the cost structure of firms
managing fixed versus variable costs

sander van triest

THE COST STRUCTURE OF FIRMS

MANAGING FIXED VERSUS VARIABLE COSTS

PROEFSCHRIFT

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de promotoren:	prof. dr. J. Bilderbeek prof. dr. J.A.M. Theeuwes RA
de referent:	dr. ir. J. Weimer

There were three kings and a jolly three too. The first one had a broken nose, the second, a broken arm and the third was broke. "Faith is the key!" said the first king. "No, froth is the key!" said the second, "You're both wrong," said the third, "the key is Frank!"

– bob dylan, liner notes to *john wesley harding*

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voorwoord/dankwoord

Als je, zoals ik, wel eens proefschriften leest, grijp je in het algemeen als eerste naar het voorwoord.[1] Een vaak terugkerend thema in zo'n voorwoord is met hoeveel mensen je nu eigenlijk een proefschrift schrijft. Laat u zich niet van de wijs brengen door wat anderen zeggen: een proefschrift schrijven doe je helemaal alleen. Ik zou bijna gaan twijfelen aan de wetenschappelijke kwaliteiten van al die tegenwoordige doctoren die beweren dat het voorliggende boekje het resultaat is van de inspanningen van velen, waarbij de promovendus een weliswaar substantiële, doch zeker niet beslissende rol heeft gespeeld – een wetenschapper heeft toch wel enig inzicht in causale verbanden, zou je denken. Bijna, want op een bepaalde manier is de invloed van anderen inderdaad onmisbaar om te komen tot een fatsoenlijke afronding van de eenzame zoektocht die een promotietraject is.[2] Het interpretatieverschil zit hem in de verschijnselen kwaliteit en kwantiteit. De kwantiteit is volledig de verantwoordelijkheid van de promovendus zelf, zoals dat hoort. Sterker nog (ja, erger nog), de promovendus is verantwoordelijk voor nog veel meer pagina's doorwrocht wetenschappelijk geschrift dan zijn proefschrift bevat. Die pagina's zouden echter de kwaliteit niet ten goede komen, en het is op dat aspect dat promoveren ophoudt een solistische bezigheid te zijn. Dat schrappen van pagina's doet de promovendus namelijk niet uit zichzelf – daar heeft hij begeleiders voor. De verdwenen bladzijden zijn de meest concrete uiting van de invloed van anderen op de kwaliteit van een proefschrift. Voor het bereiken van die kwaliteit is de promovendus een noodzakelijke, doch niet voldoende voorwaarde. De inbreng van derden is al beslissend nog voor er een pagina is geschreven en weer weggegooid, en gedurende het hele proces blijft zij noodzakelijk.[3] Aangezien het niet de kwantiteit is die bepaalt of je mag promoveren, maar de kwaliteit, stel ik het volgende compromis voor: een proefschrift schrijven doe je alleen, promoveren kun je niet zonder anderen. En het voorwoord is de aangewezen plek om die anderen te bedanken.

Mijn dank gaat uit naar mijn begeleiders Jan Bilderbeek, Jacques Theeuwes en Jeroen Weimer. Ieder op hun eigen manier hebben zij een rol gespeeld, Jan als de grote motivator, Jacques als de man met de kritische blik en Jeroen als dagelijks begeleider en luisterend oor. Een speciaal woord van dank hierbij voor Jeroen die de raderen van het promotietraject voor me in gang heeft gezet op een moment dat het allemaal niet zo heel erg liep voor me. De leden van de promotiecommissie, drs Vijge RA, prof. dr Bolwijn, prof. dr Van der Meer-Kooistra en prof. dr Vosselman dank ik voor de bereidheid om zitting te nemen in de commissie. Verder wil ik graag de heren uit het bedrijfsleven bedanken die een uurtje of meer tijd voor me hebben vrijgemaakt om over mijn onderzoek te praten, en in een enkel geval zelfs voor taxichauffeur wilden spelen. Henk Kroon en Aswin Bartels dank ik voor hun inbreng in de vorm van respectievelijk contacten en inhoudelijke kritiek.

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[1] zie ook Bos (1999, p. 7-9)

[2] door het voorwoord in het Nederlands te schrijven is hopelijk wel duidelijk dat dit geen onderdeel is van het wetenschappelijk verantwoorde deel van dit boekje, zodat ik me nu dan eindelijk even helemaal te buiten kan gaan aan metaforen en analogieën.

[3] doch niet voldoende!

En verder? Tja... Dat is een nogal kort bedankje voor zoveel pagina's tekst, en dit noopt me dan ook tot enige reflectie op mijn inleiding (ja, ik kan het even niet laten dat reflecteren – hopelijk gaat dat er nog weer af). Het is natuurlijk ook de persoonlijkheid van de promovendus zelf die bepaalt hoe groot het solistisch gehalte van het promotietraject is. Het zal voor mensen die mij kennen geen verrassing zijn dat dat gehalte in het onderhavige traject aan de hoge kant is, wat gelijk de opmerkingen in de eerste alinea nuanceert. Dat betekent niet dat er geen mensen zijn aan wie ik veel gehad heb, zowel binnen als buiten mijn werkzaamheden op de universiteit. Een aantal van hen wil ik toch noemen.
Allereerst mijn naaste collega's Aswin, Henk en Jeroen S. van wie ik een aantal zaken heb geleerd op het gebied van onderwijs geven, huizen, auto's en voetballen (in aflopende volgorde van leermomenten). Henk dank ik daarnaast voor het regelen van een tijdelijk medewerkster van tijd tot tijd, en Aswin voor het samen drinken van een biertje zo eigenlijk altijd. Mijn kamergenoten, en mijn vakgroepgenoten in het algemeen dank ik voor de gezelligheid, en ik ga er van uit dat zij de muziek van Bob Dylan tegenwoordig zo niet waarderen, dan toch in ieder geval herkennen. Ook verder binnen de faculteit waren er meerdere goede collega's waarmee ik regelmatig op de gang een praatje kon maken, of tijdens de maandelijkse borrel of na werktijd (oké, oké, op vrijdagmiddag ook *tijdens* werktijd) onder het genot van een drankje een goed gesprek kon hebben.
Zoals ik regelmatig heb lopen roepen is een van de voordelen van aio zijn dat je nog eens de tijd hebt om er een leven naast je werk op na te houden. Dat leven is flink wat aangenamer gemaakt door vele mensen, die ik hier niet bij naam ga noemen maar van wie ik toch in het bijzonder de vrienden wil memoreren die ik heb leren kennen bij de Stretchers in de eerste helft van de jaren '90 (vroeger dus, toen alles beter was...).
Tot slot mijn familie, die ik niet altijd kon uitleggen waar ik me nu precies mee bezig hield overdag (dat lukte met de avonden en de weekends toch wat beter): wel, met dit boekje dus.

