

Recession-induced mean and distributional effects on business profitability: addressing information gaps using corporate firm-level balance sheet data

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1. Background

1.1 The benefits of corporate firm-level balance sheet data

Corporate firm-level balance sheet data are widely used at central banks for the analysis of the economic situation of non-financial companies. In this respect the assessment of the corporate sector can be separated with respect to the following areas: monetary policy, financial stability, provision of statistics for the public and other statistical uses.

A comprehensive understanding of the corporate sector is important from a monetary policy perspective with regard to the impact of the transmission mechanisms. Generally the monetary policy analysis within central banks focuses on the financing conditions and profitability of non-financial companies, emphasising internal financing (corporate saving), external financing (equity, bank loans, debt securities and trade credit) and economic growth. Balance sheet data also provide valuable information about the corporate sector's resilience to economic shocks in the business cycle.

Corporate balance sheet data can also be used in the assessment of financial stability. Non-financial firms are one of the financial sector's key credit customers. If the situation in the corporate sector deteriorates, it leads to a decline in firms' creditworthiness and debt repayment capability which, in turn, may have a direct effect on the financial institutions' situation.² An analysis of non-financial corporations is also useful for a better knowledge of the credit risk coming not only from firms' bank borrowings but also from the issuance of corporate bonds through the capital markets.³

Although not a primary objective, central banks often provide statistics on the corporate sector as a public good. The predecessor of Deutsche Bundesbank was already evaluating the creditworthiness of non-financial enterprises before World War II. Taking advantage of the electronic processing of mass data received by its rediscount operations, Deutsche Bundesbank had started to produce and publish statistics on non-financial enterprises by the end of the 1960s.

Finally, corporate balance sheet data is often used as an input for the compilation of other statistics, eg in macroeconomic statistics as an information source for the euro area financial and non-financial accounts which are regularly published by the ECB and the European Commission (Eurostat).⁴

¹ Deutsche Bundesbank.

The views expressed in this research paper are those of the authors and not necessarily the views of the Deutsche Bundesbank or its staff.

² See Deutsche Bundesbank (2006, p 119).

³ See eg ECB (2010, p 53–56 and p 90–91).

⁴ See ECCBSO (2008, p 10).

1.2 Firm-level balance sheet data and national accounts: a comparison

National accounts do also provide information about the corporate sector. With respect to profitability, the main topic in this research paper (in particular gross return on sales, ROS), the European System of Accounts (ESA 1995) distinguishes between “operating surplus” (or “mixed income”) and “entrepreneurial income”.⁵ Naturally, there are a number of conceptual differences between national accounts and the respective business accounting rules, but in general the operating surplus in the national accounts can be compared to the total of operating profit derived from data in the income statements while entrepreneurial income is similar to profit after tax.⁶

The following differences in the two statistics are noteworthy:

- ROS and further income statement items are based on firm-level data, while “operating surplus” and “entrepreneurial income” in national accounts are calculated as a residual in the “generation of income account” and the “entrepreneurial income account”.⁷
- Balance sheet data statistics can display distributions of individual values while national accounts typically only show the aggregate. Eg in this paper the distribution of ROS is analysed in more detail presenting additionally the share of loss companies. This analysis can give an indication on early warning signs on business risks within the corporate sector.
- Firm-level data offer a better possibility to take into account the heterogeneity of different economic sectors by disaggregating the results. In particular, manufacturing as the core sector and “engine” of the German economy can be analysed in more depth. In contrast, German national accounts present sectoral results regarding the profitability of non-financial entities only for “operating surplus”.⁸
- Accounting data offer the possibility to take size effects into account which are very strong in the corporate sector. Furthermore, only firm-level data provide insights separating size and sectoral effects.
- Corporate balance sheet data allow additional, more detailed insights into the profitability and financing situation of firms. For instance data from the balance sheet permit an analysis of the “financing leverage”, differentiating between equity and liabilities, while data from the income statement can be used for the assessment of the “operating leverage”, allowing a differentiation between variable and fixed costs. This is in particular interesting with respect to the resistance of costs to adjust in correspondence to output in economic downturns. Furthermore, analysis on profitability can be extended by separating operating and financial income.
- Besides the profitability and financing situation, further analysis of balance sheet data can cover the endowment and structure of assets, cash flow analysis and investments.

⁵ See Eurostat (1996, paragraphs 8.18 and 8.28).

⁶ For an elaboration of the differences see chapter 4 of Statistisches Bundesamt (2007, p 173–220). The gross return on sales used by the Bundesbank is the profit before tax according to the German Commercial Code (*Handelsgesetzbuch*) as a ratio of net turnover.

⁷ See Statistisches Bundesamt (2007, p 177 and 204).

⁸ See for differences Deutsche Bundesbank (2010a) and Statistisches Bundesamt (2010, p 114–121 for sectoral data on “operating surplus”).

