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IMF Working Paper

Corporate Sector Vulnerabilities in Ireland

by Nir Klein

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Corporate Sector Vulnerabilities in Ireland

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Abstract[1]

The paper uses both macro- and micro-level data to assess how has the financial health of the Irish non-financial corporate (NFC) sector changed in the post financial crisis period. The analysis suggests that vulnerabilities have generally declined in recent years, but the NFC sector and especially smaller domestic firms remain vulnerable. A sensitivity analysis indicates that a non-extreme shock, which comprises a decline in profitability and an increase in interest rates, is likely to push many firms into a vulnerable state and that the share of firms with interest cover ratio of lower than one would triple to nearly fifty percent, largely reflecting the deterioration in the financial health of small firms. In such a scenario, the share of risky debt would increase to the level observed during the financial crisis, resulting in a significant increase in new corporate defaults.

JEL Classification Numbers: E0, G3, G20, G33, L2

Keywords: Corporate sector, financial crisis, leverage, interest rate shock, profit shock

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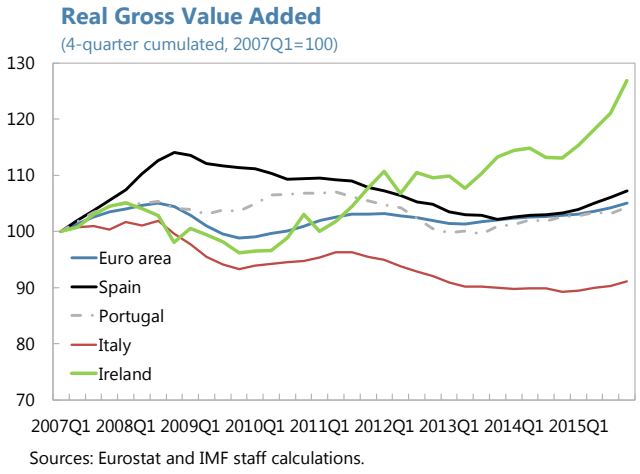
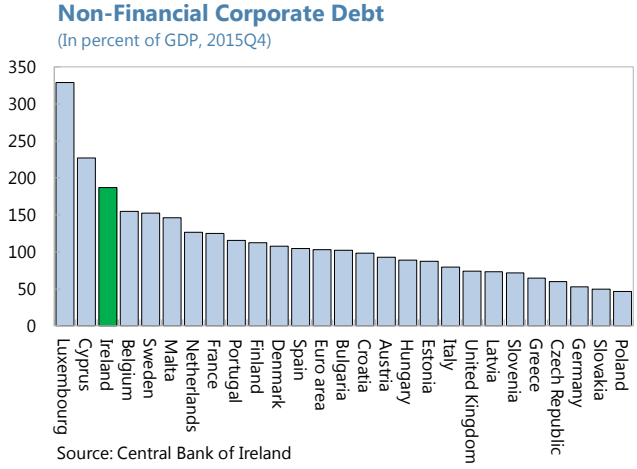
I. INTRODUCTION

1. The activity level of the corporate sector in Ireland has risen significantly recently. Following a sharp downturn in 2008–09, the activity in the corporate sector has rebounded rapidly in recent years; the rate of recovery has exceeded that seen in many of its euro area peers. In 2015, the corporate sector registered a real growth rate of 12 percent while, the gross operating surplus increased by 15 percent in real terms. The profitability share (gross operating surplus divided by gross value added) stood at about 65 percent—well above the pre-crisis average of 55 percent—and supported the sector's strong investment activity without relying heavily on debt issuance. Accordingly—and against persistent contraction of bank lending—the sector continued to deleverage.[2]



2. However, some indicators suggest that the corporate sector vulnerabilities remain elevated. While partly held by foreign-owned multinationals, which have limited linkages to the domestic financial system, the non-financial corporate (NFC) sector's debt stood at 187 percent of GDP at end-2015—among the highest in Europe in relative terms, leaving the sector vulnerable to a fall in revenues or increase in interest rate.[3] Also, non-performing loans (NPLs)—while declining— remain high. These two features limit firms' ability to undertake new investments. While credit conditions have somewhat eased and new lending to SMEs has picked up recently, banks' corporate loan books continue to contract reflecting both supply and demand factors. Despite some recent relaxation in credit conditions, the financing cost for firms, particularly SMEs, remains high relative to those of their European peers.



[2] See Carroll and others (2016).

[3] Lawless et al. (2015) showed that, in the post-crisis period, a higher debt-to-turnover ratio has a material impact on investment and employment growth of Irish SMEs as well as being associated with higher credit constraints.

3. Against this background, the primary objective of this paper is to assess vulnerabilities of the Irish corporate sector and its financial resilience to shocks. In particular, the paper aims to:

- Assess to what extent corporate sector vulnerabilities have changed since the financial crisis, examine which of the sectors and categories of firm size are the most vulnerable, and identify the portion of firms that remains at a heightened risk of default;

- Examine whether firm-level factors affect the firms' likelihood of being in distress, controlling for macroeconomic and sectoral effects; and

- Assess the sensitivity of the corporate sector to a plausible but substantial deterioration in macroeconomic conditions, and estimate how the related increase in defaults is likely to affect banks' asset quality and capital position.

4. The paper is structured as follows: section II describes the balance sheet developments of the corporate sector and discusses the sector's vulnerabilities from a macro-level perspective; section III uses firm-level data to assess corporate sector vulnerabilities, including by looking at indicators such as interest cover ratio and debt-at-risk across different categories of firm size, sectors, and ownership (domestic vs. foreign). Section IV presents a simple empirical analysis of the link between firm-level factors and firms' distress. Section V provides a sensitivity analysis of the corporate sector to adverse shocks and assesses the impact on banks' asset quality and capital position. Section VI concludes.

II. SOME STYLIZED FACTS FROM A MACRO-LEVEL PERSPECTIVE

Debt ratios have moderated from high levels

5. The debt of the Irish NFC sector increased rapidly in the pre-crisis period. With lax credit conditions in Ireland and abroad and strong investment activity, particularly in the construction sector, the Irish NFC sector sharply increased its leverage prior to the global financial crisis, mainly through borrowing from domestic monetary financial institutions. During 2005–07, the NFC sector's debt in terms of GDP climbed by 40 percentage points to 125 percent. With the contraction of GDP in 2008–9, which was accompanied by a significant decline in firms' profitability, debt to GDP increased further to 207 percent (end-2009), among the highest corporate debt levels in Europe. Since the onset of the crisis in 2008, new debt accumulation has come mainly from external and inter-company sources while domestic banks have tightened lending conditions.

6. The NFC sector has deleveraged in recent years. In part because credit supply has become more risk-sensitive, particularly for SMEs, the recent economic recovery has been accompanied by a significant increase in internal funding and equity issuance by larger firms as a source to finance investment and working capital. Consequently, credit to the corporate sector has continued to contract, and the debt-to-equity ratio declined to 45 percent in 2015Q4—among

the lowest in Europe (Figure 1)—from a peak of 123 percent in early 2009. Reflecting slower accumulation of nominal debt and the rapid increase in nominal GDP in 2014–5, the NFC debt-to-GDP ratio has declined since 2013; in 2015Q4 it stood at about 187 percent of GDP.

7. Recent years have shown a significant increase in the share of multinational enterprises' debt (Figure 1). The increased activity of multinationals in Ireland has also been reflected in their rising share in the overall NFC sector's debt. On a consolidated basis, the multinationals' debt stood at 94½ percent of GDP in 2014 compared to 36 percent of GDP in 2007, while the debt of Irish firms modestly increased to 85 percent of GDP in 2014 from at about 65 percent of GDP in 2007. As multinationals rely mostly on external financing sources, including inter-group loans, the share of non-euro denominated debt in total debt increased to more than half in 2015, from about one-quarter in 2006. Similarly, the growing reliance on external financing sources, along with the deleveraging of the Irish banking system, led to an increase in the share of loans from non-Irish entities to 55 percent of total loans in 2015Q4 compared with 34 percent in end-2012.

Rising profitability has supported the NFC sector's deleveraging

8. The increase in profitability across all categories of firm size has helped firms to sustain investment without relying on external funding. The gross operating surplus of the NFC sector—although declining as a share of total assets—has increased significantly and, as a share of the firms' value added, reached 63 percent, which is significantly above the European average (39 percent) and above Ireland's historical average (Figure 2). This is likely to reflect the improved economic conditions associated with the recent recovery, including the increase in domestic demand and strong export activity. Although more pronounced among large and medium-sized firms, profitability improved across all categories of firm size, and thus supported their investment activity (Carroll and others, 2016).

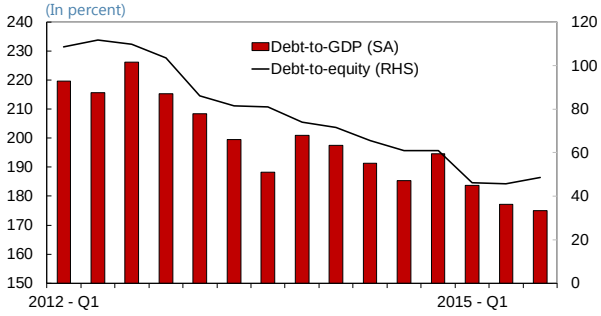
The level of corporate distress has somewhat eased recently

9. The share of non-performing loans in the corporate sector has moderated, but has remained elevated (Figure 3). The share of overdue corporate loans has eased to about 17 percent in 2015Q3 from a peak of nearly 27 percent at end-2013 thanks to improved economic conditions, write-offs, and restructuring activity. The moderation of the NPL ratio took place in all sectors, though in an uneven pace, with the NPL ratio in the manufacturing sector declining to a single digit level while the NPL ratio in the construction sector—although moderating—stayed above 50 percent.