Enschede, april 2000,

sander.

contents

1 introduction

1.1 observations

The variability of earnings is an important aspect in the management and analysis of a firm. This is true in for example financial economics, which has risk as one of its central themes and where variability is synonymous with risk. In accounting, reducing variability is the subject of income smoothing, a minor but essential section in the accounting literature. In strategic management, it is often put forward as a major goal of the firm. In everyday business management, the widespread use of insurance can be seen as an indication that reducing variability in costs, and through this variability in earnings, is something that merits real expenses in order to avoid possible occurences. The same goes for the increasing use of financial hedging instruments like forward contracts on currencies, and futures contracts on commodities.

Earnings variability can come from a number of sources. It can be caused by investments, by discontinuing product lines, by acquiring a business unit – in other words, by changes in the original configuration of the firm. These are important events that are the result of a distinct choice made by the firm. It is also possible, however, that a firm has to deal with a large amount of earnings variability while the real characteristics of the firm itself remain (largely) unchanged – which is, of course, the *ceteris paribus*-setting that is normal in economic analysis.

At first glance, it is evident that there is some earnings variability: it is very unlikely that the sales or revenues will remain constant throughout the years, and a change in sales will result in a change in earnings, when all other things remain constant. Although this is correct, it is not evident that the *magnitude* of the earnings variability is approximately that of the revenues variability. Were this always the case, the problem of earnings variability could only be tackled at the sales level, and therefore would be reduced to a marketing question. Two simple examples show that there is more to earnings variability than revenue fluctuations.

Consider the example of DSM, the Dutch chemical company that was essentially a producer of bulk chemicals in the early 1990s. It had no major changes in its number of plants or in its product line. When we look at the revenues, the earnings before income and taxes (*ebit*) and the net income of DSM from 1990 to 1995, figure 1-1 can be produced (all variables indexed with 1990 = 100).

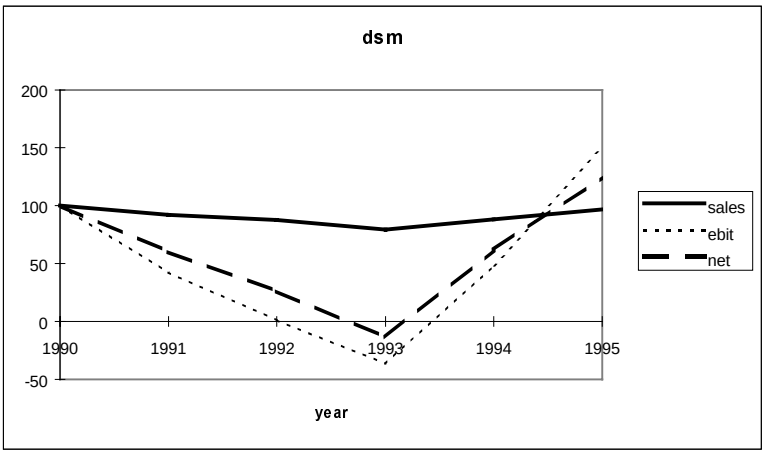

figure 1-1 sales, *ebit*, and net income for DSM from 1990 to 1995, with 1990 = 100.

What we see is a very large variability in *ebit* and net income, paired with a substantial, but much smaller change in revenues. As the revenues decline from 100 to 79, *ebit* and net income fall below zero. The subsequent upward trend is even more dramatic: revenue recovers to a level of 97 in 1995, but *ebit* and net income hit 150 and 125 compared to 1990.

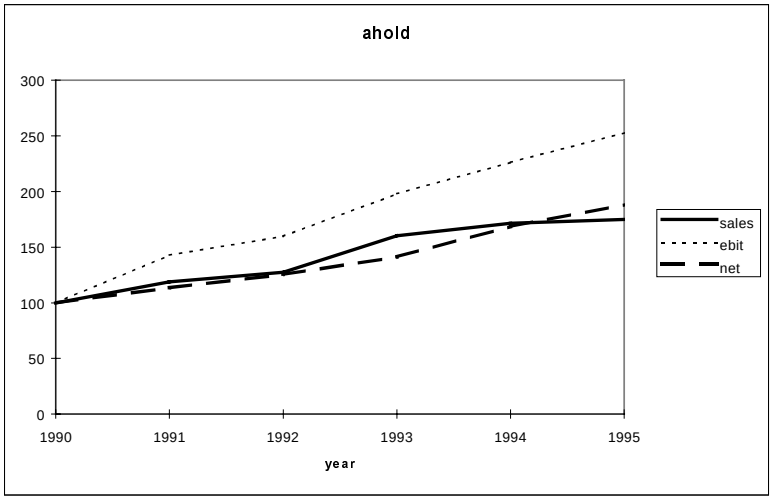

figure 1-2 sales, *ebit*, and net income for Ahold from 1990 to 1995, with 1990 = 100.

