax systems which favour debt over equity have been associated with a higher share of debt in external financing, thereby increasing financial crisis risks (Ahrend and Goujard, 2012) and greater leverage, thereby slowing down long-term growth (Cournède et al., 2015).

Figure 10. Tax systems favour debt over equity financing

Percentage point difference between the effective average tax rates on equity and debt finance, 2011



Note: The calculations account for taxes levied at the corporate level but not for those paid at the personal level. In many countries, the majority of investments are financed by foreign investors (to whom the domestic personal income tax does not apply) and by investors exempt from the personal income tax (especially pension funds and charitable foundations). The effective average tax rates on equity finance apply to new equity.

Source: Cournède et al. (2015). Effective Tax Levels Using the Devereux/Griffith Methodology, Project for the EU Commission, TAXUD/2008/CC/099, Mannheim.

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