Figure 1. Ireland: Non-Financial Corporate Sector Debt

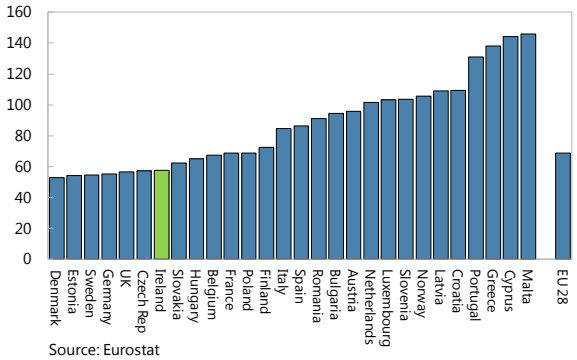
Debt of Non-Financial Corporations /1

(In percent)



1/ Debt is equal to securities other than shares, loans, and financial derivatives and employee stock options.
Sources: Central Bank of Ireland and IMF staff's calculations.

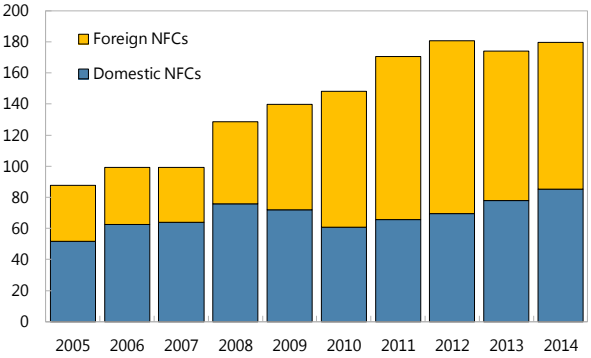
Debt-to-Equity ratio of the Non-Financial Corporate Sector, 2014



Source: Eurostat

Ireland: Non-Financial Corporate Debt

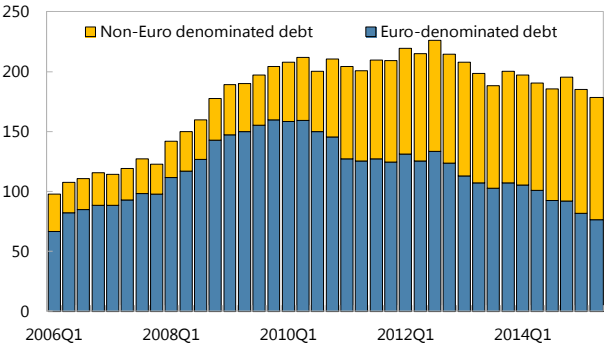
(In percent of GDP, consolidated)



Source: Central Statistic Office

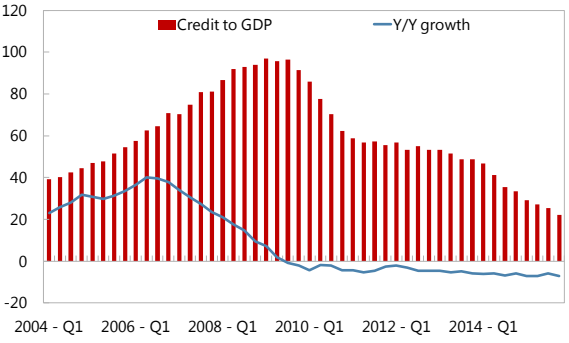
Debt of the Non-Financial Corporate Sector, by currency[1]

(In percent of GDP)



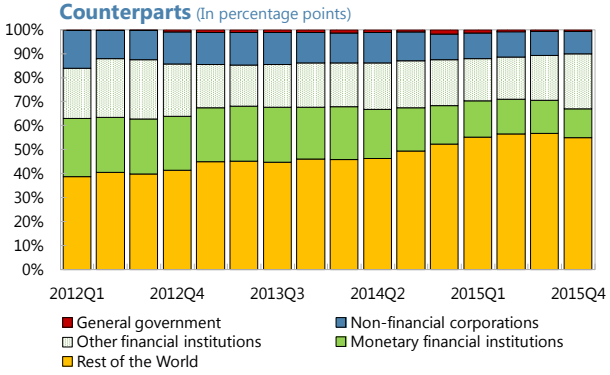
Sources: Central Bank of Ireland and IMF staff's calculations.

Credit to Irish Resident Private Sector Enterprises, Excluding Financial Intermediation



Source: Haver.

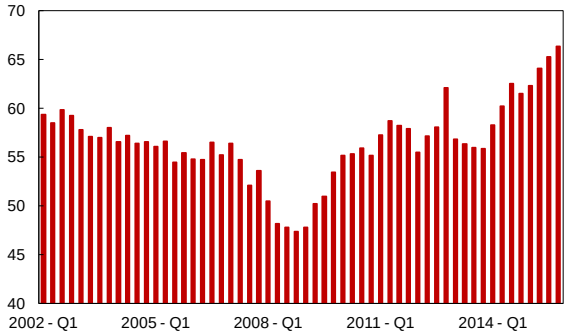
Loans of Non-Financial Corporate Sector, by Counterparts (In percentage points)



Source: Central Bank of Ireland.

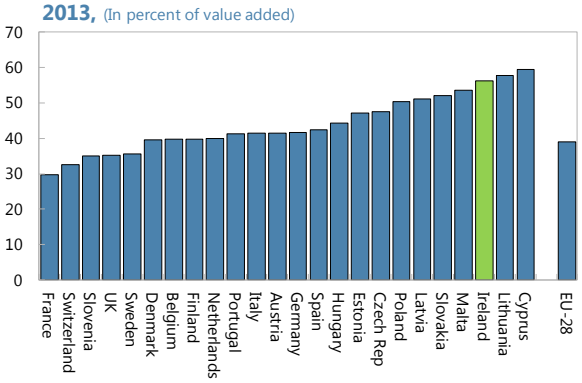
Figure 2. Ireland: Non-Financial Corporate Sector Profitability
(percent)

Profitability of the Non-Financial Corporate Sector
(Gross operating surplus as a share of value added, in percent)



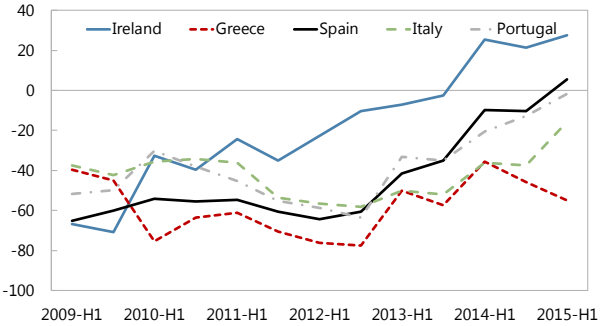
Sources: Haver and IMF's staff calculations.

Profitability of the Non-Financial Corporate Sector, 2013, (In percent of value added)



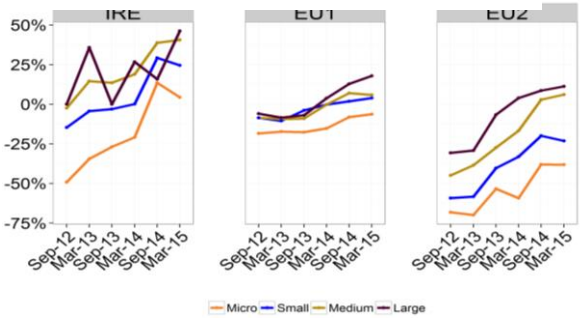
Source: Eurostat.

Net Change in Profitability 1/



1/ Net change indicates the net balance of firms that reported an increase in profitability compared with firms that reported a decline in profitability.
Source: ECB SAFE data.

Net change in Profitability by Firm Size 1/

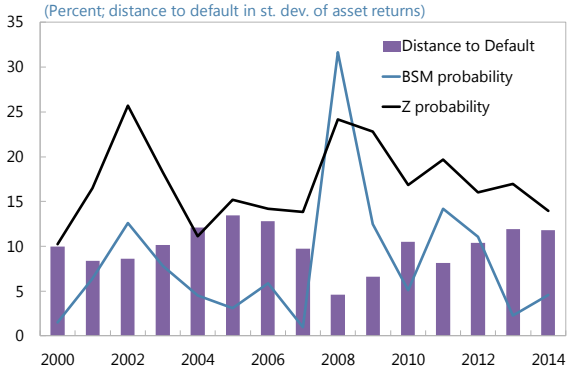


1/ Net change indicates the net balance of firms that reported an increase in profitability compared with firms that reported a decline in profitability.
EU1: Austria, Belgium, Germany, Finland, The Netherlands, France
EU2: Portugal, Italy, Spain, Greece
Source: ECB SAFE data.

10. The number of corporate bankruptcy cases has declined significantly, yet remains above the pre-crisis level (Figure 3).

Corporate bankruptcies registered more than a threefold increase in 2009–2012, reaching a quarterly average of 300 compared with 84 during 2005–07. Bankruptcies in construction, trade, and utilities sectors accounted for more than half of the cases in the former period. More recently, the quarterly average number of bankruptcies has moderated to about 225 cases (2014–15) reflecting an improvement in most of the sectors, although it still remains well above the pre-crisis levels.