1.3 The information gap with regard to micro corporate balance sheet data

In January 2010 Deutsche Bundesbank published an article in the Monthly Report concerning the profitability and financing of German enterprises in 2008.⁹ Naturally at this time the question arose as to what extent the business sector might have been affected by the sharp economic downturn in the last year and what implications that might have in terms of credit quality, rating migration and the performance and lending behaviour of financial intermediaries, especially banks. However, these basic figures from financial statements were not available at that time owing firstly to the fact that the 2009 balance sheet year had just finished. Secondly, the reporting deadlines are quite long. In particular in Germany, many exemptions are implemented in the German Commercial Code (where accounting rules are specified) in order to provide relief to SMEs with regard to the reporting burden. For instance non-listed corporations are allowed to publish their financial statements with a delay of 12 months after the balance sheet date. This regime causes a late availability of financial statements at the Bundesbank, where an estimate of a given reporting year can only be provided with a delay of 12 months for the German non-financial sector as a total, while statistics on sectoral results are published with a further delay of eight months.¹⁰

The information gap of micro balance sheet data can also be understood within the mandate of the G20 countries. In the wake of the financial crisis the G20 have attached great importance to enhancing transparency. Thus the IMF and the FSB recommended among others better sectoral-related data, stressing coverage, reliability and timeliness.¹¹ Micro corporate balance sheet data are mostly available in the European Union through the obligation of companies with limited liability to publish their financial statements as set out in the 4th and 7th European Directive. However, exemptions through member state options are given to SMEs once more, eg as passed on to German SMEs to publish only abridged accounts, thus making these financial statements almost unusable for economic statistics.¹² For this reason, Deutsche Bundesbank receives complete financial statements through different channels, resulting in a coverage with regard to corporations of approximately a tenth of the total population but 80% of the respective turnover.¹³ Coverage with respect to companies with unlimited liability is substantially lower (1.2% of the total population, 37% of respective turnover). Altogether this might explain why public authorities and research institutes often have difficulties in assessing the economic situation of SMEs in the corporate sector.

1.4 Outline of the paper

As a result of the information gap regarding timeliness described above, indications from earlier economic downturns are used in this paper in order to estimate the decline in profitability in 2009. In the following, this paper first explains why the years 1990 and 1993 were chosen as reference period and then looks at the sectoral conditions in those years and describes the changes in the distribution of gross ROS on the basis of annual results from micro corporate balance sheet data. The situation in recent years is then examined followed by additional evidence from nine-month consolidated financial statements available at the

⁹ See Deutsche Bundesbank (2010b, p 15–29).

¹⁰ The yearly article in the Monthly Report gives an indication about the most important sectoral results. However, sectoral statistics are not published at this time.

¹¹ See also Deutsche Bundesbank (2009, p 81).

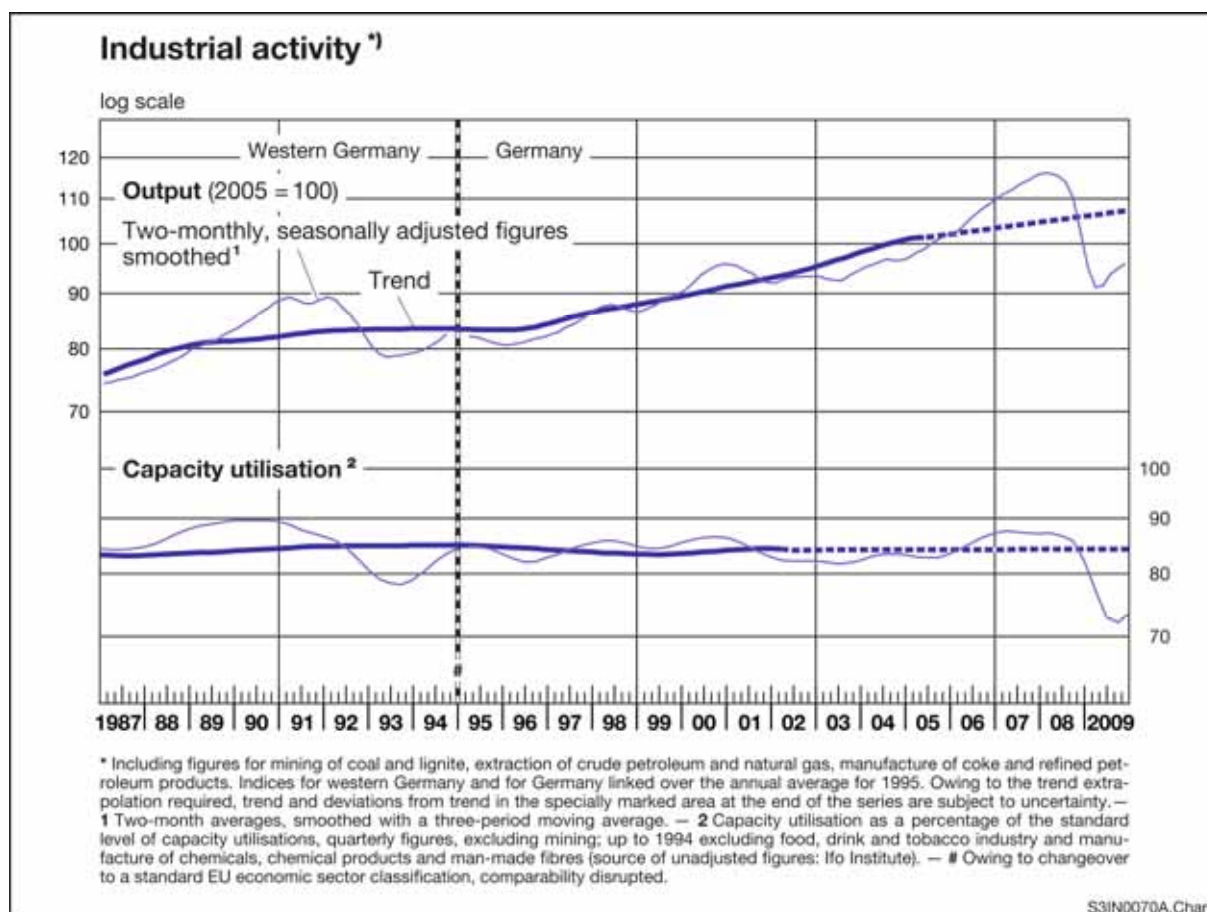
¹² Eg as small companies do not have to publish an income statement.