Now consider figure 1-2. This figure depicts the same data for Ahold, the Dutch retailer. Its revenues show a stable development: strong and consistent growth throughout the first half of the 1990s. This stable development is also present in *ebit* and net income: net income follows almost the same line as sales, and *ebit* grows in line with sales, but at

a higher rate. In 1995, sales and net income are at 175 and 188, respectively, and *ebit* is at 253.

In both cases, *ebit* and net income follow the pattern of sales. However, the relative changes are very different. If we look at *ebit*, we see that for DSM, a change of some 20% in sales from 1990 to 1993 leads to a change in earnings of more than 100%. For Ahold, a change of 75% in sales from 1990 to 1995 leads to a change in earnings of some 150%. The sensitivity of earnings to changes in sales is much larger for DSM than it is for Ahold. Apparently, there is more to managing earnings variability than maintaining your sales level. Whatever this is, we first need something to capture the phenomenon illustrated in figures 1-1 and 1-2. The measure that suggests itself based on these examples is the sensitivity of earnings variability to sales variability. Such a sensitivity measure is known as an elasticity, and this specific one has been known for a long time in business and financial economics. Its formula is

$$\text{ratio} = \frac{\Delta\%ebit}{\Delta\%sales} \qquad (1\text{-}1)$$

By taking the *ebit* in the numerator, and not the net income, we exclude tax and financing effects. This allows us to concentrate on the operational characteristics of a firm as an influence on earnings variability. For this reason, this ratio is known as the 'degree of operating leverage' or *dol*. The *ebit* of a firm with a high operating leverage reacts strongly to a change in revenues, while a firm with a low leverage sees its *ebit* change in about the same order as its revenues. Thus, DSM is a firm with a high *dol*, while Ahold has a low *dol*.

Now that we have a measure of the influence of operational characteristics on earnings variability, we would like to know where the operating leverage effect comes from. Since we are talking in financial terms, it seems appropriate to look at the costs that a firm incurs. A basic classification of costs is in their degree of variability: fixed versus variable costs. This classification is related to the physical (real) properties of the operations of the firm. The ratio of fixed to total costs is generally referred to as the cost structure of the firm. Firms that operate with a large proportion of fixed costs will have large investments in fixed assets. This is the case with DSM and the chemical industry in general. However, this also means that the contribution margin (defined as the price minus the variable costs per unit) will be large, since the proportion of variable costs is small. When the contribution margin is large, a small change in units sold, and thus a small change in revenues, will result in a relatively larger change in *ebit*. On the other hand, a retailer like Ahold sells many products with a relatively low contribution margin. With respect to its sales level, its fixed costs will be moderate. This means that a small change in units sold will not result in large swings in earnings. This is the basic mechanism underlying the operating leverage. It is the result of the presence of fixed costs, and the magnitude of the leverage effect depends on the contribution margin and the level of sales.

1.2 problem definitions

1.2.1 a first problem definition, directed at operating leverage

The observations made in section 1.1 are not new. The origins of the operating leverage concept cannot be traced exactly, but the name was probably coined some time after the famous article of Modigliani and Miller (1958), in which they popularized the term 'leverage' for the ratio of debt and equity (among other things, obviously). At least since 1958, this ratio of debt to equity is referred to as 'financial leverage', or more often just plain 'leverage'.[1] The correspondence between the names is not accidental, of course: both describe the effect of having to pay a fixed charge at the expense of an income stream.[2] The analogy also shows clearly in the Dutch language, where financial leverage and operating leverage are termed 'leverage effect of the capital structure' and 'leverage effect of the cost structure'.[3] This implies another comparison: financial leverage arises from the right-hand side of the balance sheet, and operating leverage originates from the left-hand side.

Despite the apparent similarities, operating leverage has received only a fraction of the attention that has been given to financial leverage. Whereas financial leverage has been the subject of many studies, both theoretical and empirical (cf. Cools, 1993), the literature on operating leverage is rather modest. Little research has been done on the determinants of operating leverage, its influence on firm value, or possible applications in analyzing and managing firms. The aim of this thesis is to find out why this is so, to see if it is useful to do anything about it, and if so, what it is that can be done. Properly formulated, the aim of the research seems to be:

> **to contribute to the understanding of the importance of operating leverage for firm performance.**

(We will get back to why it 'seems' to be.) Is operating leverage important to firm performance, and how does it influence firm performance? The main research question that can be asked to reach this goal would be:

> **what is the relationship between operating leverage, firm characteristics, and firm performance?**

The examples of DSM and Ahold show that different levels of operating leverage have different impacts on firm performance when there are variations in sales. The question that follows from this is what the determinants of the level of operating leverage of a firm are: can we find a relationship between firm characteristics and operating leverage? It is clear that DSM does not take on such a sensitivity of earnings to sales variations voluntarily. Obviously, certain firm characteristics force such a level of operating leverage on the firm. We need to know more about the relationship between these characteristics and operating leverage to understand the role of operating leverage in managing a firm. However, next to relating the operating leverage to its determinants,

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[1] in an article from 1966, Ghandhi discusses financial leverage measures, without once using the adjective financial. Obviously, the operating leverage concept was still not widely used at that time.

[2] although the correspondence is not exact, see section 2.2.6.