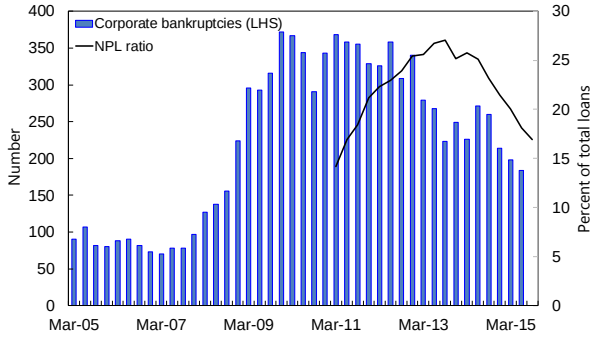
Ireland: Corporate Default Probability
(Percent; distance to default in st. dev. of asset returns)



Source: IMF Corporate Vulnerability Utility.

Figure 3. Ireland: Selected Corporate Distress Indicators

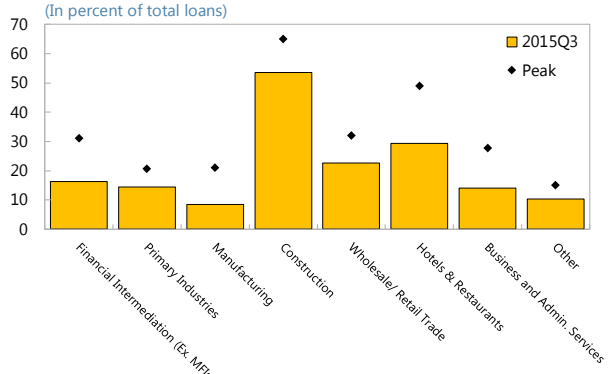
Non-Performing Loans and Bankruptcies in the Corporate Sector



Source: Central Bank of Ireland and Department of Jobs, Enterprise and Innovation.

Non-Performing Loans

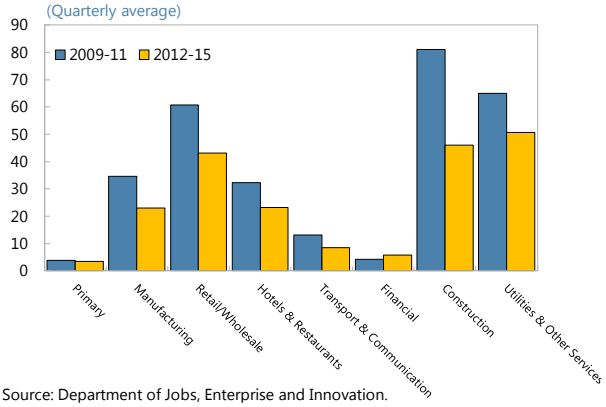
(In percent of total loans)



Source: Central Bank of Ireland.

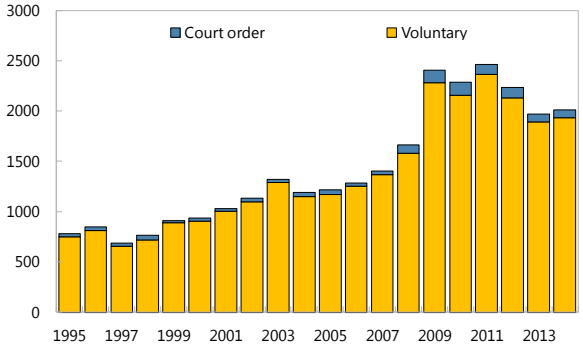
Bankruptcies by Sectors

(Quarterly average)



Source: Department of Jobs, Enterprise and Innovation.

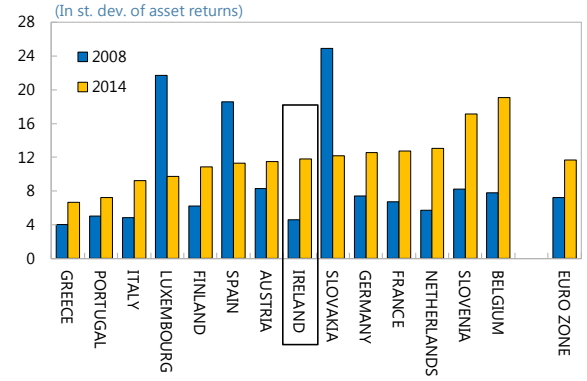
Corporate Liquidations



Source: Companies Registration Office.

Distance to Default

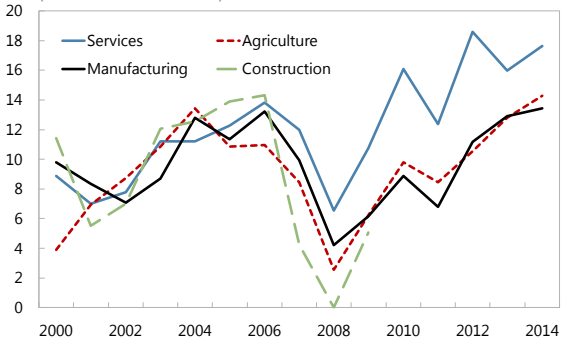
(In st. dev. of asset returns)



Source: IMF's Corporate Vulnerability Utility

Distance to Default by Sectors

(In st. dev. of asset returns)



Source: IMF's Corporate Vulnerability Utility

11. Default probabilities have normalized. The Black-Scholes-Merton (BSM) and Altman Z-probability consistently show a decline in the default probability in recent years:[4] in 2014, the BSM and the Z-probability stood at 4½ percent and 14 percent, respectively, compared with 24 percent and 32 percent in 2008, respectively. Accordingly, the distance-to-default (DTD), which measures how much asset values must fall during the year for a firm to default based on the current balance sheet position, improved significantly across the main sectors. Compared to peers, the DTD of the Irish corporate sector was slightly better than the 2014 euro zone's average, while in 2008 it was the second lowest after Greece (Figure 3).[5]

III. EVIDENCE FROM FIRM-LEVEL DATA

12. This section assesses corporate vulnerabilities in Ireland using firm-level data. More specifically, the analysis in this section looks at the firms' interest cover ratio (ICR), i.e. the ratio between the firms' earnings before interest, taxes, depreciation and amortization (EBITDA), and the firms' interest expenses, to assess to what extent the firms' debt-servicing capacity has changed in recent years, and how it could be affected by future shocks. Firms whose EBITDA is less than interest payment due, i.e. ICRs of less than one, are sometimes referred as being in "technical default". In such situations, many of these firms can survive for some time by selling assets to meet their debt obligations, but if their ICRs remain below one for a sustained period, they eventually will run out of assets and actual default will ensue. A firm with an ICR between 1 and 2 is generally regarded as being at heightened risk.

Data and sample coverage

13. The analysis uses the ORBIS database of Bureau Van Dijck (BvD), which contains world-wide information on private and public firms. For Ireland, we include all private enterprises that have a complete record of debt, EBITDA, and interest expenses.[6] The analysis distinguishes between domestic firms and subsidiaries of foreign corporations ("foreign firms" thereafter) as the financial resilience of the latter may not be primarily dependent on the Irish economy, but on their parent company's financial health. Additionally, the links of foreign firms to the Irish financial system are likely to be limited as many of these subsidiaries rely on their parent firms for funding (Stuart, 2006).

[4] The BSM probability provides the one-year-ahead probability of default, based on a theoretical asset-pricing model. The Z probability converts the Altman Z-score (a statistic that combines five accounting ratios) into a forward-looking probability of default.

[5] The distance-to-default calculation is based on a narrow sample of firms, both domestic and foreign-owned, across different categories of firm size.

[6] The sample includes all firms that have a non-missing value for Debt and interest cover ratio, including firms that have a marginal level of debt.

14. The sample provides a wide coverage of firm size, sectors, and ownership. Overall, the sample contains an unbalanced panel dataset of 7,663 observations of 3,040 domestic firms and 1,904 observations of 727 foreign firms, most of which are of small size (text table).[7] The sample covers the period 1995–2014, though the vast majority of observations is concentrated in the period 2006–2013. The sectoral composition indicates that the majority of the observations (77 percent) relate to services. Manufacturing, construction, and primary sectors account for 14 percent, 7½ percent, and 1½ percent of the observations, respectively (text table).

Sample Coverage by Firm Size

Firm size	Number of observations	Number of firms
Domestic	**7663**	**3040**
Small (1-49 employees)	4409	1882
Medium (50-249 employees)	2266	833
Large (>249 employees)	988	325
Foreign	**1904**	**727**
Small (1-49 employees)	1131	475
Medium (50-249 employees)	543	188
Large (>249 employees)	230	64
Total	**9567**	**3767**

15. The dataset, however, has several shortcomings, suggesting that the results should be treated with some caution. First, the composition and number of firms is not fixed over time, thus complicating inter-temporal comparisons. Second, the sample may involve a selection bias problem because distressed firms may not be fully represented in the sample. Third, certain sectors may be under- or over-represented. Last, the composition of the sample suggests that small firms are under-represented compared to their share in the Irish economy. To mitigate this problem, we present the vulnerability indicators and the sensitivity analysis results also by categories of firm size, and report the findings on the impact of the shocks on banks' asset quality and capital position based on a sample that is adjusted for the "right" composition of firms.