¹³ See Deutsche Bundesbank (2009, p 7). The database itself includes about a fifth of all corporations, however data is filtered for the statistics because of various reasons.

beginning of the year and further on by the full consolidated financial statements available in the second quarter 2010 in order to fill the information gap. The paper concludes with a summary of main findings.

2. Choice of the reference years

On comparing the sharp annual decline in German real GDP calculated for 2009 (4.7% y-o-y) with earlier periods, it is initially clear that a downturn of this magnitude has not been seen in the last 40 years.¹⁴ The extraordinary deterioration in overall economic performance in the last year manifested itself in particular in the industrial sector, which is of “strategic” importance for the German economy and, due to its very high exposure in terms of trade openness and export profile, very sensitive to the international business cycle. Production witnessed an unprecedented shock and capacity utilisation fell to a new historic low of just over 70%, compared to a normal, long-term average of 84% (see chart below).



Source: Deutsche Bundesbank, Statistical Supplement to the Monthly Report 4, Seasonally adjusted business statistics, May 2010, page 83, expanded to include the years 1987–90.

¹⁴ Before the onset of the financial and economic crisis, four cases of a decline in overall annual economic output had been recorded since 1970. As a reaction to both oil crises GDP declined by 0.9% in 1975 and 0.4% in 1982 (data for western Germany in both cases). In 1993, GDP decreased by 0.8% as a result of the end of the stimulus caused by reunification and in 2003 output saw a decline of 0.2%.

The sole benchmark for the decline in gross ROS to be estimated is the recession in the first half of the 1990s as, owing to changes to the German Accounting and Reporting Act (*Bilanzrichtliniengesetz*) made in 1987, the comparability of financial statements produced before this date is limited.¹⁵ The distribution of gross ROS in 1993 is therefore compared with the last preceding profitable year in the corporate balance sheet statistics (1990 balance sheet year). Only income statement data of corporations are used, as the profits for non-corporations do not provide any direct link to the share of enterprises that are operating at a loss since the costs do not include entrepreneurial income.

3. Comparison of return distributions from 1990 and 1993

A pro-cyclical reaction of business profitability is what should be expected in market economies, given the at least partly residual nature of corporate earnings also reflected in the risk premium of capital, that compensates for undiversified volatility. Furthermore, there is much evidence from micro-econometric literature concerning the link between export intensity and the rate of profit, pointing – as a stylised fact – to an important type of heterogeneity.¹⁶ The real issue in the current context is therefore to have at least a best guess about the scale, shape and duration of a profit shock hitting important parts of the business sector.

When investigating cyclical influences on the profitability of non-financial corporations, it is equally important to differentiate between mean effects and distributional effects. Average mean effects typically affect the location parameters of a distribution such as the mode, median and arithmetic mean. Distributional effects, by contrast, affect the further moments of the distribution, particularly the variance, skewness and kurtosis. Additionally, shifts in the constellation of the location parameters show changes in the density function.

With respect to profitability, the general question arises as to which financial ratio should be used in evaluating profit performance. The calculation of the return on equity is most appropriate from the perspective of shareholders. In contrast, from the viewpoint of all capital providers or the company itself, return on total assets and return on sales are more relevant. Deutsche Bundesbank's calculations, which are traditionally based on ROS, are much less open to interpretation, do not vary as greatly with firm size, and are less dependent on a firm's legal form, capital structure and accounting practices.¹⁷

Compared to 1990, the density function of gross ROS for corporations in the overall business sector showed a clear shift to the left in 1993 (see chart below and the table in annex 1).¹⁸ The mean changed from 3.2% to 1.3%. The median decreased by one percentage point to 0.9% and the values for the first and third quartiles declined by similar amounts.

The shape of the distribution also changed: the standard deviation – the classic measure of dispersion – increased from 5.6 to 6.4. Before the cyclical downturn the distribution was right-skewed ($\gamma=2.6$) while in the recession year it was practically symmetrical ($\gamma=-0.2$).

¹⁵ The slight cyclical downturn in 2003 is also not suitable for comparison. This is confirmed by comparing the distributions of gross ROS from 2001 and 2003, which differ only slightly.

