

# Corporate equity and financial stability: An approach based on net worth at risk

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*This article is based on a study conducted jointly by the Deutsche Bundesbank, the Banco d'España, the Centrale dei Bilanci (Italy) and the Banque de France under the aegis of the European Committee of Central Balance Sheet Offices.<sup>1</sup> It looks at companies' resilience in the event of an exceptional cyclical shock.*

*The article starts by outlining the economic role of equity capital, which lies at the heart of the relationship between risk and return. It can be examined from two main angles, either as a financing instrument or as a buffer in the event of a shock.*

*This study focuses on this second function, looking at it from a meso-economic perspective for which the use of central balance sheet offices is particularly well suited. It sets out to describe the implications of a crisis situation in terms of minimum capital requirements. A comparison is drawn between the situation of manufacturing sector companies in the four countries under review over the period 1987-2002 by means of several traditional indicators (income, equity capital), which resulted in the computation of a Net Worth at Risk (NwAR) indicator. The NwAR figures are calibrated on the basis of an analysis of the distribution of accounting losses (in particular at the 90<sup>th</sup> and 95<sup>th</sup> percentiles) calculated using company samples. They indicate the minimum capital that would be required in order to absorb any losses in the event of very unfavourable economic conditions.*

*The difference between NwAR and the observed level of equity capital gives us an indication of the number of companies for which the default rate is likely to increase significantly in a crisis situation. The proportion of companies that appear fragile in the event of a severe economic downturn is around 40%, as against 20% in a "normal" situation. However, this statistical analysis needs to be put into perspective. In practice, only a minority of companies default, since the majority of them benefit from protective measures implemented by their shareholders, managers and creditors to enable them to weather the downturn and revive their activity.*

*In spite of the limitations of this indicator (which are also discussed in the study), these findings will draw the attention of bank and company managers to the need to make financial projections and credit risk assessments both in normal business conditions and crisis situations.*

*An approach based on net worth at risk sheds light on the determinants of a sound financing structure and encourages the development of an active approach to preventing corporate financing problems.*

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## 1 | THE ECONOMIC ROLE OF EQUITY CAPITAL

The question of the desirable level of equity capital arises when one starts to look at ways of measuring credit risk and choosing the best financing structure. It should be considered both from the perspective of individual companies and from a meso-economic perspective based on a large sample of companies. As regards the question of the optimal financing of the economy, if one were to interpret the Modigliani-Miller theorem literally, one might be inclined to attach less importance to equity capital and instead to emphasise other indicators: cash flows, leverage effect, ability to repay debts, etc. By demonstrating that, under certain conditions (such as perfect competition, making abstraction of the tax-related bias), a company's value is unrelated to its financing structure, Modigliani and Miller laid the foundations of corporate financing approaches based on flow dynamics. These approaches completed the assets and liabilities approach which had been predominant up until then and still continues to influence the traditional banking approach to credit risk.

This viewpoint is of particular interest to economists concerned with the relationship between equity capital and economic growth. For example, the report co-sponsored by the World Bank "Doing Business in 2005 – Removing obstacles to growth" looks at entrepreneurship in affiliated countries. This report highlights the links that may exist between institutional characteristics<sup>2</sup> and the growth rate of a country. Some of these relationships suggest that, if minimum capital requirements are initially too high, they are likely to hinder business creation. Others stress the importance of measures designed to protect "risk takers" (mainly creditors and capital investors) because these measures also play a role in making an economy more dynamic.

In order to find a satisfactory answer to questions which seem to lead to contradictory recommendations, it appears relevant to combine two dimensions: risk and return.

Tying in risk with return enables us to look at the two functions of equity capital (*i.e.* protective buffer and source of financing) under the same angle. This immediately sheds light on the economic function of equity capital, as compared to other sources of financing, in particular in terms of preserving financial stability, the key focus of this article.

Significant advances were made by Knight (1921),<sup>3</sup> who introduced a breakdown of risk into two categories, "measurable" and "unmeasurable" risk, and identified the different economic behavioural patterns associated with each category. The measurable risk is defined as risk proper or "determinate uncertainty". This uncertainty can be covered, for example by setting aside provisions which reduce the amount of profits paid to the entrepreneur-shareholder. The unmeasurable risk or "indeterminate uncertainty" represents the true risk taken by the entrepreneur that enables him to generate a profit. Corporate equity embodies this type of risk. The greater the true risk, the higher the profit potential. Knight goes one step further by pointing out that a large amount of equity capital should in principle reflect a high level of indeterminate uncertainty. In his book, he also touches on the issue of the relationship between the company and its creditors by showing that, in an uncertain environment, a company will find it particularly difficult to inspire confidence on the part of its creditors if it has a small amount of equity capital.

The relationship between uncertainty and financing structure developed by Knight was taken a step further by Myers and Majluf (1996). They put forward an analytical framework explaining in what circumstances company managers suggest to their shareholders that the company be financed preferably by a capital increase. They make the assumption that managers are always better informed than shareholders about the company's future prospects. When managers are optimistic about the company's prospects, they tend to favour debt security issuance because they are aware of equity prices' potential to appreciate. In their opinion, shares are currently undervalued and it is therefore not in the interest

<sup>2</sup> This report mainly sets out to establish a relationship between regulations and economic performance. The role of equity capital is not its main focus. However, the authors do take an interest in this issue insofar as they take a look at the obstacles to business creation and development.

<sup>3</sup> Knight does not view his work as the introduction of a new theory but rather as the structured and clarified presentation of previous concepts. He refers to the work of various German economists relative to profit analysis and the firm, as well as work by Jean-Baptiste Say and Courcelle-Seneuil, the latter having studied the relationship between profit and risk.

of the company to finance itself at an undervalued issue price. Conversely, when managers are pessimistic about the company's prospects, they are likely to issue new shares as they would raise equity capital with a significant premium. From this standpoint, the level of equity capital is seen as relative and largely linked to the degree of uncertainty or expected "risk". Furthermore, the existence of risk, which is the counterpart of a profit maximisation strategy, justifies the existence of a minimum amount of equity capital.

## 2 | DIFFERENCES IN EQUITY RATIOS ACROSS COUNTRIES

The theoretical framework used to explain the role of equity capital could suggest that every company is subject to a universal law. In a context of financial market globalisation driven by a global economic integration process, itself principally spurred by companies, one would expect the relative level of equity capital across countries to be somewhat similar.