Sample Coverage by Sectors
(Number of observations)

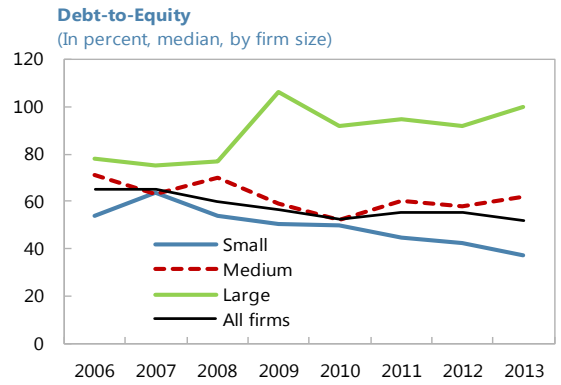
Sector	Domestic	Foreign	Total
Primary	121	35	156
Manufacturing	999	295	1294
Construction	603	131	734
Services	5940	1443	7383
Total	**7663**	**1904**	**9567**

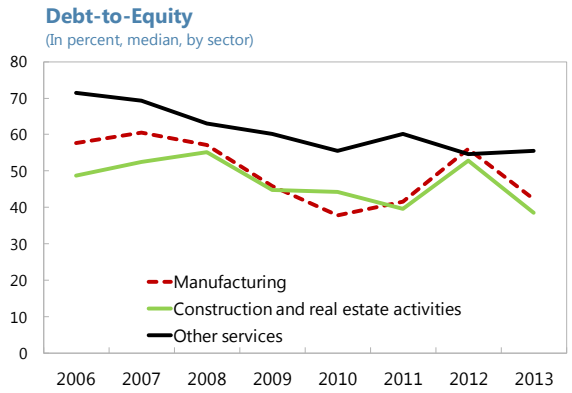
Some stylized facts on firms' financial performance from firm-level data

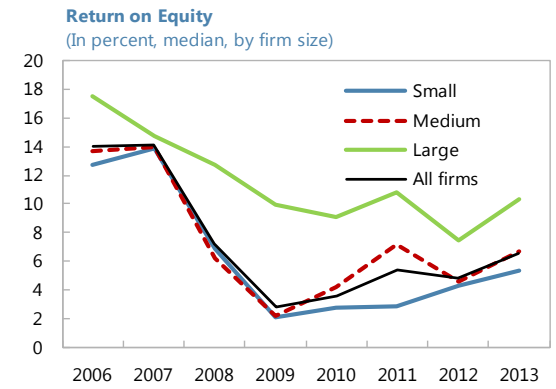
16. Firms' profitability dropped significantly across all firms in 2009, and only recently it has shown a modest recovery. The return on equity (RoE) of the median firm fell to just below 3 percent in 2009 from 14 percent in 2007, reflecting mainly a decline in profitability across small and medium-sized firms, particularly in the construction sector. The profitability among large firms declined, but more modestly. In 2010–13, the profitability recovered somewhat across all categories of firm size and sectors, though RoE of large firms remained significantly above that of smaller firms.

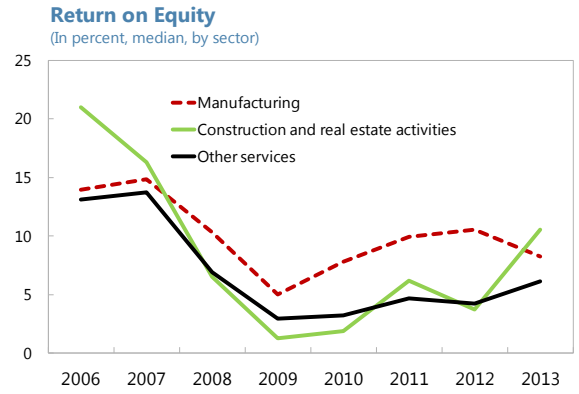
[7] See Table A1 in the Appendix for a more detailed breakdown of the sample's coverage.

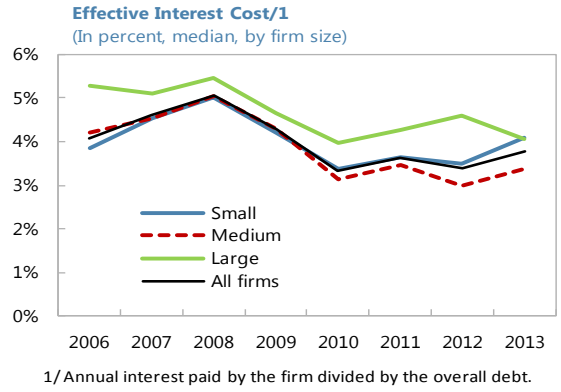
Figure 4. Ireland: Return on Equity, Debt-to-Equity, Effective Interest, and Composition of Debt



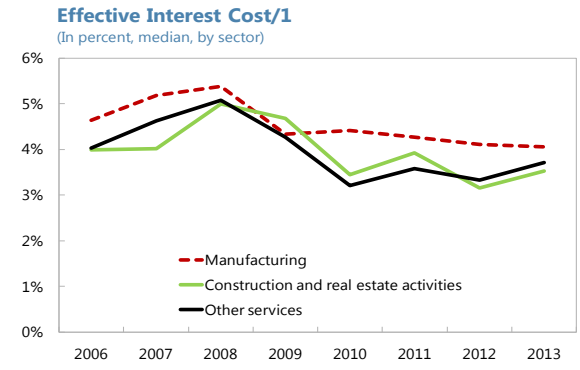


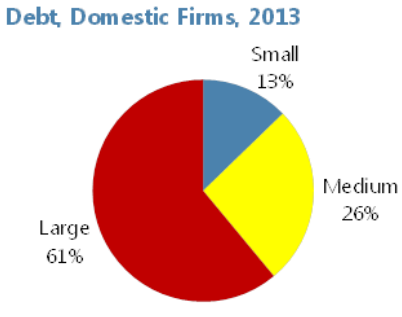


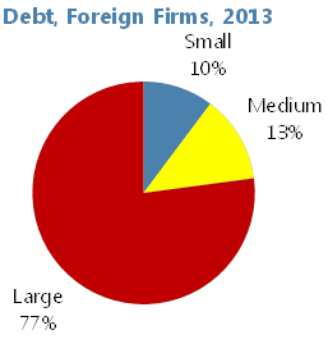




1/ Annual interest paid by the firm divided by the overall debt.





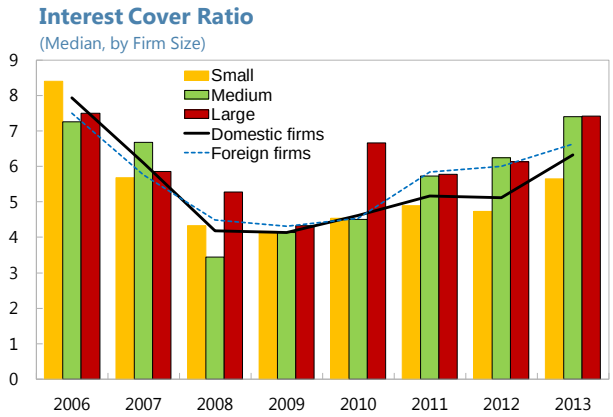


Source: BvD and IMF's staff calculations.

17. The debt-to-equity ratio has declined since the pre-crisis period, though deleveraging was concentrated in small and medium-sized firms. The debt-to-equity ratio of the median firm in the sample declined to 52 percent in 2013 from 65 percent in 2007, driven largely by a rapid deleveraging of small firms. In contrast, large firms, which on average maintain a higher debt ratio, accumulated higher debt, and as a result, the debt-to-equity ratio of the median large firm increased to 100 percent in 2013 from 75 percent in 2007. Deleveraging was evident across all sectors, though at a slower pace among firms in the services sector.

18. Borrowing costs have declined modestly. The median firm's effective interest cost, as measured by total interest expenses divided by total debt, slightly increased in 2008 to 5 percent from 4.6 percent in the previous year, possibly reflecting tighter financial conditions at the outset of the global financial crisis. In the following years, the effective interest rate cost eased to around 3.5 percent. Interestingly, the effective interest rate cost of large firms was higher than that of smaller firms, perhaps due to longer maturities and higher term premia.

19. The ICR increased steadily in recent years following a considerable decline in 2008-09. As profitability declined significantly in 2008–09, the ICR fell across all categories of firm size. The ICR of the median firm declined to about 4 from just above 6 in 2007. This brought the share of vulnerable domestic firms (i.e., firms with ICR lower than two) to 37.2 percent in 2009 from 24.4 percent in 2007, mainly reflecting a sharp increase in the ICR among small and medium-sized enterprises (Table 1).[8] The share of domestic firms where profits were below debt service payments (i.e. ICR below one) also increased significantly.[9]



Source: BvD and IMF staff's estimates.

20. A similar pattern was observed among foreign firms. In recent years, their ICR exhibited a healthy recovery as profitability somewhat improved and deleveraging continued. This brought the ICR of the median domestic and foreign firms in 2013 to 6.3 and 6.6, respectively, though in both types of ownership the ICR of small firms remained below that of medium-sized and large firms, suggesting that, on average, small firms have become more vulnerable. Reflecting recent improvements, the share of vulnerable firms across all categories of firm size has declined, and apart from medium-sized domestic firms, it has even fallen below the pre-crisis levels.

[8] The data suggests that low ICR was persistent. About 22 percent and 29 percent of the firms that had ICR of less than 2 in 2008 and 2009, respectively, had it for more than two years consecutively.

[9] The number of firms that remain in the sample in each year during 2007–13 is limited (few hundreds) and they are mostly of large and medium size. Nevertheless, their ICR exhibits a similar U-shape pattern over the period.