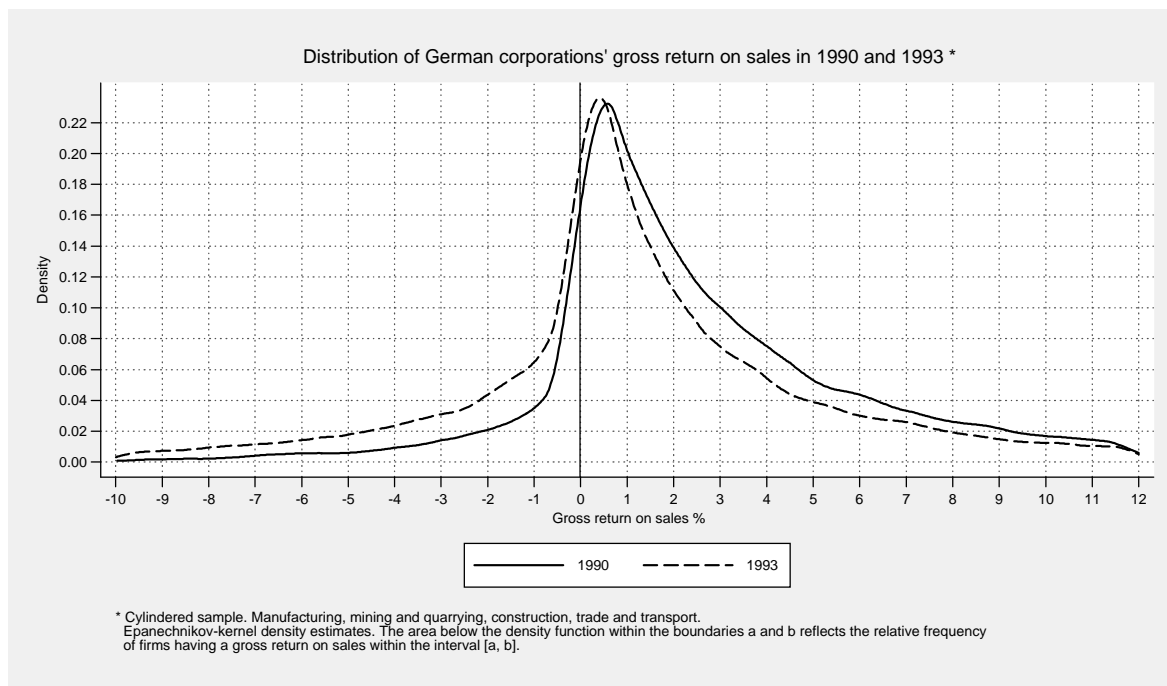
¹⁶ See International Study Group on Exports and Productivity (2008).

¹⁷ See Deutsche Bundesbank (2010b, p 20–21).

¹⁸ A cylindered sample for the years 1990/1993 was formed in order to eliminate the effect of structural changes in the data. The aggregate used comprises enterprises from manufacturing (including mining and quarrying), construction, the retail trade and transport (excluding railways). Business-related services were not included due to insufficient data for earlier financial years.

Kurtosis also flattened markedly ($\kappa=19.2$ before the downturn and $\kappa=9.2$ in the recession year).¹⁹

All changes in the distribution parameters indicate a substantial deterioration in the annual results across the entire distribution spectrum. The proportion of enterprises incurring losses more than doubled, from 13.3% to 29.8%. Average gross ROS of enterprises making losses moved from -2.9% to -4.7% .



Source: Deutsche Bundesbank.

The shift in the distribution of gross ROS can also be observed in selected economic sectors (see annexes 1 and 2) with manufacturing, as a sector particularly sensitive to the business cycle, strongly affected. The mean decreased by almost three percentage points, from 4.2% to 1.3% , within three years. Effects of the decline were also clearly visible in the construction sector, in retail trade in motor vehicles and transport enterprises. Profits in auto sales fell to around zero (mean gross ROS 0.0% , median 0.2%). Overall, 42% of auto dealers recorded a loss. Other trade was affected to a lesser extent.

4. Comparison of 2007 and 1990

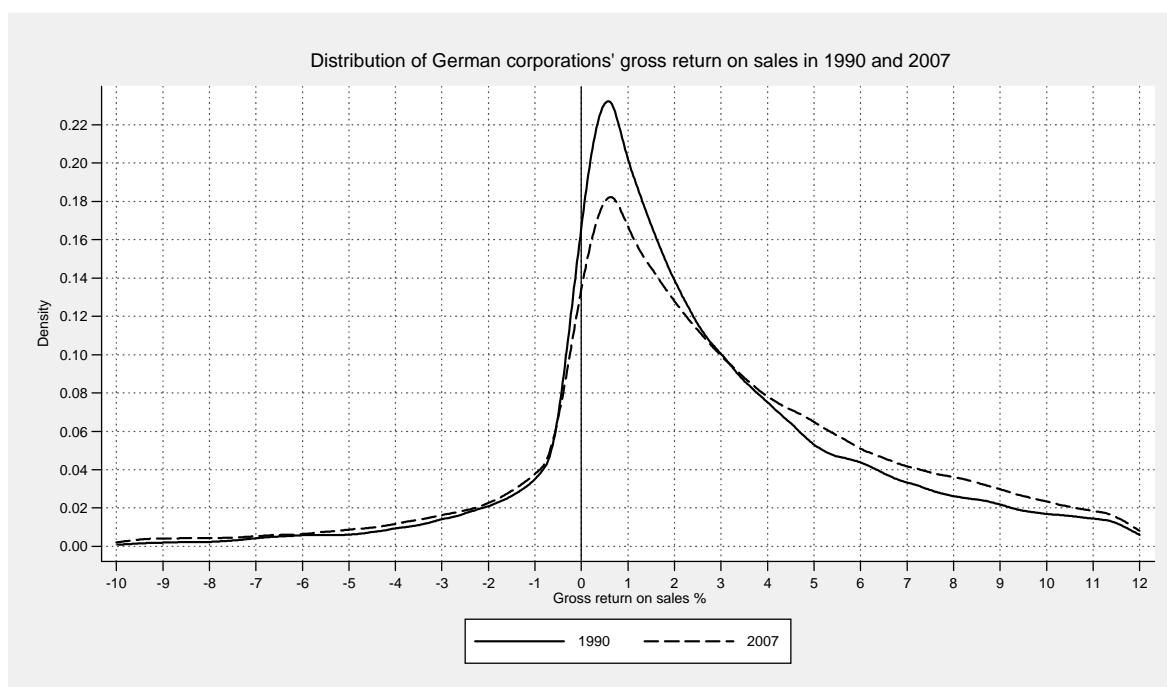
The distribution of gross ROS from 2007 is used as the starting point before the beginning of the most recent crisis²⁰ as the dataset for 2008 is on the one hand still incomplete (data for