[3] *hefboomwerking van de vermogensstructuur* and *hefboomwerking van de kostenstructuur*, respectively.

we would like to say something about its relationship with the general level of profitability, or performance. If it were possible to establish a clear relationship in this respect, we could imagine that it would be possible to set an optimal target for the operating leverage of any firm.

1.2.2 the problem with the problem

Our understanding of the operating leverage concept is lacking in several aspects. Although there is a clear definition of operating leverage, it is defined as an effect, not a firm characteristic. Even if we look at it as a phenomenon that originates from the cost structure, we are left with the question of what the cost structure of a firm is. In economics, the cost structure seems to indicate the costs of production in general, or equivalently the unit production costs. As a result, the cost structure is often evaluated in terms of economies of scale (see e.g. Durkin and Elliehausen, 1998). In an article from an accounting journal, Balakrishnan, Linsmeier, and Venkatachalam (1996, p. 189) relate the cost structure of a firm to 'the extent and composition of its committed costs'. However, they also look at operating efficiency as an aspect of a firm's cost structure. In the popular management literature and in newspapers, the cost structure is generally associated with fixed costs: Dutch financial newspaper *Het Financieele Dagblad* reported on 5 October 1999 that pvc-producer EVC had lowered its fixed costs through closing old factories with a high cost structure.
However we define the cost structure, it is safe to say that we are interested in the shares of fixed and variable costs in total costs. Why not simply take the ratio of fixed to variable costs as the cost structure? Well, take a look at the costs of the following firms:

	firm 1	firm 2
fixed costs	500	500
total variable costs	1500	1500

table 1-1 two cost structures – are they the same?

Based on this information, we would be inclined to say that both firms have the same cost structure: their ratio of fixed to variable costs is identical. But what if we learned that firm 1 had revenues of 3000, and firm 2 of 4000? Then we would say that the cost structure is different for both firms. Firm 2 has a much better cost position, precisely because of its operating efficiency: it achieves a relatively higher margin. So it proves to be essential to include the revenues when considering the cost structure of a firm. At the same time, it is more than just unit production costs, or unit margins. If we want to measure the cost structure, or model its influence on firm performance, we need to have a precise definition. The operating leverage is exactly defined, but as an effect, not as a characteristic in the way financial leverage is defined. This means that giving a target number for the operating leverage requires translating it into other firm characteristics, whereas the financial leverage in the form of the mix of debt and equity is directly observable.
Why is this definition issue important? After all, in discussing operating leverage or the cost structure, it is clear that fixed costs, sales levels and margins are important. Surely it should be possible to say something useful on the subject without exactly defining it?

Well, yes, but this would not bring us to our research goal, which is explicitly linked to operating leverage precisely because this concept *is* clearly defined. And this brings us to the problem with our research problem: it is centered on a concept that is not very practical. This is partly caused by measurement problems, which will prove to be almost insurmountable. Alongside these measurement problems, we are faced with the fact that the operating leverage is a very aggregate measure. This makes it difficult to translate findings with respect to operating leverage into conclusions regarding actual firm characteristics.
The analogy between financial leverage and operating leverage, raised in the previous sections, brings on another issue with respect to the problem definition: ultimately, the nature of the operating leverage concept leads us to look for an optimal level of operating leverage, as was indicated in the previous section. It is an appealing idea to search for an optimal cost structure (as measured with operating leverage), just as there has been a long search for the optimal capital structure (as measured with financial leverage). Apart from the measurement problems, this is only useful if the operating leverage is something that can be set (relatively) freely by the firm. The manageability of the operating leverage is an important issue if we want to understand its role in firm performance. This manageability depends on the extent to which management 'can do something' with fixed costs, sales levels and margins – the aspects that we try to capture with the term 'cost structure'.

1.2.3 another problem definition, directed at the cost structure

The problems surrounding operating leverage as the research topic are fundamental: we have measurement and definition problems, and besides that we need to look at the causes of the effect it measures in order to say something about how to achieve any target we set for its level – whatever that target may be. Therefore, to understand the importance of operating leverage, it would seem more useful to look at its cause: the cost structure. Through this, we shift our focus from one number – the degree of operating leverage *dol* – to the composition of costs, and the influences and constraints that explain the cost structure of a firm. The implication of this shift is that we are no longer looking at just the behavior of earnings, but at fixed costs, variable costs, and sales levels. To keep the link with the operating leverage, we consider these firm characteristics in light of earnings variability.
What changes when we focus on the cost structure instead of its effect? At first glance not very much, since the operating leverage is an effect of the cost structure – a better understanding of the cost structure will also help us in getting a better grasp on operating leverage. However, focusing on the cost structure leaves open the possibility that the level of *dol* is not that important, again because of measurement and conceptual problems, whereas the effect it measures *is* important. It is not the number, but the mechanism of the operating leverage that becomes the point of interest. This also changes the emphasis from an econometric view to a managerial economics, or even a management view. Consequently, an adjusted problem definition that reflects this changing emphasis is:

to contribute to the understanding of the importance of the cost structure for firm performance.

Of course, nothing much has changed in this definition except trading in operating leverage for cost structure, but the main thrust of the research is now directed at describing what happens: which cost structures can be found under which conditions? This is different from the first problem definition, presented in section 1.2.1, which tends towards prescribing the optimal level of operating leverage.