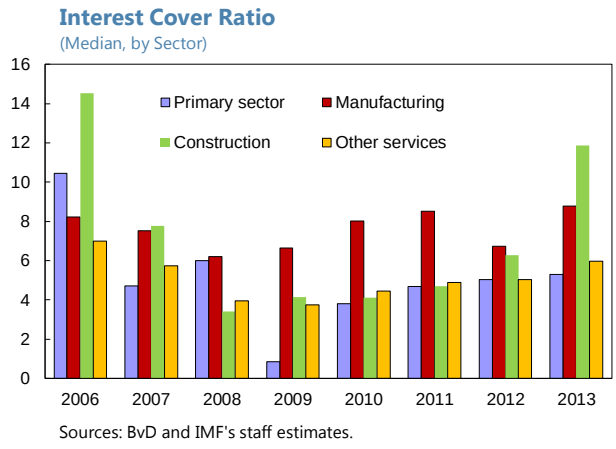
Table 1. Ireland: Share of Vulnerable and Distressed Firms /1
(Share of firms per year, percent)

	2007		2009		2013	
	ICR<2	ICR<1	ICR<2	ICR<1	ICR<2	ICR<1
Domestic firms	24.4	16.6	37.2	27.7	24.3	18.0
Of which:						
Small	15.2	10.7	23.1	17.7	14.2	10.1
Medium	6.4	4.0	10.5	7.8	8.1	6.5
Large	2.8	1.9	3.5	2.1	2.0	1.4
Foreign Firms	28.4	20.4	35.2	27.7	19.1	12.7
Of which:						
Small	18.3	12.2	22.4	16.7	10.0	7.3
Medium	7.0	5.8	9.2	7.4	6.4	3.6
Large	3.1	2.4	3.6	3.6	2.7	1.8

Source: BvD and IMF staff estimates.
1/ The number of firms changes over time.

21. The U-shape pattern of the ICR is evident also across sectors. The ICR of the median firm registered a decline in all of the main sectors in 2008–09. The sharpest decline in the median ICR took place in the primary sector, where the ICR of the median firm fell to below 1 in 2009 from above 10 in 2006, with half of the firms in "technical default". A similar decline was evident in the construction sector, though the financial health of the median firm was still solid. In recent years all the sectors recorded an improvement in their ICR, and, in 2013, the ICR of the median firm was above the 2007 level across all sectors.

22. The share of "debt-at-risk" has moderated in recent years following a significant increase in 2009. The analysis suggests that the share of debt that is owned by domestic firms with an ICR of less than one increased to above 15 percent in 2009 from 10½ percent in 2007, mainly reflecting deterioration in the financial health of small and medium-sized enterprises (Table 2). Interestingly, the share of debt-at-risk among large companies declined. Also, the share of debt that is owned by foreign firms with an ICR of less than one increased rapidly at the onset of the financial crisis, mainly due to a decline in profitability of large companies; in 2009 it reached 20 percent compared with 11.2 percent in 2007. In recent years, the share of risky debt moderated across both domestic and foreign firms. Among domestic firms, the share of risky debt in 2013 reverted to just below the pre-crisis level, though with a different composition: small firms accounted for about



two-thirds of the risky debt compared with one-third in 2007; the share of risky debt owned by large firms declined significantly to about 15 percent, from nearly 50 percent in 2007. Among foreign firms, the decline in risky debt was largely driven by large companies, though the improvement was evident across all categories of firm size.

Table 2. Debt-at-Risk, based on ICR<1
(Debt of firms with ICR < 1 relative to total debt, percent)

	2007	2009	2013
Domestic firms	10.5	15.3	9.9
Of which:			
Small	3.1	6.5	6.3
Medium	2.3	4.2	2.3
Large	5.1	4.6	1.3
Foreign firms	11.2	20.0	4.1
of which:			
Small	5.2	4.9	3.0
Medium	2.4	3.6	0.8
Large	3.6	11.5	0.3

Source: BvD and IMF staff estimates.
1/ The number of firms changes over time

IV. ECONOMETRIC ANALYSIS

23. This sub-section explores whether there is a significant relationship between a low ICR (below 2) and a situation of "distress". The results could indicate whether a situation of distress is directly linked to the firm's financial health or whether it is related to a broader set of factors, including macroeconomic and sectoral effects.

24. To examine this question, we apply a binary Logit model where the dependent variable is the probability of being in a "distress" situation (i.e. in insolvency proceedings, liquidation, default of payment, or temporary inactivity).[10] The model uses a logistic distribution that limits the predicted probabilities to between zero and one as follows:

$$y_{i,t} = f(X'\beta) = \frac{e^{\alpha+\beta x}}{1+e^{\alpha+\beta x}}$$

where $y_{i,t}$ is the probability of being in distress and X is a vector of the explanatory variables, which includes both firm-specific factors as well as sectoral, and time dummies. The effect of a low ICR is explored by including two alternative dummies: one for firms with an ICR lower than two (*vulnerable*), and one for firms with ICR lower than one (*highly vulnerable*). The analysis controls for firm level factors, such as the firm's current ratio, age, size (as measured by the

[10] For simplicity, the analysis does not differentiate between different levels of distress. The level of distress may vary over time.

number of employees), ownership (domestic vs. foreign) and the share of fixed assets to total assets, which captures the firm's collateral and thus may indicate the firm's ability to obtain bank financing.

25. The sample available for estimation purposes covers the period 1995-2014, and includes about 9,500 observations. Overall, there are 706 observations of distress, accounting for about 7½ percent of the total observations in the sample, with more than half of them in the 2007–09 period. Figure A4 in the Appendix presents the distribution of distressed firms by sectors and firm size.

26. The estimation results presented in Table 3 corroborate the hypothesis that the ICR is an important indicator of corporate financial soundness. While the explanatory power is relatively low, the results remain robust to various specifications and confirm that, other things being equal, firms are more likely to be in distress if they have a low ICR.[11,12] The marginal effects at mean, which are presented in Table A4 in the Appendix, indicates that the effect of the *vulnerable* dummy is slightly higher than that of *highly vulnerable*, possibly reflecting the higher mean of the latter as it covers a larger number of firms in the sample. Moreover, the results suggest that firms in the construction sector are more likely to be in distress compared with companies in other sectors, though two specifications show that also firms in the manufacturing sector are more prone to distress. More liquid companies (i.e. with a higher current ratio) are less likely to be in distress, suggesting that they can use their liquid assets to meet their debt service payments, even if their profitability declines sharply and their interest cover ratio is below the indicated thresholds. Finally, larger companies are less likely to be in a distress, perhaps indicating their strong bargaining power with the creditors. Interestingly, the results do not indicate that ownership has a significant effect.

[11] The results remain robust for a dummy that obtains a value of one if ICR remained below two/one consecutively for two years or more, and for inclusion of real GDP (excluding the activity of multinationals) growth instead of time dummies.

[12] The estimates coefficients on the control variables have the predicted signs.

Table 3. Ireland: Determinants of Firms' Distress

	Logit model, coefficients					
	(1)	(2)	(3)	(4)	(5)	(6)
Highly vulnerable	0.806***	0.804***	0.795***			
Vulnerable				0.948***	0.956***	0.945***
Current ratio	-0.024**	-0.032**	-0.032**	-0.022***	-0.031***	-0.031**
Fixed assets/total assets		-0.004***	-0.004***		-0.005***	-0.004***
Number of employees			-0.000**			-0.000**
Foreign			0.100			0.101
Primary sector	-0.262	-0.230	-0.274	0.230	-0.195	-0.236
Manufacturing	0.189	0.144	0.168	0.224*	0.174	0.196*
Construction	0.815***	0.731***	0.740***	0.824***	0.730***	0.738***
Time dummies	yes	yes	yes	yes	yes	yes
# of obs.	9,522	9,522	9,522	9,522	9,522	9,522
Pseudo R^2	0.086	0.088	0.097	0.0957	0.098	0.100

Source: IMF staff estimates.
*** Indicates significance at 1 percent **indicates significance at 5 percent * indicates significance at 10 percent.

V. SENSITIVITY ANALYSIS

Calibration of shocks

27. This section assesses the vulnerability of the corporate sector to adverse changes in the macroeconomic environment and evaluates the impact on banks' asset quality and capital positions. For this exercise, we exclude the subsidiaries of foreign firms as their linkages to the Irish economy and the domestic banking system are limited. We consider three types of shocks: (i) an interest rate shock; (ii) a profit shock; and (iii) an interest rate-profit combined shock. In this static exercise, we define all three shocks on the basis of end-2013 balance sheets.[13]

- **Interest rate shock.** We use the calculated effective interest rate of each firm at end-2013 $(i_{eff,t-1})$, and we apply a 450bp shock, which is consistent with the adverse scenario of the banking sector's stress test.[14] In addition, and in line with CBI data on corporate lending, we assume that half of the 2013 debt stock $(Debt_{t-1})$ will be rolled-over with a higher interest rate:[15]

[13] Parameters of the shocks are in line with the FSAP's adverse scenarios.

[14] This shock is consistent with the deviation from the baseline of the yield on 10-year Irish sovereign bond at the end of the stress horizon.

[15] CBI data suggests that 45 percent of large firms' debt and 69 percent of SMEs' debt are at variable rates. The rollover assumption of 50 percent takes into account the higher weight of large firms (60 percent) in total debt.

$$Interest\ expense_{i\_shock,t} = \frac{i_{eff,t} + 4.5}{100} \cdot \frac{1}{2} \cdot Debt_{t-1} + \frac{i_{eff,t}}{100} \cdot \frac{1}{2} \cdot Debt_{t-1}$$

An increase in the interest rate would also increase the return on financial assets. Hence, we add the expected increase in the return on these assets to EBITDA, assuming that the 2-percentage points spread between lending rates and deposit rates that was observed during 2008–9 will prevail also in this scenario. This effect is captured by the assumption that the yield on financial assets will increase by 250bp as follows:[16]

$$EBITDA_{i\_shock,t} = EBITDA_t + (financial\ assets_{t-1}) \cdot 2.5/100$$

The ICR in the interest rate shock scenario is then given as:

$$ICR_{i\_shock,t} = \frac{EBITDA_{i\_shock,t}}{Interest\ expense_{i\_shock,t}}$$

- **Profit shock**. This scenario simulates a downturn of economic activity, leading to lower profitability. Lower profits are derived by shocking the firms' added value by 15 percent, while holding the costs of employees constant at their baseline level.[17] The rigidity in the costs reflects firms' tendency to hoard labor in the short run at least until the magnitude and length of the shock become clearer. The calculation of this shock suggests that average profit in the sample declines by about 20 percent compared with the baseline. The ICR in this scenario is then given by:

$$\begin{aligned} EBITDA_{profit\_shock,t} &= Added\ value_t - Costs\ of\ employees_t \\ &= Added\ value_{t-1} * 0.85 - Costs\ of\ employees_{t-1} \end{aligned}$$

$$ICR_{profit\_shock,t} = \frac{EBITDA_{profit\_shock,t}}{Interest\ expense_t}$$

- **Combined interest rate and profit shock.** This shock combines the two shocks that are discussed above to affect the numerator and the denominator. The ICR in this shock is given by:

$$ICR_{combined\_shock,t} = \frac{EBITDA_{profit\_shock,t} + financial\ assets_{t-1} \cdot 2.5/100}{Interest\ expense_{i\_shock,t}}$$

[16] Consistent with the financial quarterly accounts of the non-financial corporate sector, we assumed that the firms' financial assets amount to 10 percent of the firms' total assets.