¹⁹ However the distribution remained significantly more pointed than a normal distribution ($\kappa=3$), which is not atypical for financial data.

²⁰ In order to use the same data preparation method for the comparison with the 1990 financial year, the results from a cylindered sample for 2006/2007 are used for the 2007 financial year.

smaller enterprises in particular are still to be reported).²¹ On the other hand, 2008 data would already be “flawed” by the beginning economic downturn. Compared with 1990, the profitability of enterprises is much better overall. The mean was 3.7% in 2007, half a percentage point higher than in 1990. As illustrated in the chart below, the distribution has shifted partly to the right. Taken together this may indicate that although the shock was more pronounced this time, the ability to absorb it can be rated higher. However, the share of enterprises making a loss in the 2007 financial year was somewhat higher than in 1990. In addition, these enterprises recorded significantly higher average losses than in 1990.

From a sectoral point of view (see annexes 1 and 3), in particular the manufacturing sector and wholesale and retail trade (excluding motor vehicles) were in a slightly better starting position in 2007. By contrast, retail trade in motor vehicles and transport were in a worse starting situation, also reflecting structural weak points.



Source: Deutsche Bundesbank.

5. Interpreting the figures

As the economic downturn in the first half of the 1990s was much weaker than during the current economic and financial crisis, the decline in profitability from 1990 to 1993 should – at a first glance – only be regarded as a lower limit for the effects of the economic and financial crisis in the 2009 financial year. However, various factors make the historical comparison used here more difficult. Unquantifiable ambiguities have been caused by the change in raw data from the corporate balance sheet statistics (from rediscount operations as the only data source to the Financial Statements Data Pool with several sources²²). In addition, the

²¹ The extrapolated results for the 2008 financial year show a slight deterioration in profitability with respect to 2007. Therefore, the comparison of the data from 2007 with those from 1990 is likely to produce a less significant change than a comparison of 2008 and 1990 would.

²² The Financial Statements Data Pool is a voluntary facility of the Bundesbank in cooperation with institutions of the banking industry as well as other institutions with extensive financial statements data. The purpose of this

structure of the business sector has changed over the last 20 years, for example as a result of increasing vertical and horizontal integration. The figures for the 2007 financial year may also change slightly over the course of 2010 as data input has not yet been finalised for this – albeit somewhat distant – year (experience shows that annual results with a somewhat poorer profitability situation are to be expected, resulting in a likely leftward shift in the distribution).

A comparison of the recessions from 1993 and 2009 is subject to limitations not only due to statistical reasons, but also due to economic reasons. For example, in the current crisis, big economic stimulus packages and specific countercyclical measures were launched to dampen second round effects of this extraordinary shock. Furthermore, labour hoarding took place, putting additional pressure via operating leverage on business earnings. The former makes a comparison for the construction and car sales sectors more difficult, at least as regards their endogenous cyclicity. From an economic perspective, the type of shock behind the deterioration in capacity utilisation as well as the length of the cyclical downturn also play a central role in an overall assessment and these at least partly differ between the two time periods analysed.

6. Evidence from consolidated data of large listed non-financial enterprises

6.1 Evidence from data available in early 2010

Consolidated quarterly results of large listed non-financial enterprises can offer an additional insight into the effects of the current economic crisis on the profitability of German enterprises.²³ Early in 2010 quarterly IFRS consolidated financial statements were available representing three quarters of 2009. Taking these data as an indicator, gross ROS decreased by 4½% from 6¼% to 1¾% in the first nine months of 2009 year-on-year (see table below).²⁴ However the group analysed predominantly includes internationally active enterprises which were particularly affected by the global financial and economic crisis and the massive collapse in global trade. From a time perspective, the bad news was concentrated in the fourth quarter of 2008 and the first quarter of 2009. The two subsequent quarters already saw profitability improve slightly, meaning that it is likely that the cyclical low was already overcome in the spring of last year.