However, even in a highly integrated economic area like the European Union, this does not appear to be the case.

This article looks at companies in the following four countries: Germany, Spain, France and Italy (see Appendix 1 for a presentation of the databases used). As shown in Chart 1, equity ratios<sup>4</sup> differ substantially from one country to another.

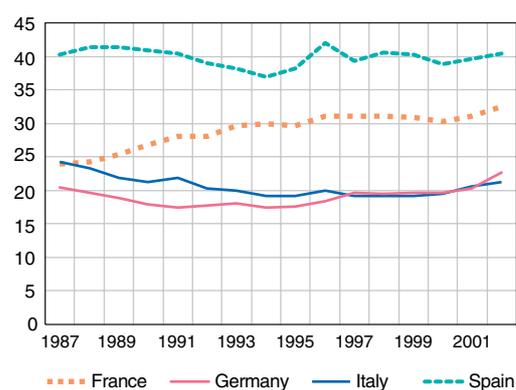
Spanish firms have the highest equity ratio; the median of the ratio of equity capital to total assets was close to 40% from 1987 to 2002. Conversely, Italian and German companies appear less capitalised, with an equity ratio of around 20%. The situation of French firms improved significantly over this

same period. In 1987, their equity ratio was close to that of Italian and German firms. In 2002, the median of the ratio of equity capital to total assets stood at roughly 30%, *i.e.* in an intermediate position. The same observations can be made when analysing overall distributions.<sup>5</sup>

In addition to the risk-return relationship on which economic literature tends to focus, specific equity capital differentiation factors also need to be taken into account in order to understand these differences. It is essential to identify these factors to correctly interpret the equity ratios, both for the purpose of individual company assessments and meso-economic analyses of financing structures.

The statistical observations do not appear to be related to the sectoral composition of the four national samples, because an analysis of the results by economic sector leads to the same conclusions. On the other hand, other structural factors such as company size, bank-firm relationships and the national legislations on collective proceedings introduce a number of differences and should therefore be given full attention.

**Chart 1**  
**Median of the equity ratio**  
**(ratio equity capital/total assets)**  
**Manufacturing sector –(NACE: D)**  
(%)



<sup>4</sup> The indicator used is the ratio of equity capital to total assets. This enables us to offset the distortions linked to company size. It is also a more suitable indicator for conducting analyses of distributions and thus making cross-country comparisons.

<sup>5</sup> Detailed statistics are presented in the report of the working group, which can be downloaded from the Banque de France website.

## 2|1 Size effect

A number of findings emerged from the analysis of the sub-sample of large companies (defined as companies with a turnover of more than EUR 50 million). The equity ratio of Italian firms was very stable over the period under review, while that of Spanish firms showed pronounced fluctuations in line with business cycle movements. In France, this ratio improved. It posted a significant rise up until 1994, then declined, but remained higher than in 1987. This swing could be due to the share buyback policy adopted by certain firms to raise their return on equity. At the end of the period under review, the equity ratio of large French firms was close to that of their Italian and German counterparts.

A comparison of the equity ratios of large firms with those of SMEs also brings to light a number of national differences. In Germany, and to a lesser extent in Spain, large companies are better capitalised than smaller ones. Conversely, in Italy, the disparities are less pronounced. In France, the equity ratio of large companies was higher than that of small ones during the first half of the period, but in 2002, they were practically identical as the equity ratio of the largest firms had started to decline at the end of the 1990s.

## 2|2 Institutional factors

According to Delbreil *et al.* (1997), the differences in equity ratios are largely attributable to structural factors.

First, the degree of legal protection of creditors differs from one country to the next. In Germany, for example, the law is very protective of creditors: they benefit from a preferential right to payment in the event of the company's bankruptcy. Similarly, in Italy, the law gives priority to secured creditors. Conversely, in France and Spain, commercial courts tend to give priority to salvaging companies rather than protecting the interests of secured creditors, in line with the objectives of the law on collective proceedings.<sup>6</sup> This factor can –at least partly– explain the lower degree of capitalisation of German and Italian firms. Indeed, thanks to the protection from

which they benefit, creditors are less risk averse –which implies lower minimum capital requirements– than in Spain and France. This analysis is consistent with the work of Rajan and Zingales (1995) and La Porta *et alii* (1996).

Taxation and pension schemes can also explain differences in equity ratios. In Germany, pension provisions are very high and were for a long time considered as a substitute for equity, while in France –under the accounting framework prevailing during the period under review– pension payments are recorded as charges in the profit and loss account and not as a future liability to be recorded in the balance sheet. The same holds true in Italy and Spain.

## 2|3 Access to sources of financing: Bank-company relationships, group effect

Differences in equity ratios may be linked to the role played by the banking system. In this respect, the so-called *Hausbank* relationship which exists between German banks and their clients (especially SMEs) may explain the relatively low level of equity capital of German firms. In this system, banks and companies maintain a long-term and often exclusive relationship, such that the *Hausbank* is almost viewed as a partner involved in the smooth running of the company and not just as a mere fund provider. This structure contributes to reducing the information asymmetries that exist in a more traditional banking relationship and thus the amount of discrimination. The studies conducted by Elsas and Krahnert (1998) and Harhoff and Körting (1998) show that this practice contributes to an efficient allocation of bank financing and could partly explain why German companies are less inclined to seek alternative sources of financing, such as equity financing. The situation of Italian firms is diametrically opposed to that of German firms, but the results are the same. Traditionally, Italian firms have close ties with several banks and use multiple credit lines. Banks lower their risk by spreading their credit portfolio rather than properly assessing the creditworthiness of each company. Consequently,

<sup>6</sup> In France, the law on collective proceedings has just been substantially amended (*Loi sur la sauvegarde des entreprises*). One of the objectives of the law is to better protect creditors to encourage them to get more involved in ensuring the success of the conciliation and salvaging procedures. In view of these developments, the assessment made for the past 10 years could be altered over the medium-term.

just like in Germany, Italian firms tend to have less recourse to equity financing because bank credit is relatively accessible.

Furthermore, in Germany alternative sources of financing play an important role. Thus, intra-group loans<sup>7</sup> or loans from associated companies and pension provisions add to equity capital, raising the amount of stable resources.

Even though it is possible to provide a number of explanations for the differences in equity ratios, the fact remains that the relationship between the way in which the economy is financed and the level of equity capital is complex.