1.2.4 one more problem

In the end, even focusing on the cost structure can prove to be not basic enough. Looking at the cost structure implies looking at fixed and variable costs. As noted in 1.2.2, this results in attention for unit production costs, or general cost effectiveness. In this view, cost structures can be good or bad, and a better cost structure is one with lower unit production costs. Now, there is nothing wrong with this, of course – efficient production should be priority number one for every firm. However, we want to focus specifically on the leverage mechanism, not costs in general. We are not so much interested in management decisions that change the *overall* level of costs, as we are in the *composition* of total costs. Leverage originates from the presence of fixed charges – interest in the case of financial leverage, and fixed costs in the case of operating leverage. If we aim our attention on the presence of fixed costs, their nature, and ways to deal with them, then we can be sure that we talk about the leverage effect instead of issues like the cost efficiency of the production process.

So we arrive at a point where we find that the best way to look into operating leverage, and how firms (can) deal with it, is to leave it out of the problem definition. The path that leads to this situation is clear: the degree of operating leverage is a measure that is (a) subject to fundamental measurement problems, and (b) missing a clear link to firm characteristics. To gain more understanding, we look at the causes of the leverage effect, the cost structure. Even with the link to firm characteristics provided by the cost structure, we are left with the question what the possibilities are for management to *do* something with these characteristics, and consequently with the degree of operating leverage. This comes down to asking what management can do about the level of fixed costs. Ultimately, it is this 'fixed cost management' that results in the right view on the issue of operating leverage, what role it plays in firm performance, and what possibilities management has to apply the concept in managing its firm.

1.3 methodology

No Dutch thesis in the field of business administration and management is complete without a section on methodology. The basic choice within the Dutch tradition in this field is that between an empirical and a design methodology. In this research projects, each approach has been the operative one at some point in time. This is because the research has been guided by the *topic* at hand. The research originated from the observation that the operating leverage is a seemingly useful but little used concept, especially when compared to its financial equivalent financial leverage. Throughout the

research project, the aim has been to find out why it is used so little, and what can be done about it. This caused a shift from empirical research on large databases, to interviews, to drawing up new typologies, all with a strong emphasis on links to theory. The drive behind this is understanding the role of the operating leverage in firm management. As described in section 1.2, this necessitated shifting our attention first to the cause of the leverage effect – the cost structure – and finally to just a part of that cause – fixed costs. Should we have stuck to our original problem, we would have tried to find a way to determine the optimal operating leverage for a firm (or project).
Because the main focus of the research has shifted during the project, the structure of this thesis is somewhat different. The line that is being followed is logical (and chronological), but cannot be described as the process to answer the original question. It does, however, *address* the problem of the operating leverage, what role it plays in managing a firm, and what management can do with it and about it.

1.3.1 methodological justifications

Going back to the issue of design versus empirical research, we can explain the choices we have made from a methodological point of view. We do this by taking a look at the basic process that is going on in scientific research.[4] There are several models of the research process, each of which has its own implications for the way the research will be structured and for the objective that is pursued. All models start with the basic premise that scientific research is an iterative process. It is only by going through the motions that a result can be achieved. The oldest model is the so-called 'empirical cycle' (see figure 1-3). Science is depicted as an ongoing exchange between theory and reality.[5] The starting point can be located in either box: a real problem that is to be explained theoretically, or a theory that has to be tested in reality. Hypotheses can be deducted from theory, and they can be tested in practical situations. The results lead to falsification or confirmation of the theory, and they can also lead to modification of the theory. This is called induction; making general remarks based on a few observations. Essential to the empirical cycle is the role of theory: it is aimed at making general statements.

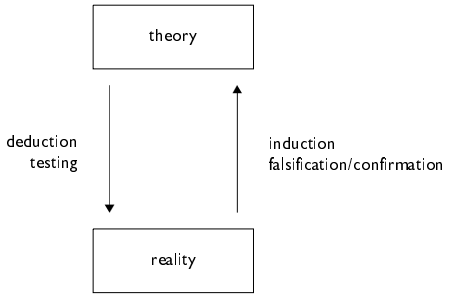

figure 1-3 the empirical cycle: trying to find general relations (source: De Leeuw, 1996, p. 57)

[4] the issues discussed are dealt with in more detail in Van Triest (1999).
[5] note that the nature of reality is not discussed. This thesis is written from a dogmatic positivistic view of the world: a unique reality exists, the trouble lies in getting to know that reality.

The starting point of empirical research is not an observed practical problem, but more often a discrepancy between theory and reality. The ultimate goal of empirical research is the explanation of practical phenomena through generalizable scientific statements. A very different approach to the research process is the regulative cycle, developed by Van Strien (see figure 1-4). It is aimed at diagnostic thinking, and tries to reach solutions to observed problems rather than generalizable results.

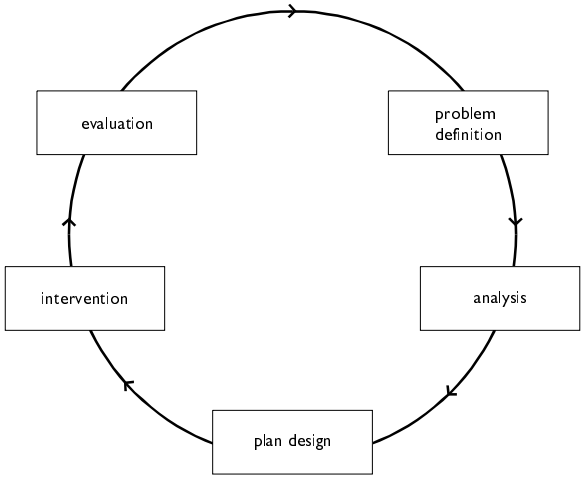

figure 1-4 the regulative cycle: tackling a single problem (source: Van Aken, 1994, p. 20)