6.2 Evidence from data available in the second quarter of 2010

In the middle of the second quarter of 2010, 2009 full year consolidated data of listed companies were available. The decrease year-on-year slightly improved because of the

facility is to bring together – in an anonymous form – the data of the institutions. In addition, the data pool is supplemented by financial statements which the Bundesbank obtains in connection with its refinancing operations as well as publicly accessible data from credit rating agencies. For the financial years prior to 1997, the financial statements submitted in the context of refinancing operations are the sole source of data for evaluations.

²³ When analysing the consolidated results other limitations must be taken into account, not least that they include business by foreign subsidiaries. Also, they are recorded according to IFRS whereas the extrapolated results are based only on results reported according to the German Commercial Code. In addition, the representativeness of the data could only be investigated on an approximate basis. For example, in the quarterly dataset currently available, manufacturing, with a two thirds share, is over-represented.

²⁴ The statistical measure used here is a weighted average.

better economic situation in the fourth quarter of 2009. However, the drop still amounted to more than three percentage points.

Return on sales*	%				Change in percentage points		
	2006	2007	2008	2009	2007	2008	2009
Consolidated accounts as of 30 September (nine-month data)	6.3	7.0	6.2	1.7	0.6	-0.8	-4.5
Consolidated accounts as of 31 December (yearly data)	5.6	6.5	4.8	1.6	0.9	-1.7	-3.2
Individual accounts: extrapolated results for corporations (yearly data)	3.7	4.5	3.8	not available yet	0.8	-0.7	.

* 68 large listed non-financial companies from DAX and MDAX without energy sector.

Source: Deutsche Bundesbank.

7. Conclusion

Corporate firm-level balance sheet data, widely used at national central banks, is of major importance when analysing the economic situation within the corporate sector. However, although showing comparative advantages vis-à-vis national accounts and completing information with respect to financial accounts, annual balance sheet data imply an information gap with regard to timeliness. This was in particular visible in the financial crisis. For this reason, indications from earlier economic downturns were used in order to estimate the decline in profitability in 2009.

If the recession in the first half of the 1990s is used as a benchmark to assess the severity of the decline in profitability in the 2009 financial year, a considerable movement downwards can be expected for average gross ROS in those sectors that were particularly affected by the recent financial crisis (ie manufacturing, wholesale trade and transport). Additionally, in order to fill the information gap consolidated quarterly data of listed non-financial enterprises offer some help. Deutsche Bundesbank is going to investigate further the potential of this data source that might also reveal structural differences in corporate finance behaviour between small and medium-sized entities and listed groups.

Annex 1

Distribution of gross return on sales in 1990, 1993 and 2007

Distribution parameters	Overall business sector ¹⁾		
	1990	1993	2007
Arithmetic mean	3.2	1.3	3.7
Standard deviation	5.6	6.4	8.7
Coefficient of variation	1.8	5.2	2.3
Skewness	2.6	-0.2	-0.4
Kurtosis	19.2	9.2	31.0
1 st quartile	0.5	-0.5	0.5
2 nd quartile (median)	1.9	0.9	2.4
3 rd quartile	4.7	3.3	6.2
Share of companies with losses	13.3	29.8	15.4
Arithmetic mean of loss companies	-2.9	-4.7	-6.0
Standard deviation of loss companies	3.5	5.9	10.7
Number of companies	19,119	19,119	34,476

Selected economic sectors

Distribution parameters	Manufacturing, mining and quarrying			Construction			Retail trade in motor vehicles			Wholesale trade and commission trade			Retail trade (excluding motor vehicles)			Transport (excluding railways)		
	1990	1993	2007	1990	1993	2007	1990	1993	2007	1990	1993	2007	1990	1993	2007	1990	1993	2007
Arithmetic mean	4.2	1.3	5.1	3.0	1.8	3.0	1.9	0.0	1.3	2.4	1.4	3.2	1.9	1.2	2.5	3.4	1.1	2.3
Standard deviation	6.6	7.8	9.3	5.3	5.6	7.6	2.7	3.1	4.5	4.3	4.7	7.0	4.3	4.8	7.0	7.0	8.2	12.9
Coefficient of variation	1.6	5.9	1.8	1.8	3.2	2.6	1.5	640.1	3.4	1.8	3.4	2.2	2.3	4.0	2.8	2.1	7.5	5.6
Skewness	2.1	-0.3	0.3	2.6	0.0	-1.0	5.0	-1.3	-1.5	3.0	0.0	0.2	2.1	-0.4	-0.8	2.8	0.6	-2.0
Kurtosis	13.9	6.7	21.3	19.9	9.9	36.0	79.2	17.8	61.8	28.7	13.5	34.6	22.8	10.3	28.4	19.3	7.6	28.1
1 st quartile	0.6	-1.3	1.0	0.5	0.1	0.5	0.5	-0.9	-0.1	0.4	0.0	0.5	0.3	-0.1	0.3	0.4	-1.5	0.2
2 nd quartile (median)	2.7	1.1	3.8	1.9	1.3	2.2	1.3	0.2	0.7	1.4	0.9	1.9	1.2	1.0	1.8	2.2	0.6	1.9
3 rd quartile	6.4	4.4	8.4	4.3	3.8	5.3	2.7	1.1	2.4	3.5	2.8	4.8	3.1	2.8	4.5	5.4	3.3	5.2
Share of companies with losses	14.0	32.5	14.2	12.3	23.3	15.9	9.9	41.9	26.6	12.1	23.6	12.2	17.8	26.4	18.7	17.0	34.8	18.6
Arithmetic mean of loss companies	-3.3	-6.0	-6.7	-3.0	-4.4	-6.1	-1.5	-2.2	-2.4	-2.3	-3.3	-4.7	-2.7	-3.7	-4.9	-3.9	-5.7	-10.9
Standard deviation of loss companies	3.7	6.6	9.8	3.7	5.2	9.7	1.8	3.0	4.4	3.1	4.6	9.1	3.3	4.7	8.7	3.8	6.3	19.4
Number of companies	8,990	8,990	14,085	1,334	1,334	4,061	1,662	1,662	2,092	5,511	5,511	8,844	1,223	1,223	2,583	399	399	2,811
Share of overall business sector	47%		41%	7%		12%	9%		6%	29%		26%	6%		7%	2%		8%