The analyses conducted by Rajan and Zingales (1995), La Porta *et alii* (1996) and those by the European Committee of Central Balance Sheet Offices (1997, 2000) show that the countries where intermediated financing is predominant are not necessarily those where companies appear the most indebted. Conversely, countries with highly developed financial markets are not always those where companies' equity ratio is the highest. They also show that a higher corporate debt ratio is not necessarily associated with a more dynamic economic growth rate.

According to the above-mentioned studies, the analysis of the growth patterns of the UK and German economies lends support to this viewpoint. German and UK firms post similar equity ratios, whereas the levels of bank intermediation and economic growth rates differ.

## 2|4 Differences in economic growth rates

In theory, there should not exist any medium to long term relationship between economic growth and companies' equity ratios. Even though buoyant economic growth gives rise to higher profits, it also encourages the arrival of new companies –startups, foreign investors– which spurs competition and increases the pressure on profits. The number of companies grows –and thus the overall amount

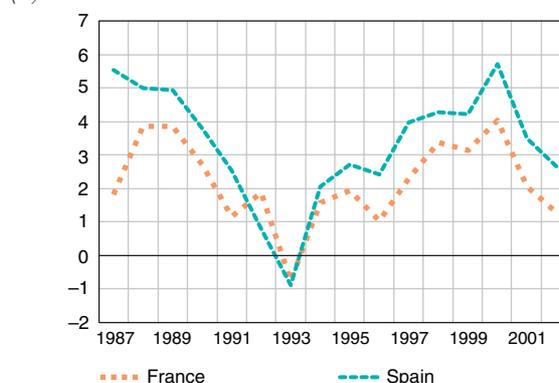
of equity capital– but not the equity ratio of each individual company. However, when sectoral growth does not result in the arrival of new entrants, the relative level of profits and equity capital may increase for a short period, if the profits are not entirely distributed. Indeed, companies already present in that sector benefit from an economic rent stemming from “barriers to entry”.

The trend in the equity ratio of Spanish manufacturing firms, compared with that in other countries reflects the above-mentioned relationship. Although Spain posted a higher growth rate than its European counterparts over the period under review (see Chart 2), the equity ratio did not increase (true, in level terms, it is the highest of the four samples). However, the economic recovery of 1994-1995 enabled Spanish firms to rapidly build up their equity capital again, following the recession of 1992-1993.

The comparative results obtained from the databases used in this study appear to be consistent with the conclusions of the theories underlying the differences in equity ratios and with other empirical studies on the subject. In particular, it seems important to stress the role played by institutional and legal factors. The differences in economic growth rates should also be taken into consideration.

The analysis of the economic role of equity capital contains two ideas: on the one hand, equity capital represents a source of corporate financing that

**Chart 2**  
Annual growth of GDP (%)



<sup>7</sup> In a consolidated approach, intra-group loans correspond to reciprocal transactions and are not included in the balance sheet presentation. This study is based on individual company accounts. Furthermore, a large number of holding companies are not part of the manufacturing sector and are not incorporated into the sample. This is why group financing is considered as external financing.

must be properly balanced with respect to debt financing, the other source of corporate financing; on the other, equity capital represents a guarantee for creditors because it is intended to absorb losses and shield creditors in the event of a shock affecting the company. In this respect, it can be viewed as a financial factor that contributes to ensuring long-term growth.

This last role of equity capital, which can be described as “financial stabiliser”, is particularly significant in a context where credit institutions are required to set up internal credit risk rating systems as part of the implementation of the Basel II Accord. Credit institutions are encouraged to test the information at their disposal from the point of view of its risk prediction capacity. In this respect, they are led to re-examine the role of equity capital as an indicator to be used for individual company assessments, in the light of the recent developments regarding accounting standards, the institutional context and companies’ financing habits.

In addition to modelling credit risk at the individual firm level, one should also look at the question of the optimal level of equity capital from a macroeconomic perspective. Although the stabilising role of equity capital has clearly been established by financial theory, it has not yet been properly quantified. This is why the “net worth at risk” indicator –described in the following section– was developed.

### 3| COMPUTING “NET WORTH AT RISK”

In order to compute the net worth at risk indicator, shortened to NWaR (Section 3|1), we first need to calculate the distribution of annual income of manufacturing firms in the four economies (Section 3|2), then that of the estimated losses over a two-year period (Section 3|3). These losses are used as a basis for calculating NWaR figures (Section 3|4). The difference between NWaR and equity capital gives us an indication of the proportion of companies whose equity capital alone would not be sufficient to absorb losses in the event of a situation of stress (see Part 4), *i.e.* the largest losses incurred by the worst performing firms (90<sup>th</sup> and 95<sup>th</sup> centiles) and over the

worst two years (conditional NWaR) or on average over the period 1987-2002 (unconditional NWaR).

#### 3|1 The concept of net worth at risk

There are essentially two ways of measuring the resilience of a group of companies to an activity shock. The first approach consists in modelling the impact of an exogenous shock (such as a sudden increase in commodity prices, a fall in demand, an exchange rate shock requiring a sharp adjustment of profit margins or a supply shock on the labour market) on companies’ operating flows and profit and loss account. This approach requires making a number of assumptions on the elasticity of the different intermediate operating balances to such shocks and raises a few practical implementation difficulties, which are likely to affect the robustness of the results.<sup>8</sup>

The second approach –which we chose to adopt– focuses on equity capital and emphasises its role as buffer for losses. The NWaR indicator is derived from the accounting aggregate of net equity. A distinction can then be made between “conditional” and “unconditional” NWaR.

Net equity is defined using the reference variables of the BACH database (Appendix):

- + Subscribed capital
- + Share issue, corporate merger and split premiums
- + Revaluation reserves
- + Other reserves
- + Net profit or loss for the financial year
- + Special tax-based reserves
- Uncalled or unpaid subscribed capital
- Intangible fixed assets

We use the common definition of net equity, as it is obtained by deducting the “deferred charges” recorded under assets (and listed above) from the amount of equity capital. However, in the rest of the article, we refer to “equity capital” for simplicity’s sake. Computing NWaR amounts to estimating equity ratios

<sup>8</sup> The Banque de France has, however, developed an individual assessment tool to conduct simulations according to different scenarios. This expert system for financial analysis is part of a package available to SMEs that wish to test the financial consistency of their projects or their resistance in certain business conditions.

on the basis of the losses to be covered. It corresponds to the minimum equity capital, as a percentage of total assets, that a company would need to weather a two-year recession if it were to incur the same amount of losses as that incurred by the worst performing firms following the shock. It is assumed that any company is likely to be among the 5% or 10% of the worst-hit companies. Box 1 describes the methodology used to compute this indicator and identify the recession

years. NwAr then represents the potential losses that a company might incur, with a given probability of occurrence, and not the losses that a company would incur in the event of recession. When compared to total assets, NwAr can be viewed as a measure of the equity ratio that a company would need in order to develop its activity in a given sector. The riskier the sector, the greater the NwAr must be for the company to withstand the sectoral fluctuations.