This cycle starts with the problem definition: there is something wrong, or at least not going in a way which is considered desirable. The problem is analyzed using the available theories. Causes and symptoms are discerned. Based on the analysis, a plan is drawn up, describing concrete actions to remedy the problem. In the phase of intervention, the proposed plan is executed (or implemented). Finally, the effects of the intervention are evaluated in relation to the problem, from which a new problem definition can result.
An important aspect of the regulative cycle is its focus on design: instead of observing from a distance, there is active intervention in reality, thus creating a new reality through scientifically guided actions. It can be said that the regulative cycle is primarily oriented towards action, and the empirical cycle towards knowledge. Theory does come into play in the regulative cycle, but only on a very general, integrative level. Whereas empirical research tries to explain certain aspects of reality for the *whole* reality, design research tries to solve a specific problem in its entirety.
Because of its nature, it is hard to associate the regulative cycle with scientific research, or more specifically with the development of generalizable knowledge (ie. theories). Its importance, especially for research in the field of business administration and management, does not come from its own qualities, but more from the failure of the application of the empirical research cycle. This failure arises from the type of scientific statements that the empirical cycle produces: the general relationships that science is made of tend to be very hard to find in business administration (cf. Van Aken, 1994, p. 18). This, in turn, is caused by the fact that every organization, like every individual,

is unique. Only when more-or-less overlooking this fact is it possible to produce general statements – whose usefulness can be questioned as a result. This can be seen in the related field of financial economics.[6] In this field, firms are viewed at an aggregate level: it is not at all uncommon to infer a relation between earnings and the use of debt at an industry level, while it is obvious that such a causal relation cannot be concluded from a statistical evaluation of the data. A relation between causes and effects can only be established if the chain between dependent and independent variables is short and clear. This makes it difficult to apply in practice the knowledge resulting from empirical research in the finance tradition, performed on large numbers of firms observed over many years. All these problems do not diminish the lasting value of empirical knowledge: even in the process of design, we need to know about the properties and qualities of the research subjects, and the possibilities of changing those properties.

The research cycles are a typical Dutch phenomenon, and their usefulness is questionable. Nevertheless, they can help in justifying the evolution of the research problem described in section 1.2. At first, the research focused on the operating leverage as a firm characteristic, expressed in a single number. The ultimate idea behind this focus was the development of some sort of method or instrument to use this number in managing the firm.[7] As such, we would be operating in the regulative cycle. We would be trying to improve reality, e.g. the investment decision process, or overall firm management, by designing a support tool to incorporate the importance of the operating leverage for the 'financial behavior' of the investment project or firm. But this also means that we would take the influences of the operating leverage on firm performance and the possibilities for influencing operating leverage itself as a known basis for developing the tool. As the following chapters will show, this is not the case. This led us to the empirical paradigm, since the first step is *knowing*, as opposed to assessing.

The choice for a specific paradigm is not just a mere methodological question. It is important for the focus of the research: searching for knowledge is something different from implementing a tool. This search is aimed at a better understanding of the real relations and topics surrounding the operating leverage. Only when this territory is mapped, we have a foundation that makes it possible to suggest ways in which management can incorporate the operating leverage in their decisions, or even more how they can or should influence the operating leverage in order to improve company performance.

By structuring the research process on the basis of the empirical cycle, we achieve a shift in the theoretical basis in a sort of paradoxical direction. The development of an instrument was embedded within the theory of financial economics. It is in this field that theoretical treatments of the operating leverage and its influence on firm performance can be found. Financial economics takes the real sphere of the firm as given and, in fact, uninteresting. It looks for simple, direct causal relations, which is precisely what is needed for the development of a tool. During the course of the research, it appeared that this point of view is too narrow. It is clear that the operating leverage is not the only determinant of earnings and earnings variability; it may not even

[6] see also sections 2.2.3, 3.1, and 3.2.1.

[7] the approved research proposal included the following goal: 'to develop a management tool for investment decisions that incorporates the cost structure of a project'.

be the most important one. Therefore, we have to look at the operating leverage from a broader perspective, based on a 'business management paradigm'. This means that we accept that the internal processes and the environment of a firm are not constant, and are not represented by simple numbers or constant causal relations. We first have to establish the nature and direction of the influences on the operating leverage, and the possibilities for changing it.
What we see here is the everlasting struggle of business administration: in order to say something of practical use, we would like to aim our research at developing a useful tool. To do this, we have to view the firm as a complex, ever changing entity which we study through the regulative cycle – otherwise the tool will probably not function like we want it to. But if we want to be able to design a tool, we have to know how the firm behaves in reality. Otherwise, developing tools in individual cases may lead to practical recommendations, but it will be extremely hard to generalize the results. So we have to get a better, more accurate view of reality, of the nature of the relationships we use our tool for. This asks for analytical research. To produce practical results which go beyond the anecdotal application in the studied cases, we first have to go to a higher level of research. Should we stick to solving individual problems in unique settings, then we limit ourselves to acting scientifically, instead of generating scientific knowledge.