[17] The firm's added value can be proxied by the sum of cost of employees and EBITDA (the share of income that goes to capital).

Stress test results

28. The sensitivity analysis suggests that Irish corporations, particularly SMEs, are vulnerable to adverse macroeconomic changes (Table 4). In particular:

- A 450bp interest rate shock would push the median ICR from 6.8 in the baseline to 4.0—similar to the median ICR during 2008–09—while increasing the share of vulnerable firms to nearly one-third from 22 percent in the baseline. In addition, the share of risky debt (debt owned by firms with ICR of less than 2) would increase to more than half of the total, pointing to a potential of sharp increase in new defaults.[18] The most vulnerable group appears to be the large and medium-sized firms, reflecting their high leverage and debt service payments.

- A profit shock would bring the ICR of the median firm down to 2, and would make more firms vulnerable compared with the impact of the interest rate shock (i.e. result in a higher share of firms with ICR of less than 2). However, the impact of this shock on the share of debt that is owed by firms with ICR lower than 2 would be significantly smaller than under the interest rate shock. This may suggest that the shocks affect firms differently: An interest rate shock would mostly affect firms that are heavily leveraged (mostly medium-sized and large firms), resulting in a sharp increase in the share of risky debt. By contrast, a profit shock would affect the entire distribution of firms, but, as the results indicate, the impact of this shock on firms that are heavily leveraged would be weaker than that of the interest rate shock, and thus the share of risky debt would increase only moderately. A close look at the sample's characteristics indeed corroborates this hypothesis: firms with ICR below two under a profit shock had an average debt-to-equity ratio of 140 percent in the baseline, while firms with ICR below two under an interest rate shock had an average debt-to-equity ratio of 197 percent in the baseline.

- Finally, a combined shock of tighter financial conditions and lower profitability would have a sizable impact on firms' balance sheets, and thus likely to push many firms into a vulnerable situation. In particular, the share of firms with ICR less than 2 would increase to nearly 60 percent from 22 percent in the baseline. A similar increase is expected to take place in the share of risky debt, indicating a sharp increase in new defaults. Table A5 in the Appendix shows that, in a combined shock, the shares of risky debt (i.e. owned by firms with ICR at less than 2) are at 50 percent or above in all categories of firm size.

[18] As discussed in Section IV, the probability of default also for firms with ICR higher than 1 is significant.

Table 4. Ireland: Corporate Sector Sensitivity Analysis Results[1]
(Percent except where indicated)

		ICR of the median firm	Share of Firms		Share of Debt	
			ICR<1	ICR<2	ICR<1	ICR<2
Baseline	All firms	6.8	16.5	22.3	9.4	22.7
	of which:					
	Small	6.0	8.0	11.5	5.8	6.1
	Medium	7.4	6.9	8.8	2.3	9.6
	Large	7.4	1.5	2.2	1.3	7.0
Interest rate shock	All firms	4.0	17.3	31.0	9.8	56.6
	of which:					
	Small	3.6	8.6	17.2	6.1	7.0
	Medium	4.3	7.4	10.8	2.4	21.6
	Large	4.7	1.3	3.0	1.3	27.0
Profit shock	All firms	2.0	42.9	50.2	11.3	25.9
	of which:					
	Small	1.9	24.7	27.7	6.4	7.1
	Medium	2.1	14.5	17.5	2.6	10.1
	Large	2.3	3.7	5.0	2.3	8.7
Combined shock	All firms	1.2	47.4	58.6	14.7	59.9
	of which:					
	Small	1.2	26.4	31.4	6.7	7.6
	Medium	1.2	16.5	21.6	3.2	22.5
	Large	1.3	4.5	5.6	4.8	29.8

Source: BvD and IMF staff's calculations.
[1] To ensure consistency in the number of observations between the baseline and the adverse scenarios, the baseline figures were re-calculated and thus slightly differ from those presented in Section III.

Implications for banks' asset quality and capital position

29. This section estimates the banks' potential losses that may arise due to corporate exposures, and compare them with the banks' buffers. We follow the GFSR's (IMF 2013) methodology and assess the corporate exposures of the banking system as follows:[19]

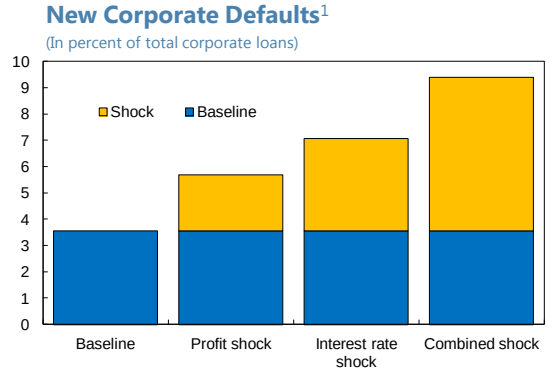
[19] See Global Financial Stability Report, 2013 October, Annex 1.2, for further details.

- Firm-level ICRs are mapped into probability of defaults (PDs) by using GFSR calculations, which matched ICR levels to historical default rates of companies rated by rating agencies (Table A6 in the Appendix).

- Loss rates are obtained by multiplying the PDs by loss given default (LGDs) ratios. For this, we apply the Basel's standard LGDs of 45 percent.

- We assume that 50 percent of the large firms' debt and 75 percent of the SMEs' debt are owned by the banks.[20, 21]

30. The results show that the applied shocks would lead to a significant increase in new corporate defaults (text figure).[22] The analysis indicates that a profit shock would increase the new corporate defaults to 5.7 percent of the overall bank corporate loan book from 3.6 percent in the baseline (cumulative, two-year horizon).[23] The impact of an interest rate shock and a combined profit-interest rate shock would have a greater effect as it estimated to increase new defaults to 7.1 percent and 9.4 percent of total corporate loans, respectively. While the magnitude of shocks differs, these estimates appear comparable to the 11 percentage point increase in corporate NPL ratio realized in 2011–13, when corporate distress was generally high.



1/ Cumulative new defaults over a period of two years.
Sources: BvD and IMF staff's calculations.

31. These estimations are moderately sensitive to the assumptions regarding the shares of SMEs' and large enterprises' debt that is owned by the banks. For example, assuming that the share of SMEs' debt that is owned by banks is the same as that of large firms (50 percent), a profit shock, interest rate shock, and a combined shock would increase the share of new defaults to 5.0 percent, 6.6 percent, and 8.9 percent of total corporate loans, respectively, from a level of 3.2 percent in the baseline (cumulative, two-year horizon). The results assuming a LGD rate of 60 percent are not dramatically different.

[20] While recent surveys on SMEs' credit, including the Department of Finance's Red C and ECB's SAFE, suggest that the reliance on internal funding has increased significantly in recent years and now accounts for the lion share of SMEs' financing of investment and working capital, bank loans/overdrafts still account for the majority of SMEs' debt. Lawless et al (2013) suggest that nearly 80 percent of SMEs used bank overdrafts/loans in 2013.

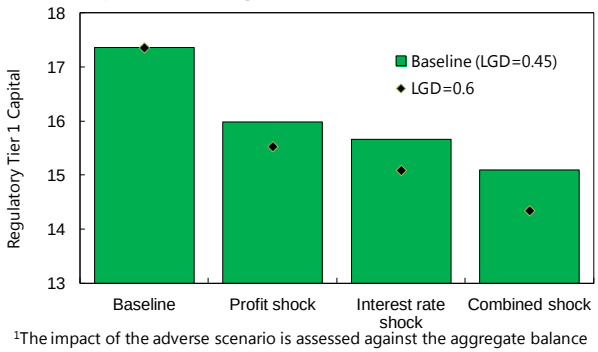
[21] CBI's data suggests that credit from monetary financial institutions accounted for 64 percent of the overall domestic NFC's debt in 2013.

[22] The presented calculations are based on Moody's PDs. The calculations based on alternative PDs are not significantly different.

[23] The banks' corporate loan book is assumed to remain constant during the shock period.

32. Ceteris paribus, banks would still be able to absorb the shocks while keeping the regulatory Tier 1 capital well above the minimum requirement. To calculate the impact on the banking system, we apply the calculated share of new defaults in the total corporate loan book under each scenario to the aggregate corporate loan book of the three main domestic banks in 2015Q3. Given the moderate share of corporate loans in the domestic banks' loan book (about 35 percent) and the banks' current capitalization levels, the analysis suggests that banks would be able to keep the regulatory Tier 1 capital well above the minimum requirement (text figure). More specifically, the results show that, in a combined shock scenario, where losses from defaults are expected to be the highest, the regulatory Tier 1 capital would fall to 15.1 percent of risk-weighted assets from 17.4 percent in the baseline (2015Q3). If a more conservative LGD is used, such as 60 percent, the regulatory Tier 1 capital would fall by an additional 0.8 percentage points of risk-weighted assets to 14.3 percent.