### Box 1

## Methodology for calculating net worth at risk (NwAr)

### 1| Databases used (see Appendix)

*This study focuses on manufacturing sector companies with a turnover of over EUR 5 million; it does not include sole traders and partnerships. This gives us homogeneous and representative samples of companies for the four countries under review. This study covers the manufacturing sector for two reasons. First, the databases used have a high coverage rate. Second, given that the manufacturing sector has always played a structuring role in the economic cycle, it seems particularly appropriate to study it in view of the purpose of this paper. The sample is not stable, i.e. the population of companies varies each year, according to arrivals (new companies or those whose turnover exceeds EUR 5 million for the first time) and departures (mergers and acquisitions, defaults, other events). This enables us to have large samples over a long period.*

### 2| Net worth at risk (NwAr)

*The computation of NwAr is based on the calculation of losses to be covered. Three accounting variables are used: total assets, net equity and net income, the choice of which is explained in Appendix 1. The period under review is 1987-2002, which enables us to capture a variety of business cycle configurations in the countries under review. In order to establish a distribution of the cumulative results over a two-year period, we calculated two-year corporate profits and losses, for each company and each sector.*

*The statistical distributions of these 15 two-year periods enabled us to identify the 90<sup>th</sup> and 95<sup>th</sup> percentile values of net losses (i.e. the ratio between net accounting losses and total assets).*

*The NwAr figures correspond to the average values of the two-year losses (90<sup>th</sup> and 95<sup>th</sup> percentile) over a given period. The 85<sup>th</sup> and 99<sup>th</sup> percentile values were also calculated. The 85<sup>th</sup> percentile does not provide more information than the 90<sup>th</sup> percentile, while the 99<sup>th</sup> percentile yields partly unrealistic results due to the existence of extreme values, and in particular in the case of a segmentation by size or sector, it does not include a sufficient number of observations to be properly interpreted.*

*It is worthwhile comparing the significance of the percentiles in this study with that of the quantiles that credit institutions use to model risk according to the Basel II recommendations. Under Basel II, the 99.9<sup>th</sup> quantile represents the boundary between losses to be covered and losses which, with a 0.1% probability of occurrence, correspond to the indeterminate uncertainty. The 95<sup>th</sup> percentile in this study represents the amount of equity capital necessary to cover the losses of 95% of companies. This threshold might appear less strict than that for credit institutions. However, it is calculated on the basis of the losses incurred by the 5% of companies showing the highest level of debt and then applied to all companies, some of which are in reality hardly likely to incur losses thanks to their specific competitive position. It is therefore a very cautious approach.*

### 3| Definition of recession periods

*Underlying our definition of recession periods is a specific multicriteria approach applied homogeneously to all four countries. In view of the objectives of the study, the definition generally used by the National Bureau of Economic Research (NBER), based on the analysis of quarterly GDP statistics, did not seem totally appropriate. Indeed, the focus of this study is on the manufacturing sector and its sub-sectors and our objective was therefore to identify the recession periods specific to these sectors. Furthermore, given the nature of the test (stress test), it was decided to consider a more violent shock than that resulting from a macroeconomic recession as defined by the NBER, i.e. a period of two consecutive years, in order*

to clearly establish a relationship between the macroeconomic context and corporate performance on the one hand, and between equity capital and losses on the other. We thus used a definition based on the accounts of the companies under review. The following three criteria were taken into consideration: the 90<sup>th</sup> percentile of the distribution of net losses, the annual change of value added derived from corporate balance sheet data, the annual change of value added derived from the national accounts. A year was considered as recessionary if it was highlighted by at least two indicators; the periods of two consecutive recessionary years were then identified. This procedure resulted in the years 1992-1993 being identified as a recession period for all four countries. For some sub-sectors, other two-year periods were brought to light and used in a sectoral analysis (not covered in this article).

#### 4| Conditional and non-conditional NWR

Two NWR values were calculated for the identified recession period (1992-1993). They correspond to the 90<sup>th</sup> and 95<sup>th</sup> percentiles of the distribution of net losses over the two-year period. They are deemed conditional, because their value depends on the occurrence of a recession, as defined above.

Two other NWR values were calculated. They correspond to the average of net losses over the 1987-2002 period, for the same percentiles as above. They are deemed unconditional because they are based on an entire economic cycle.

#### 5 | Differences between Value at Risk and Net Worth at Risk

Value at Risk corresponds to the maximum portfolio losses that an economic agent can incur over a specific period of time with a given confidence level. VaR is calculated on the basis of market prices, which are made available at frequent intervals (in general, daily). VaR depends on the period chosen. Its robustness depends on the extent to which market prices during the period under review are assumed to be representative of potential future developments. It also relies on other assumptions, such as the probability distribution, stationarity, market liquidity, etc. VaR gives the value of economic capital necessary to cover unexpected losses and can be used to differentiate between expected losses (covered by provisions, etc.) and unexpected losses.

By contrast, the computation of NWR is based on corporate accounting data, in accordance with the historical cost convention. This convention provides an imperfect proxy for market prices (when these are available). The statistical distribution of losses is directly derived from the observation of historical series and the distinction between expected losses and unexpected losses is not applicable in this context.

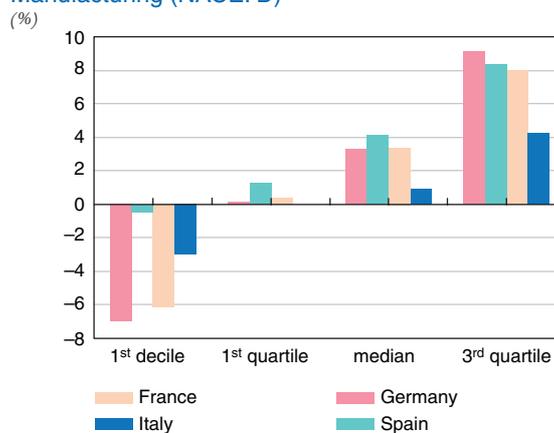
## 3|2 Distribution of annual income

The distribution of the net income/total assets ratio for manufacturing sector companies differs substantially from one country to the next. Chart 3 shows the first decile and the three quartiles of this distribution in 2002, the last year in the period under review.