1.4 summary and outline

To give the reader an idea what to expect in this thesis, we now outline the structure and the main findings. This also serves as a factual summary; in the final chapter we will reflect on the issues discussed in this thesis.

operating leverage
Starting from our first problem definition, we discuss the operating leverage. We note that the degree of operating leverage dol, as measured with formula (1-1), can be rewritten into its underlying variables, price p, variable costs per unit v, fixed costs F, and units sold q:

$$dol = \frac{q(p-v)}{q(p-v)-F} \qquad (1\text{-}2)$$

This formula clearly shows where leverage comes from: the presence of fixed costs. For if F were zero, *dol* would be 1, and there would be no magnification of the change in revenues.
If we look at formula (1-2), we note that each level of sales has its own *dol.* This means that *dol* is not a unique firm (or project) characteristic. What's more, the formula can only be derived under the strict assumptions of the break-even analysis: everything is constant except for units sold q. While a first analysis of formula (1-2) suggests that for a profitable firm, *dol* is always larger than 1, this will only hold true if nothing changes. This means that it is very well possible for a profitable firm to have a *dol* below 1, when measured with the elasticity formula (1-1).
The impact of the operating leverage has been studied within the context of the capital asset pricing model CAPM. The risk measure in this model, the systematic risk β of a

firm, can be decomposed to show what the main influences are. A very clear relation has been found by Mandelker and Rhee (1984). Using the degree of financial leverage *dfl* (defined as the sensitivity of net earnings to changes in *ebit,* so equivalent to *dol* and not as a ratio of debt and equity) as a measure for financial leverage, they show that

$$\beta = dol \cdot dfl \cdot \beta^0 \qquad (1\text{-}3)$$

This relation says that the systematic risk of a firm is the result of the 'intrinsic business risk' β^0, the operating leverage *dol,* and the financial leverage *dfl.* The intrinsic business is the result of being in a market with a certain competitive position. This risk is increased by the presence of fixed charges, both financial and operational: if there are no fixed costs, *dol* is 1 and the intrinsic risk is not magnified. Although the derivation of formula (1-3) is only possible under very strict assumptions, it very elegantly shows the role of the operating leverage in firm performance: it influences the risk position.
Since we cannot observe the levels of fixed and variable costs from outside the firm, we need to use the realized earnings and sales numbers of a firm to calculate *dol.* Several methods have been suggested to measure *dol* empirically from a series of yearly financial data. All these measures tend to have their theoretical drawbacks. Even more important, however, is the fact that there is no 'true' *dol* available to test which method comes closest to providing the actual level of *dol.* We apply the methods to a database of Dutch firm financial statements, but the results are mixed. We try to relate the values found with the different methods to other firm characteristics, but no clear pattern emerges. Therefore, it is not possible to come to a conclusion on which method is the best to measure *dol* empirically.
Next to the problems of measuring *dol,* we are confronted with another issue: should we know the 'true' *dol,* what would we do with it? Could we say it is too high, or too low, or just right? An overview of the literature does not provide us with an optimal *dol.* This is because this requires an optimal level of the systematic risk of a firm, so an optimal risk position. There is no such position from a theoretical point of view. Also, since we cannot adequately measure *dol,* we cannot look for any empirical suggestions about optimal *dol*-levels.
The conclusion with respect to the operating leverage is clear: it is a concept that helps in explaining firm performance, and it is important for firm performance. However, we cannot come to any conclusions with respect to the relation between operating leverage, firm characteristics, and firm performance.

cost structure

Although the operating leverage phenomenon is important, operationalizing it as a number does not seem very useful. Therefore, we direct our attention towards the cost structure that underlies the leverage effect. Rather than looking at an aggregate number, we are now going to focus on the cost structure, the levels of fixed and variable costs, and revenues of a firm. As a consequence, we can shift our attention from the result of the cost structure, the degree of operating leverage, to its influences and determinants.
After positioning the research in a broader context than the narrow financial economics framework of the *dol,* we discuss the importance of earnings variability. Since the cost structure expresses itself in the variability of earnings, establishing the importance of

reducing this variability translates into support for looking into the cost structure. This support is found in the fields of financial economics, accounting, and strategic management, and a more general discussion on the goal of the firm also leads to conclusion that reducing earnings variability is important.
As a result, we are able to draw up a model that views the cost structure as a mechanism through which the important influences on earnings variability are translated (see figure 1-5). Note that we still think it is very important, but no longer do we see it as the target variable that can be assigned an absolute optimum value. The influences included in the model are chosen based on logical reasoning rather than rigorous theory development. Therefore, it is not clear yet what the nature of the lines in the model is. A variation in sales will result in a variation in earnings, but we can also expect that the nature of the sales patterns influences the choice of the cost structure.

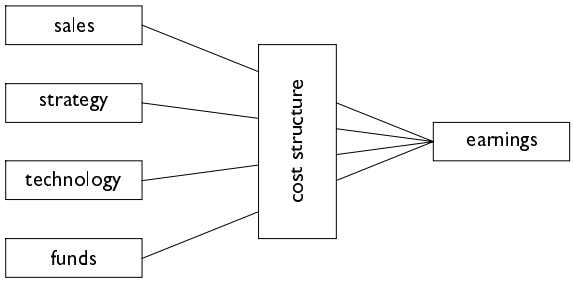

figure 1-5 a conceptual model of the position of the cost structure with respect to influencing variables and earnings.

To fill in the model, a series of interviews was conducted with (mostly) controllers of independent firms or business units of larger firms. We talked with the interviewees about the role of the cost structure, its influences and its importance. What became clear was that the cost structure is not seen as something a firm chooses as such: it is the result of other decisions, involving issues like the technological constraints and the market structure, but also control issues, flexibility aspects, and simply the financial benefits from making the products. This implies that viewing the cost structure as 'nothing more' than the mechanism through which the variables influence earnings variability is correct.
However, at the same time, it proved very difficult to distinguish the cost structure as a topic of interest from cost awareness in general. The issues that we identified beforehand as influencing the cost structure, sales, technology, strategy, and funds, did come back more-or-less in the interviews, but we cannot come to a clear picture of the nature of the lines in figure 1-5. This is precisely the cost structure is 'nothing more' than a mechanism: there is no reason why a certain sales pattern, or a certain strategy, should result in any specific cost structure. And the other way round: a specific combination of fixed and variable costs does not have a corresponding profitability. This also means that the model of figure 1-5 helps us a little in understanding the cost structure, but does not bring us all the way. To come all the way, we need to take yet another approach to the subject of this thesis. The basic cause of the leverage effect, the presence of fixed costs, now becomes the focus of the research.

fixed costs

Having discarded operating leverage and cost structure as practical concepts to apply in management tools, we still recognize their overall importance to firm performance. In order to develop some practical handles, we turn to fixed costs as the center of our research. Next to the fact that fixed costs are the cause of the leverage effect, this choice is also inspired by the observation that the interviewees generally felt that fixed costs were an important issue, even in firms where they were relatively low. This suggests that fixed costs are something to which managers can 'relate', more than is the case with the operating leverage and the cost structure.