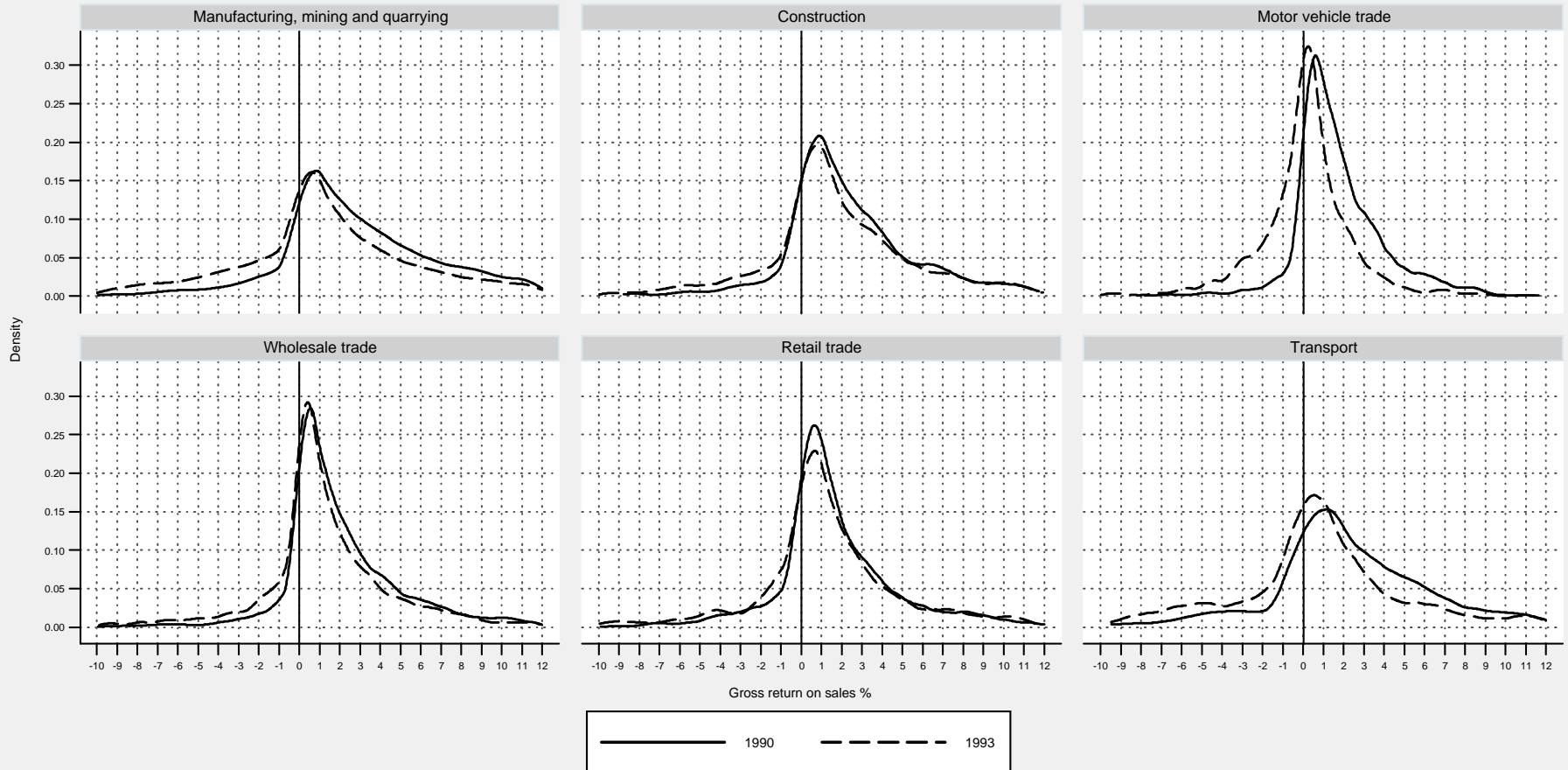
Data basis: Cylindred samples 1990/1993 and 2006/2007 (as of 28 January 2010). Figures for 2006 not given, as they are not relevant for the analysis.

¹⁾ Manufacturing, mining and quarrying, construction, trade and transport (excluding railways).

Source: Deutsche Bundesbank.