According to the net income/total assets ratio, Italian firms are less profitable than their foreign counterparts: for 50% of firms, net income accounts for less than 1% of total assets. Spanish, French and German firms appear more profitable. In the last quartile, German firms show particularly high net income/total assets ratios (over 9.1%).

The picture changes if one looks at the first decile of the distribution, which is made up of the worst performing companies and where negative values mean that companies are incurring losses. In the first

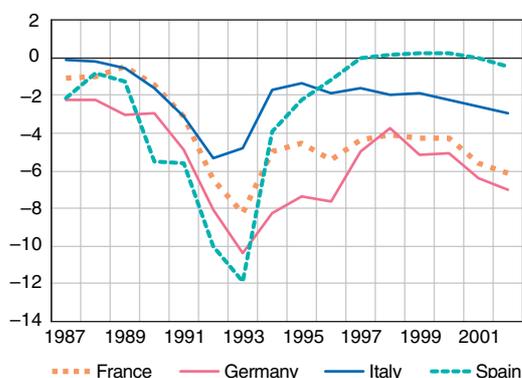
**Chart 3a**  
Distribution of the net income/total assets ratio in 2002  
Manufacturing (NACE: D)



decile, Spanish companies display the best results, *i.e.* relatively small losses, while Italian firms show lower losses than their French and German counterparts.<sup>9</sup>

<sup>9</sup> Explaining the difference between these two country rankings is not easy. On the one hand, as higher risks tend to be remunerated by larger profits, the ranking could reflect a ranking of the level of credit risk in the four countries during the period under review. This argument could partly explain the case of German firms. However, it does not account for all situations: Spanish firms for example are highly profitable without incurring significant losses. Other factors, such as institutional, accounting and tax-related factors, should also probably be taken into account.

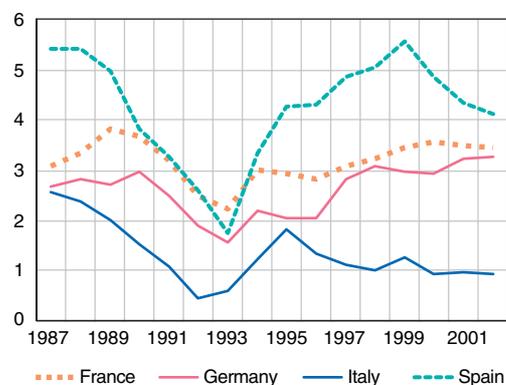
**Chart 3b**  
1<sup>st</sup> decile of the distribution  
of net income/total assets (1987-2002)



One should nevertheless not draw hasty conclusions as to the ranking of countries. Indeed, the indicator used is based on net income, which depends on the type of accounting convention applied and possibly on companies' tax optimisation behaviour.

On the other hand, the differences in performance across countries seem to reflect contrasting economic conditions. In the Italian manufacturing sector, for example, the dispersion of results is less wide than in other countries, in particular France and Germany. An analysis of net income in the 1<sup>st</sup> decile and the median over the whole period also brings to light the somewhat unique situation of Italian firms. Italy's specific policy mix in the

**Chart 3c**  
Median of the distribution  
of net income/total assets (1987-2002)



early 1990s, consisting of a depreciation in the lira and an accommodating fiscal policy might have enabled the least profitable companies to remain in activity, without necessarily raising the profitability of the entire Italian manufacturing sector.

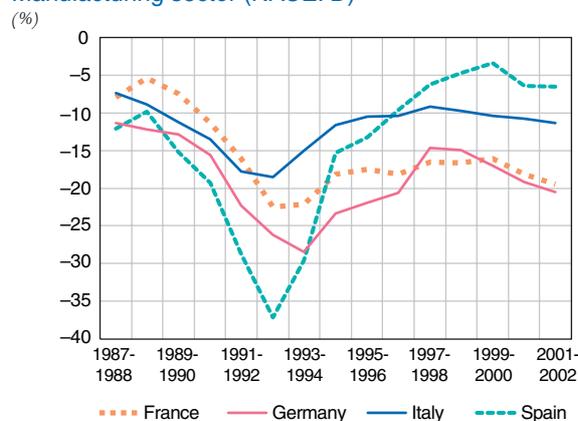
### 3|3 90<sup>th</sup> and 95<sup>th</sup> percentiles of the two-year losses distribution

In the rest of the study, we clarify and deepen the assessments made in the previous section by examining the 90<sup>th</sup> and 95<sup>th</sup> percentiles of the net losses/total assets ratio, which correspond to the first decile (or 10<sup>th</sup> percentile) and 5<sup>th</sup> percentile of the net income distribution (Chart 4). These percentiles are made up of companies incurring net losses. The following observations can be made regarding the changes in these percentiles over the entire period under review.

First, all four countries show very large losses in 1992-1993. These two years are therefore identified as a recession period, according to the procedure described in Box 1.

Generally speaking, the 95<sup>th</sup> percentile yields the same results as the 90<sup>th</sup> percentile in terms of the ranking of countries according to the net losses/total assets ratio in the manufacturing sector.

**Chart 4**  
95<sup>th</sup> percentile of the two-year losses distribution  
Manufacturing sector (NACE: D)



The losses incurred by Spanish firms in the 95<sup>th</sup> percentile are significantly higher during the recession period (accounting for 35% of total assets) than those recorded as from the mid-1990s (just over 5%).<sup>10</sup> This can be attributed to the progressive convergence of Spain's macroeconomic indicators towards those of its European counterparts. At the start of the 1990s, Spain posted high inflation and Spanish interest rates were well above those in Germany and France. Interest payments represented a heavy burden on indebted firms, thus hindering their performance even further. Since the mid-1990s, the catching-up process of the Spanish economy and the convergence of interest rates prior to Spain's adoption of the euro led to a narrowing of the gap in financing costs between the European economies under review. Benito *et al.* (2004) have given empirical evidence of the positive effect of convergence in interest rates on the profitability of Spanish firms.<sup>11</sup>

The 95<sup>th</sup> percentile also highlights the particularity of Italian manufacturing firms, as pointed out in section 3.2: Italian firms incurred lower losses during the 1992-1993 recession than their French and German counterparts. Since the mid-1990s, the 95<sup>th</sup> percentile of two-year losses for French and German firms has followed a similar pattern. However, the recession weighed more heavily on German firms, weakened by reunification.