Impact on Banks' Tier 1 Capital[1]
(In percent of risk weighted assets)



[1]The impact of the adverse scenario is assessed against the aggregate balance sheets of the three domestic banks.
Sources: BvD and IMF staff's calculations.

Re-weiging the composition of firms

33. The application of shocks to a sample with higher representation of SMEs would lead to a higher share of new defaults and a stronger effect on banks' capital. The baseline relies on observations of 2013, where SMEs are somewhat under-represented: They account for about 90 percent of the total firms compared with a Central Statistics Office estimation of 99.7 percent. To correct for this bias, we increase the weight of SMEs in the sample while keeping the distribution of ICR the same and examine the impact on banks. The results suggest that, given the SMEs' high reliance on bank financing and their initial weaker financial health, the shocks would have a somewhat stronger effect on banks. In particular, a profit shock, interest rate shock, and a combined shock would increase the share of new defaults to 9.1 percent, 9.4 percent, and 11.9 percent of total corporate loans, respectively, from 5.2 percent in the baseline (cumulative, two-year horizon). In a combined shock scenario, where losses from defaults are expected to be the highest, the regulatory Tier 1 capital would fall to 14.5 percent of risk-weighted assets from 17.4 percent in the baseline (2015Q3).

VI. CONCLUSION

34. The vulnerabilities of the Irish NFC sector have moderated in recent years. The recent strong economic performance of the Irish economy was accompanied by increased corporate sector's profitability, sharp reduction in debt-to-equity ratio, and a decline in distress indicators, including default rates. The ICR of the median firm increased steadily in recent years, following a sharp decline in 2008–09, and the share of risky debt in total debt has declined. While NFC debt-to-GDP ratio remains high from an international perspective, more than half of

it is owned by multinationals and originates from external sources, including from inter-group loans.

35. However, vulnerabilities remain elevated. The levels of corporate debt and corporate NPLs remain high, therefore limiting firms' ability, particularly SMEs, to access finance and undertake new investment. While firms' financial health has improved, about one-fifth of the domestic firms—mostly of small size—were under "technical default" (with ICR of less than one) in 2013, with the share of debt owned by firms with ICR of less than one at 10 percent. Furthermore, the share of risky debt among small firms constituted nearly half of small firms' debt. [24]

36. The sensitivity analysis suggests that adverse shocks would push many firms into a vulnerable state, yet banks' capital position would remain comfortable, at least in a first round effect. An adverse shock might push many corporates' ICR below two, and thus result in a significant increase in the flow of new defaults. Still, given the moderate share of corporate loans in banks' loan books and banks' current capital position, they would still be able to keep the regulatory Tier 1 capital well above the minimum requirement.

37. It is important to treat these results with some caution as the analysis in this paper is a static exercise. Therefore, the analysis does not take into account second round effects, which may lead to higher unemployment and lower property prices and thus inflict additional losses on banks. Also, as adverse macroeconomic changes are likely to have a wider impact on the economy, including on government revenues, households, and financial institutions, the stress on banks' balance sheet is likely to be greater than measured in this exercise.

[24] It must be noted that one-in-three Irish SMEs have no debt on their balance sheet (McCann, 2014), therefore vulnerabilities are concentrated amongst a group of indebted SMEs.

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APPENDIX. STATISTICAL TABLES AND DETAILED RESULTS

Appendix Table A1. Ireland: Sample Coverage by year

	Domestic Firms					Subsidiaries of Foreign Firms				
year	Small	Medium	Large	Sum	Cumulative	Small	Medium	Large	Sum	Cumulative
1995	2	1	9	12	12	1		3	4	4
1996	3	1	9	13	25	1		5	6	10
1997	2	3	9	14	39	1		5	6	16
1998	1	1	10	12	51			4	4	20
1999	2	4	9	15	66		2	5	7	27
2000	3	3	10	16	82			7	7	34
2001	3	3	8	14	96	1	1	4	6	40
2002		1	4	5	101			2	2	42
2003	4	2	4	10	111		2	1	3	45
2004	3		6	9	120			1	1	46
2005	53	36	43	132	252	11	7	6	24	70
2006	332	234	116	682	934	101	53	20	174	244
2007	700	381	153	1234	2168	198	96	33	327	571
2008	756	360	136	1252	3420	199	93	30	322	893
2009	691	326	111	1128	4548	177	78	26	281	1174
2010	616	280	106	1002	5550	154	66	23	243	1417
2011	517	246	107	870	6420	128	57	22	207	1624
2012	410	205	72	687	7107	85	52	17	154	1778
2013	281	164	49	494	7601	62	34	14	110	1888
2014	30	15	17	62	7663	12	2	2	16	1904
Total	**4409**	**2266**	**988**	**7763**		**1131**	**543**	**230**	**1904**	

Appendix Table A2. Ireland: Share of Vulnerable and Distressed Firms /1
(Share of firms per year, percent)

	2007		2009		2013	
	ICR<2	ICR<1	ICR<2	ICR<1	ICR<2	ICR<1
Domestic firms	24.4	16.6	37.2	27.7	24.3	18.0
Within small firms	26.9	18.9	37.8	28.9	24.9	17.8
Within medium firms	20.7	12.9	36.5	27.0	24.4	19.5
Within large firms	22.2	15.7	36.0	21.6	20.4	14.3
Foreign Firms	28.4	20.4	35.2	27.7	19.1	12.7
Within small firms	30.3	20.2	35.6	26.6	17.7	12.9
Within medium firms	24.0	19.8	33.3	26.9	20.6	11.8
Within large firms	30.3	24.2	38.5	38.5	21.4	14.3

Source: BvD and IMF staff estimates.
1/ The number of firms changes over time

Appendix Table A3. Ireland: Debt-at-Risk, based on ICR<1

(Debt of firms with ICR < 1 relative to total debt, percent)

	2007	2009	2013
Domestic firms	10.5	15.3	9.9
Within small firms	22.2	40.4	49.0
Within medium firms	8.0	20.7	8.9
Within large firms	8.8	7.2	2.1
Foreign firms	11.2	20.0	4.1
Within small firms	28.2	23.2	38.6
Within medium firms	21.2	21.7	7.8
Within large firms	8.9	41.3	0.6

Source: BvD and IMF staff estimates.
1/ The number of firms changes over time

Appendix Table A4. Ireland: Determinants of Firms' Distress						
Logit model, Marginal effects at the means						
	(1)	(2)	(3)	(4)	(5)	(6)
Highly vulnerable	0.038***	0.038***	0.037***			
Vulnerable				0.044***	0.044***	0.043***
Current ratio	-0.001**	-0.001**	-0.001**	-0.001***	-0.001***	-0.001**
Fixed assets/total Assets		-0.000***	-0.000***		-0.000***	-0.000***
Number of employees			-0.000**			-0.000**
Foreign			0.004			0.004
Primary sector	-0.012	-0.010	-0.012	0.010	-0.009	-0.010
Manufacturing	0.009	0.006	0.007	0.009*	0.008	0.009*
Construction	0.039***	0.034***	0.034***	0.033***	0.033***	0.033***
Time dummies	yes	yes	yes	yes	yes	yes
# of Obs.	9,522	9,522	9,522	9,522	9,522	9,522
Pseudo R^2	0.086	0.088	0.097	0.0957	0.098	0.100
*** Indicates significance at 1 percent **indicates significance at 5 percent * indicates significance at 10 percent.						

Appendix Table A5. Ireland: Sensitivity Analysis Results

	Share of Firms		Share of Debt	
	ICR<1	ICR<2	ICR<1	ICR<2
Baseline, 2013				
Shares within small firms	14.9	21.2	47.3	49.9
Shares within medium-sized firms	19.5	24.3	8.9	36.5
Shares within large firms	14.2	20.4	2.1	11.4
Interest rate shock				
Shares within small firms	16.1	31.7	50.3	57.5
Shares within medium-sized firms	20.7	30.5	9.0	82.9
Shares within large firms	12.2	28.6	2.1	44.1
Profit shock				
Shares within small firms	45.8	51.4	48.7	51.6
Shares within medium-sized firms	40.9	49.4	9.9	38.5
Shares within large firms	34.7	46.9	3.8	14.1
Combined shock				
Shares within small firms	49.0	58.2	52.2	59.0
Shares within medium-sized firms	46.3	61.0	12.3	85.7
Shares within large firms	42.9	53.1	7.9	48.8

Source: BvD and IMF staff's calculations.

Appendix Table A6. Ireland: Mapping of Corporate Vulnerability Indicators to Probabilities of Default

Corporate Vulnerability Indicators[1,2]				Cumulative Default Rates[3]					
				Moody's		Standard & Poor's		Fitch	
ICR	Profitability	Leverage	Implied Rating	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2
27.0	21.1	0.6	Aaa/AAA	0.0	0.0	0.0	0.0	0.0	0.0
14.7	13.5	1.5	Aa/AA	0.0	0.1	0.0	0.0	0.0	0.0
9.3	12.0	2.0	A/A	0.1	0.2	0.1	0.2	0.1	0.2
5.2	9.9	2.6	Baa/BBB	0.2	0.5	0.2	0.6	0.2	0.7
3.4	9.3	3.2	Ba/BB	1.1	3.1	0.9	3.0	1.1	2.8
1.6	7.3	4.8	B/B	4.1	9.6	4.5	10.0	2.0	4.8
0.5	3.2	7.6	Caa-C/CCC-C	16.4	27.9	26.8	36.0	24.9	31.9

Sources: Fitch; Moody's; Standard and Poor's; and IMF staff estimates.