Annex 2

Distribution of German corporations' gross return on sales in 1990 and 1993 *
Selected sectors of economic activity

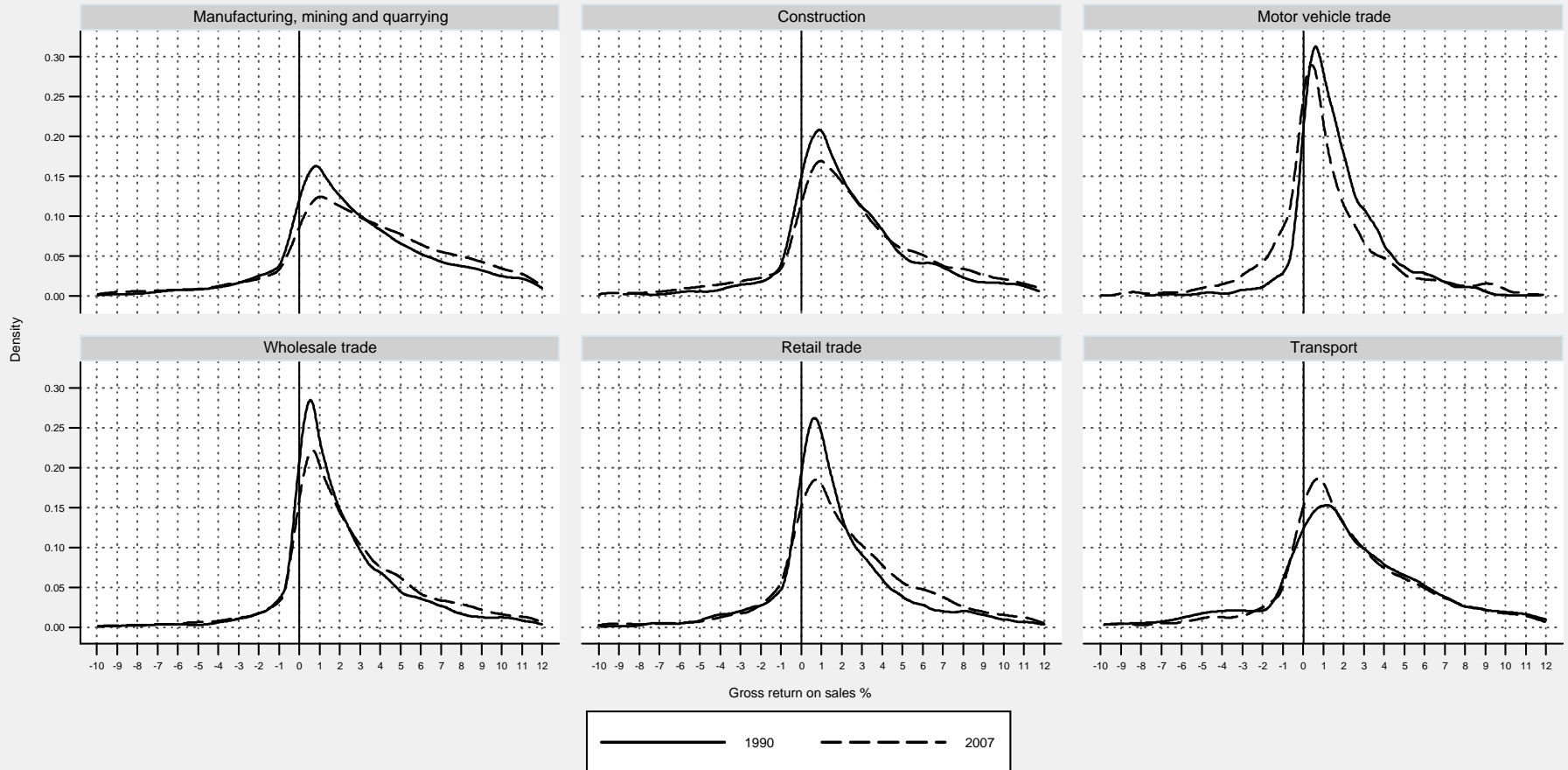


* Epanechnikov-kernel density estimates.

Source: Deutsche Bundesbank.

Annex 3

Distribution of German corporations' gross return on sales in 1990 and 2007 *
Selected sectors of economic activity



* Epanechnikov-kernel density estimates.

Source: Deutsche Bundesbank.

References

Deutsche Bundesbank (2006): *Financial Stability Review*.

--- (2009): *Financial Stability Review*.

--- (2010a): *Extrapolated data from financial statements of German enterprises from 1997 to 2008*.

--- (2010b, January): German enterprises' profitability and financing in 2008, in *Monthly Report*.

ECB (2010): *Financial Stability Review*.

ECCBSO, III WG on IFRS impact and CBSO databases (2008): *Non-financial corporations' quarterly databases*.

Eurostat (1996): *European System of Accounts, ESA 1995*.

International Study Group on Exports and Productivity (2008): Understanding cross-country differences in exporter premia, comparable evidence for 14 countries, *Review of world economics*, 144, 4, p 596-635.

Statistisches Bundesamt (2007): *Volkswirtschaftliche Gesamtrechnungen, Inlandsprodukt nach ESGV 1995, – Methoden und Grundlagen –*, Fachserie 18, Reihe S.22.

--- (2010): *Volkswirtschaftliche Gesamtrechnungen, Inlandsproduktsberechnung – Detaillierte Jahresergebnisse 2009*, Fachserie 18, Reihe 1.4, Stand: August 2010.