To sum up, as shown in Chart 4, the amplitude of the economic cycle and the strength of previous recessions are shown to have a significant impact on companies' financial situation.

### 3|4 Conditional and unconditional NwAR

The 90<sup>th</sup> and 95<sup>th</sup> percentiles of two-year losses determine two values of NwAR. Conditional NwAR represents the net losses that a company may have to absorb during a two-year recession period if this company were to incur the same amount of losses as that incurred by the worst performing companies in the past. This two-year recession represents a worst-case scenario in the light of the events recorded

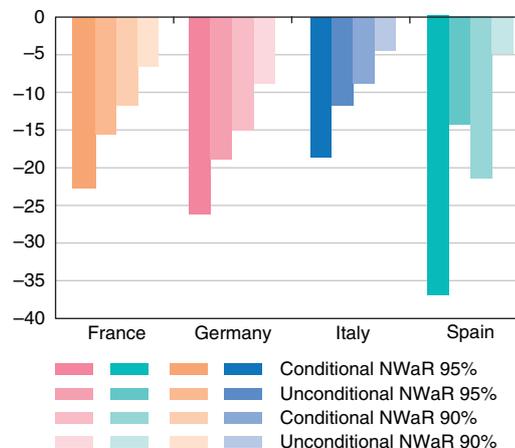
over the 15 years under review. Of course, it is not necessarily predictive of what may happen in the future. It nevertheless gives us an indication of the "cushion" of equity capital that would be needed to absorb the losses that a company may incur during a severe crisis in the event that it should not have taken any protective measures.

As shown in Chart 4, the years 1992-1993 have been identified as a recession period for all four countries under review. It should be recalled that this study sets out to examine companies' resilience to a severe recession, irrespective of the nature of the recession, on the understanding that the combination of factors that brought about the 1992-1993 recession cannot occur twice (see Box 1 and section 3|5 below).

Chart 5 shows both the conditional NwAR values (computed on the basis of the 90<sup>th</sup> and 95<sup>th</sup> percentiles for the years 1992-1993) and the unconditional NwAR values, which correspond to the respective averages of the 90<sup>th</sup> and 95<sup>th</sup> percentiles over the 1987-2002 period.

Spanish firms post the highest conditional NwAR values, both in the 95<sup>th</sup> percentile and the 90<sup>th</sup> percentile. This finding is in line with the fact that the income of Spanish manufacturing firms is highly cyclical (see Chart 3). German firms rank second: the 5% most vulnerable firms post NwAR values of

**Chart 5**  
Net worth at risk (NwAR)  
Manufacturing sector (NACE: D)  
(%)



<sup>10</sup> Over this same period, the 90<sup>th</sup> percentile of the distribution is positive, reflecting the fact that less than 10% of Spanish companies incur losses.

<sup>11</sup> Another explanation could be the fact that, following the substantial losses incurred in 1992-1993, a large number of Spanish firms either went bankrupt or were restructured. The general restructuring drive that followed was then reflected in the profitability distribution.

over 26.2% during a crisis period. For France and Italy, these figures are 22.5% and 18.5% respectively.

The ranking of countries is different if one looks at the unconditional NwAR. German manufacturing firms show the highest unconditional NwAR values, followed by French and Spanish firms. Italian firms continue to perform relatively well, recording the lowest unconditional NwAR values.

This change in the ranking of countries highlights the different information content of the conditional and unconditional NwAR. The conditional NwAR gives an indication of the amount of equity capital that relatively fragile companies need to weather a recession. The unconditional NwAR provides a measure of the amount of equity capital necessary to support relatively fragile companies throughout an economic cycle.

The size of the differential between conditional and unconditional NwAR provides the following information:

- it is an indication of the extent to which companies restructured their balance sheet<sup>12</sup> and improved their performance between the trough of the cycle and the cycle trend, for a given percentile;
- if one considers that this indicator is a proxy for credit risk, the differential between conditional and unconditional NwAR is an indication of the migration of companies between high risk categories and low and average risk categories.

The situation of Spanish firms is particularly noteworthy: the differential between conditional and unconditional NwAR amounts to 22.7 points, pointing to significant restructuring efforts and/or a substantial rise in profitability<sup>13</sup> after the recession. The differential for German and Italian firms (7.5 points) probably reflects the combination of two phenomena: a less pronounced restructuring process on account of the lesser intensity of the recession and slower growth in productivity gains and profitability. In France (10-point differential), the restructuring drive, which had started in 1992-1993, continued until

1995-1996 as part of the French “competitiveness through disinflation” policy.

### 3|5 Need for caution in interpreting the results

Caution should be exercised when interpreting the results relative to net worth at risk. First, this is a worst-case scenario approach, reflecting the risk borne by the 5% or 10% worst performing firms. Furthermore, the estimated potential losses obviously depend on the extent of the recession. Thus, the recession in Europe in 1992-1993 hit a group of interdependent economies, each with its own national currency and therefore confronted by foreign exchange crises. For the four countries under review, the monetary context has changed and a recessionary shock in today's new environment would have different consequences. It should also be stressed that each firm is faced with specific factors (dependence on suppliers and clients, flexibility of the production structure, change in competitive pressure, etc.) which have an impact on its performance. It is therefore not possible to use the NwAR concept to estimate the individual default probabilities. NwAR provides information on the risk profile of large sectors or groups of companies, but should not be used for individual assessments.

Bearing this in mind, a comparison of NwAR figures and equity ratios (see section 4|3) in the four economies under review suggests that NwAR could be an explanatory factor underlying the equity ratio. Spanish firms record the largest losses during a recession, both in the 90<sup>th</sup> and 95<sup>th</sup> percentiles, as well as high equity ratios. The situation of Italian firms is diametrically opposed to that of Spanish firms, with relatively small losses and low equity ratios. French firms are somewhere in between, showing moderate NwAR and equity ratios. In all of these cases, there appears to be a relationship between the equity ratio and companies' sensitivity to business cycle variations. The more companies are sensitive to these fluctuations, in particular recessions, the larger the cushion of equity capital will have to be.