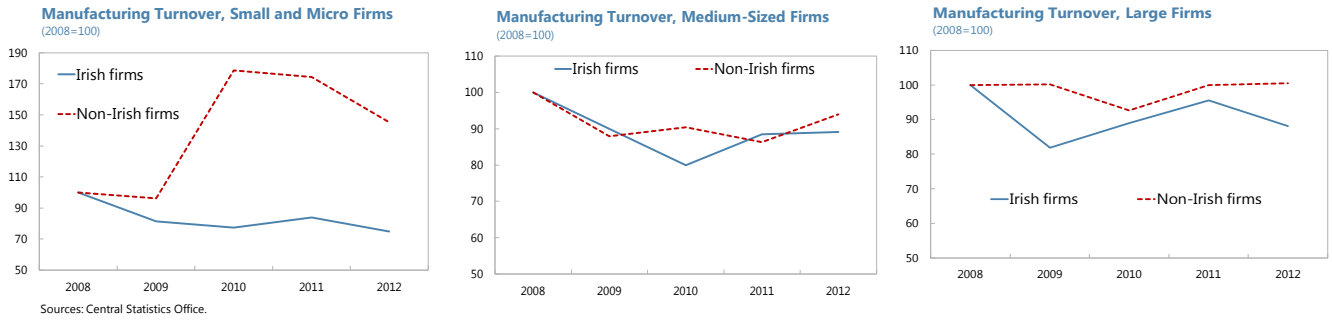
[1]ICR is defined as EBIT/interest expense; profitability is defined as EBIT/average assets; leverage is defined as Debt/EBITDA.

[2]The probabilities of default are extrapolated beyond those corresponding to the implied rating C for firms with weaker vulnerability indicators.

[3]Based on 1970–2012 for Moody's, 1981–2011 for S&P, and 1990–2012 for Fitch.

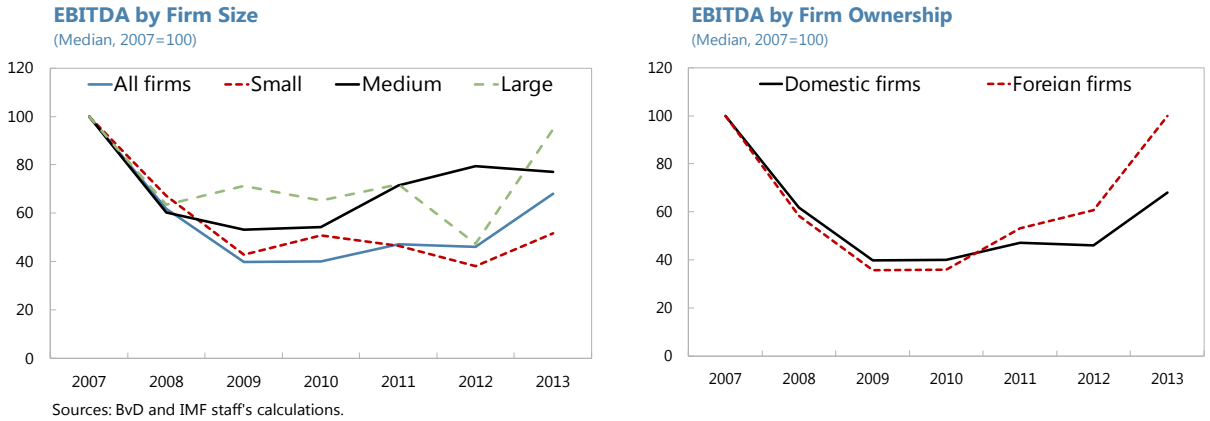
Source: IMF, GFSR, October 2013 , Chapter 1, Annex 1.2.

Figure A1. Ireland: Manufacturing Turnover by Firm Size and Ownership



Sources: Central Statistics Office.

Figure A2. Ireland: EBITDA by Firm Size and Ownership



Sources: BvD and IMF staff's calculations.

Figure A3. Ireland: Share of Vulnerable Firms

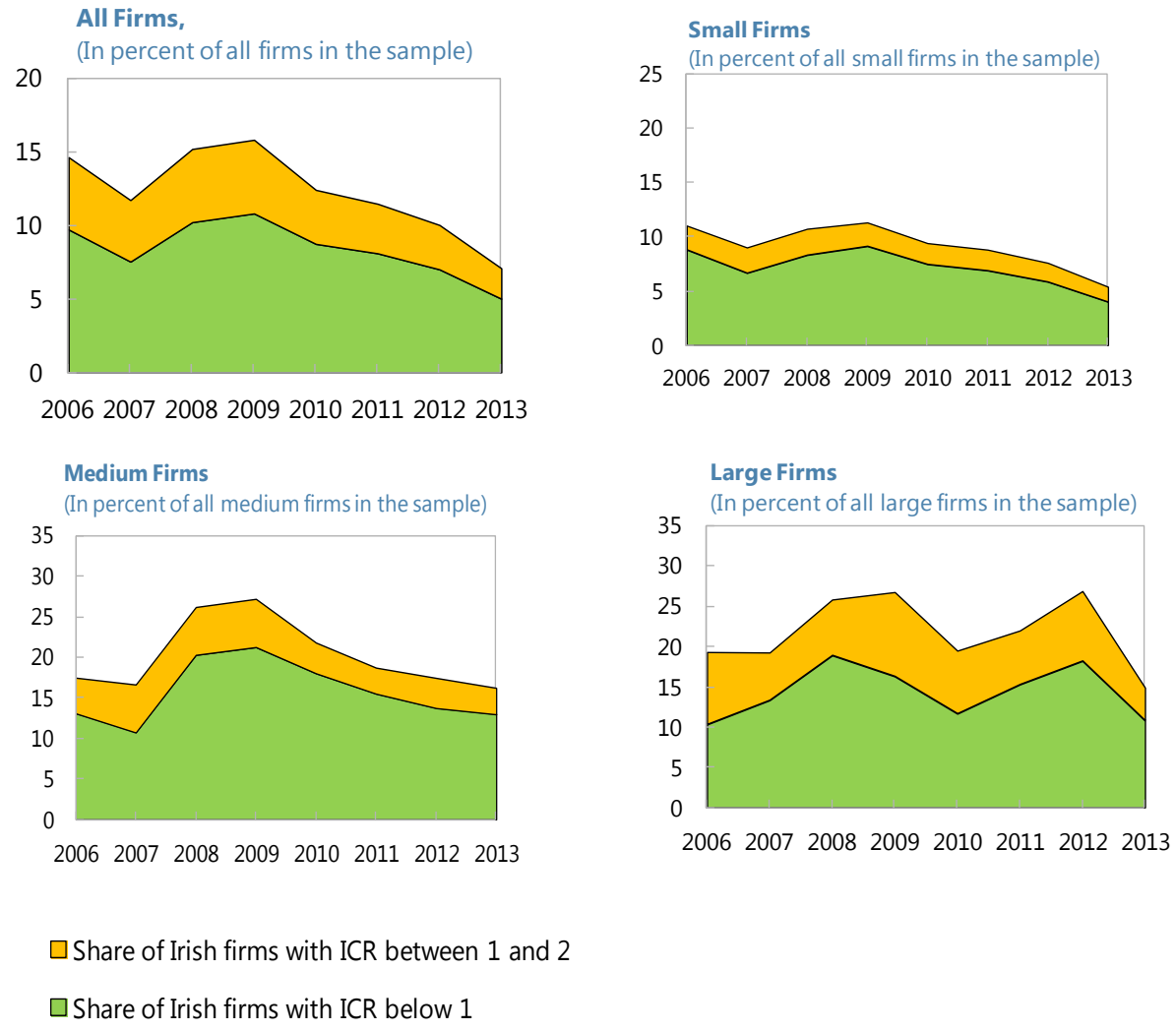
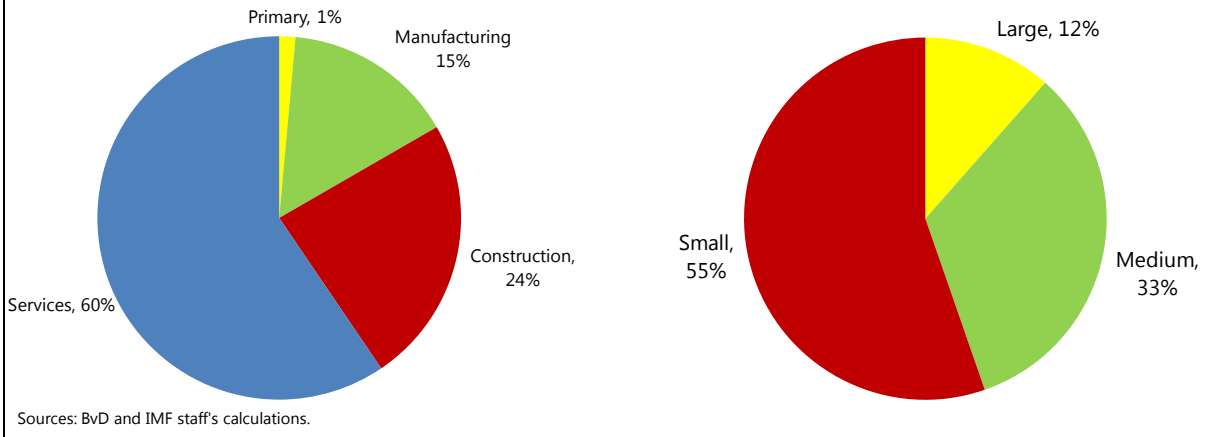


Figure A4. Ireland: Distribution of Distress by sectors and Firm size
(In percent of total observations)



Sources: BvD and IMF staff's calculations.