<sup>12</sup> As the sample is not constant, defaulting companies are excluded from the sample from one year to the next, which automatically alters the value of the percentiles, in particular the highest ones.

<sup>13</sup> Measured by the amount of losses incurred.

These elements should, however, be set back within a wider context. The fact that NwAr may be viewed as a determinant of the equity ratio does not call into question the relevance of the other factors highlighted above. This is illustrated by the case of German firms, which show both high NwAr and lower equity ratios than the other countries under review.

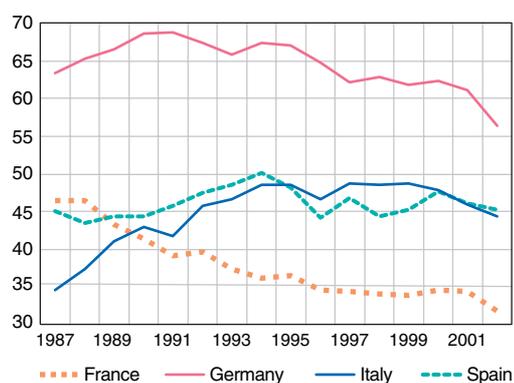
## 4 | COMPARING NET WORTH AT RISK AND EQUITY CAPITAL

Comparing NwAr figures with equity ratios for a given year is straightforward. By subtracting the NwAr value from the equity ratio for each company we obtain the proportion of companies that don't have sufficient equity capital to weather a two-year recession should they incur the same amount of losses (as a percentage of total assets) as the worst performing companies in the past. Chart 6 shows the proportion of countries with an equity ratio below the NwAr (95<sup>th</sup> percentile) for the four countries under review. From a meso-economic perspective, this can be viewed as the amount of equity capital covering the losses incurred by 95% of companies *i.e.* a residual risk of 5%.

Of course, these results are obtained on the assumption that all other things are equal. The financial system's reaction to a deterioration in companies' financing structure could have a positive or negative impact on the results, depending on banks' ability to prevent some of their clients from defaulting or the support they provide to their clients in difficult situations. In France, depending on their perception of the relative effectiveness of the various possible approaches (measured in terms of their capacity to minimise the amount of unrecoverable losses), credit institutions may choose either to opt for conciliation or an out-of-court settlement or have recourse to collective proceedings. This choice may also depend on the specific situation of each bank, in terms of liquidity and therefore its ability to bear a more or less significant transformation or illiquidity risk.

The situation of German manufacturing firms differs markedly from that in other European countries. A very large proportion of firms (55%

**Chart 6**  
Proportion of companies with an equity ratio below NwAr (95<sup>th</sup> percentile)  
Manufacturing sector (NACE: D)  
(%)



in the 95<sup>th</sup> percentile in 2002) post an equity ratio below the conditional NwAr. Conversely, since 1990, France has shown the best performance (32% in the 95<sup>th</sup> percentile in 2002). The decline in the proportion of French manufacturing firms with an equity ratio below NwAr can be attributed to the increase in equity capital during the period under review. In Spain and Italy, the proportion of companies in this situation is similar, *i.e.* close to 45% in 2002. The same results can be obtained with the 90<sup>th</sup> percentile.

Although these results are generally attributable to both equity capital and potential losses incurred in the event of a recession, in the case of Germany they mainly stem from a lower equity ratio than in the other European countries. In the light of the NwAr values obtained, it seems that German firms could be encouraged to alter their financial management in order to raise their level of equity capital. It should be noted that this assumption concerning the behaviour of German firms is in line with the concerns expressed in other studies (Deutsche Bundesbank, 2003), in particular in the framework of the implementation of Basel II. The slight increase in equity ratios recorded in 2002 could be the first step in this direction.

Despite being relatively high, the equity ratios of a large proportion of Spanish firms are below NwAr, on account of the significant losses incurred during the recession. As regards the unconditional NwAr, Spanish firms show more favourable results. Indeed, the unconditional NwAr is an indicator

which smooths out the amplitude of business cycle fluctuations and only the trend economic growth rate is (indirectly) reflected in its calculation.<sup>14</sup>

Italian firms are also in an intermediate position. In this case, however, their situation stems from a combination of a relatively small amount of losses and a low equity ratio.

In terms of their NWR, French firms appear to have the largest resistance capacity to a cyclical shock. This can be attributed both to high equity ratios, which increased throughout the period, and relatively moderate losses during the 1992-1993

recession. As regards the unconditional NWR, the results are less good. In France, the proportion of firms for which the level of equity capital is below average two-year losses over the 1987-2002 period is high compared with that in Spain and Italy (but close to that in Germany). This could mean that poorly capitalised French firms continue to develop their activity for various reasons (bank support, alternative sources of financing, such as intragroup loans and trade credit). But it also points to their vulnerability, in terms of ensuring a proper balance of their sources of financing, to which shareholders and business partners should give their full attention.

## Box 2

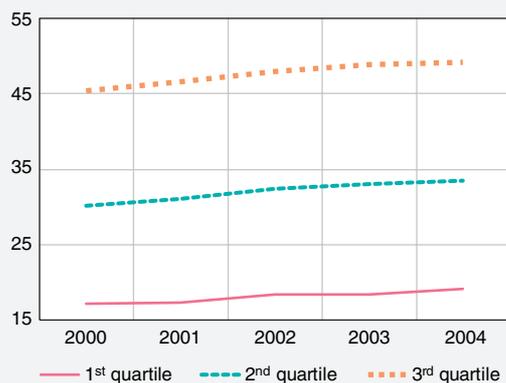
### Recent trends recorded by French firms

*The trends recorded by French manufacturing firms between 1987 and 2002 continued in 2003 and 2004.*

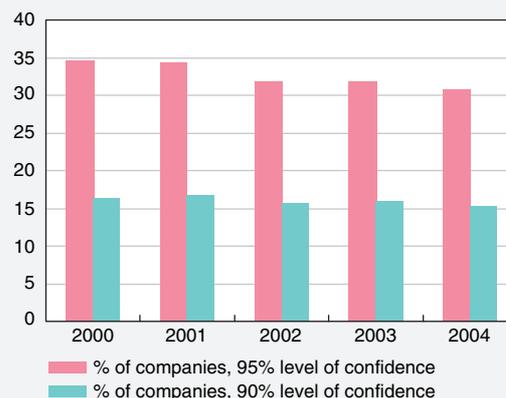
*Net income and equity capital continued to post a slight rise.*

*In the 95<sup>th</sup> percentile, the proportion of companies with an equity ratio below NWR during a recession is at its lowest in 2004, at 30.8% (3,826 companies out of 12,417). This decrease is in parallel with the downward trend in the company default rates recorded over the period.*

#### Equity capital of French firms



#### French companies with an equity ratio below the NWR



<sup>14</sup> If one accepts the assumption that companies show better results in a context of strong economic growth. This is highly likely given that established firms are the first ones to take advantage of the new business opportunities arising from economic growth, before having to face competition from new entrants, which eventually leads to the convergence of results towards a long-term equilibrium.

*In this study, we have expanded on the concept of net worth at risk (NWAR), defined as the equity capital that would be needed to absorb the losses incurred by a company if it were to incur the same amount of losses as that of the worst performing firms over a given period (at the 90<sup>th</sup> and 95<sup>th</sup> percentiles of the losses distribution). A distinction is made between the concepts of conditional NWaR (calculated on the basis of the losses incurred during the 1992-1993 recession) and unconditional NWaR (calculated on the basis of the average losses over the whole period 1987-2002).*

*The results obtained for the four countries are different.*

*The proportion of Italian and Spanish firms for which the conditional NWaR is above their equity ratio in 2002 (at a 90% and 95% level of confidence) is similar, i.e. roughly 45%. In the Italian case, however, this situation is due to the low level of equity capital and the small amount of losses.*

*German firms post less favourable results: for over 60% of firms the conditional NWaR is greater than their equity ratio in 2002. This situation does not necessarily imply greater vulnerability, because it probably results from a specific financing structure stemming in part from the strong Hausbank relationship between companies and banks. Furthermore, the proportion of banks in this situation declined slightly in 2002, the last year of the period under review.*

*The proportion of French firms for which the conditional NWaR is above their equity ratio in 2002 is lower (30%) than in the other European countries. This largely reflects company managers' drive to strengthen their financial structure during the period under review, as well as the moderate losses recorded during the 1992-1993 recession.*

*As regards the unconditional NWaR, i.e. the average losses incurred by the most highly indebted firms over the entire period 1987-2002, French firms show the same degree of vulnerability as German firms (roughly 15% to 20%), yet they do not enjoy a Hausbank-type relationship with their bank.*

*If one considers that NWaR represents a proxy for credit risk, the differential between conditional and unconditional NWaR would imply that the proportion of high-risk companies in a credit portfolio can be multiplied by two between a "normal" period and a period of significant stress.*

*In this context, the financial partners of these firms should make them more aware of the importance of financial factors and contribute to rebalancing the financing structure of the most vulnerable ones in the framework of an approach aimed at preventing corporate failure. Credit institutions must establish a dialogue with companies in view of the implementation of Basel II and explain to them the way in which their position on a standardised risk scale determines their credit policy. This dialogue can be viewed as going hand in hand with the improvement in information and internal ratings systems conducted by banks in the framework of Basel II. Banks would probably need to enhance their commercial strategy by systematically including information on credit risk factors.*

*More generally, computing and studying the NWaR indicator contributes to a better understanding of the determinants of companies' financing structure.*

*Bearing in mind the fact that it should not be used to assess individual company risk, this indicator has a meso-economic purpose. It contributes to improving the monitoring of company credit risk. It supplements the information provided by scores and ratings –which are generally available in the case of a stable economic environment– by an approach to risk in the case of exceptional economic tensions.*

## APPENDIX

### Databases and methodology

The data used are drawn from the individual company databases managed by the Deutsche Bundesbank, the Banco d'España, the Centrale dei Bilanci and the Banque de France. Given the confidentiality of the data, each institution processed its own data according to a common methodology and the results –rendered anonymous– were pooled in order to compare them. The accounting concepts were drawn from national charts of accounts, which could be compared by means of a conversion table, developed by the European Committee of Central Balance Sheet Offices in order to handle the BACH harmonised company accounts database. Accounts are “harmonised” as national charts of accounts are drawn up in accordance with the Fourth Council Directive and using similar implicit conceptual frameworks.

The databases used in the study contain more than 10,000 companies for each country (see table below). These databases were not designed to obtain a set of representative statistics, but rather to have detailed accounting data, in particular for the purpose of risk analysis. However, thanks to the relatively large number of companies in the samples, the results were representative of the general situation of companies, especially as observations were made over a long period.

We used three accounting variables: total assets, net equity and net income. The four countries display similar financing structures (in particular, the bank intermediation rate and the role of trade credit). Furthermore, only manufacturing sector companies are within the scope of the study. These characteristics limit any cross-country comparison biases. The variables were standardised by means of ratios (net equity/total assets, net income/total assets), in order not to skew the results due to size effects. Lastly, net income was chosen over other intermediate operating balances (which are representative of companies' current performance), given that the purpose of the study is to measure losses eroding net equity, *i.e.* final losses. We chose to estimate two-year losses in order to smooth any possible volatility in the profit and loss account balance, as losses over two consecutive years generally reflect a structural deficit denoting deficits on all of the intermediate balances.

The table below gives an indication of the representativeness of the databases in 2000. Values for the other years may be slightly different as the samples are not stable from one year to the next. Representativeness indicators differ somewhat across countries on account of institutional factors.

#### Manufacturing industry (NACE: D)

Country – database	Germany (Deutsche Bundesbank)	Spain (Banque d'Espagne)	France (Banque de France)	Italy (Centrale dei Bilanci)
Number of companies	11,709	20,906	10,464	22,052
of which: companies with a turnover of over EUR 50 millions	1,706	347	1,845	1,832
Coverage rate	90.1% <sup>a)</sup>	100% <sup>b)</sup>	79.6% <sup>c)</sup>	100% <sup>d)</sup>

(a) As a % of total company turnover, drawn up by the tax authorities.

(b) As a % of the number of manufacturing companies included in the Directorio Central de Empresas database produced by INE, the Spanish national statistics institute.

(c) As a % of the workforce employed recorded by INSEE (the INSEE database covers all companies taxed on industrial and commercial profits on the basis of real and normal profits –BIC-BRN).

(d) As a % of limited liability companies recorded in the database of the national statistics institute.

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