We start with a discussion on the nature of fixed costs. Fixed costs are costs that do not vary with a change in a cost driver – typically volume. More generally, they can be thought of as costs that only change when management takes specific action to do so. We do not distinguish between cash and non-cash fixed costs, with non-cash costs being mainly depreciation.

Next, we discuss flexibility management, as a first step towards 'fixed cost management'. Being flexible requires possibilities to choose. These possibilities can also include changing fixed costs levels. However, the flexibility literature seems to center on the *built-in* flexibility of processes, i.e. the flexibility that the existing configuration with its corresponding fixed costs levels provides. Although such built-in flexibility is very attractive for a firm, it is not what we are looking for when talking about fixed cost management, which focuses on how to deal with fixed costs.

To structure our ideas, we list a series of managerial actions that influence fixed costs. This can be through changing the existing level of fixed costs, through substituting fixed and variable costs (in both ways), or through taking revenue measures. Increasing revenues without increasing fixed costs makes fixed costs less important, and as such is also a way to manage them. We look at the way the management actions influence important firm characteristics: capacity, the product mix, and the revenue. We plot them against the break-even point instead of earnings or some other performance indicator. This has the major advantage of not needing an existing performance level, while still providing insight into the impact of the actions on the overall risk position of the firm.

The figures that result do not capture all there is to fixed cost management. The decision to take any action should be based on a capital budgeting decision, but there are more issues that come into play. These regard technology, control, supplier and buyer relations, and strategy. All these issues can influence the isolated financial analysis that suggests a certain action should be taken, which basically means that the problems that can result will lead to a lower financial outcome. It may also be possible that flexibility considerations take precedence over the financial evaluation, but in general, the flexibility benefits can be incorporated in the financial figures. If we start from the premise that a firm wants to be as flexible as possible, we can draw up a 'theory' of fixed cost management. The firm will want to bring down the fixed costs as much as possible, until a constraint kicks in. Next to technology, this will mostly be the financial aspect, for example the benefits of economies of scale. But control and relation issues can also limit the possibilities to lower fixed costs.

In a second series of interviews, we find that taking fixed costs as the topic leads to more discussion on the cost structure, as opposed to costs in general. The issues we identified as playing a role in fixed cost management help in explaining existing cost structures. This leads us finally to where we want to be: not only understanding the importance of operating leverage and the cost structure, but also what is important in choosing a cost structure, and consequently what a firm should take into account when setting its cost structure.

2 operating leverage

In this chapter, we analyze the operating leverage, as measured with the degree of operating leverage or *dol*. With our research goal in mind – understanding the importance of operating leverage to firm performance – we are going to tackle the following sets of questions.

1 the nature of operating leverage

(a) what is operating leverage? This is to describe the basic mechanism of operating leverage;

(b) what measures of operating leverage are there? Here we look at the formulas that there are to capture the leverage effect in figures;

(c) what do textbooks on financial management and management accounting say about operating leverage? More than scientific journal articles, textbooks can be expected to represent the current knowledge about the importance and the application of the operating leverage concept.

2 research on operating leverage

(a) what is the theoretical importance of operating leverage? An overview of the research into operating leverage as an independent variable;

(b) what methods are there to measure the degree of operating leverage from empirical data? As will become clear from the answer to question 1(b), measuring the degree of operating leverage presents difficulties that require more-or-less sophisticated procedures;

(c) what measurement method – if any – adequately measures the degree of operating leverage? Using our own set of financial statements, we will evaluate the methods from the previous question;

(d) what does theory tell us on the applications of the degree of operating leverage? In other words, what ideas are there with respect to operating leverage as the dependent variable.

With these questions, we have covered the theoretical aspects of operating leverage as measured with *dol* and the research that has been done on the subject both theoretically and empirically. There is another question to be answered on the concept itself. This has to do with the observations made in section 1.2.1 (page 4): the discrepancy in the attention paid to financial leverage on the one hand and operating leverage on the other. Since this issue is not so much related to the *dol*, but requires discussion at a more conceptual level, this will be deferred until the next chapter.

2.1 operating leverage: what it is

As indicated in the opening section of this thesis, the interest in the operating leverage of firms arises from the different patterns of earnings development that can be observed in practice. Why is it that some firms react very strongly to a change in revenues, whereas others show much smaller fluctuations? To find an answer to this question, we

take a look at a basic tool of business economics: the cost-volume-profit analysis or break-even analysis. In this analysis, the following profit equation is used:

$$X = q(p - v) - F \qquad (2\text{-}1)$$

with X = profit
q = unit sales
p = price
v = variable cost per unit
F = fixed costs

The only 'real' variable in this model is q, the unit sales. All other variables are, in fact, parameters: they are fixed. The equation allows us to compute the break-even point, the level of sales at which there is neither a profit nor a loss. It also tells us something about the sensitivity of the profit to a change in sales. Most of all with respect to the current research, it shows what determines that sensitivity: the contribution margin, $p - v$. Depending on the contribution margin, the profit will change more or less with a change in sales. Consider the following two projects:

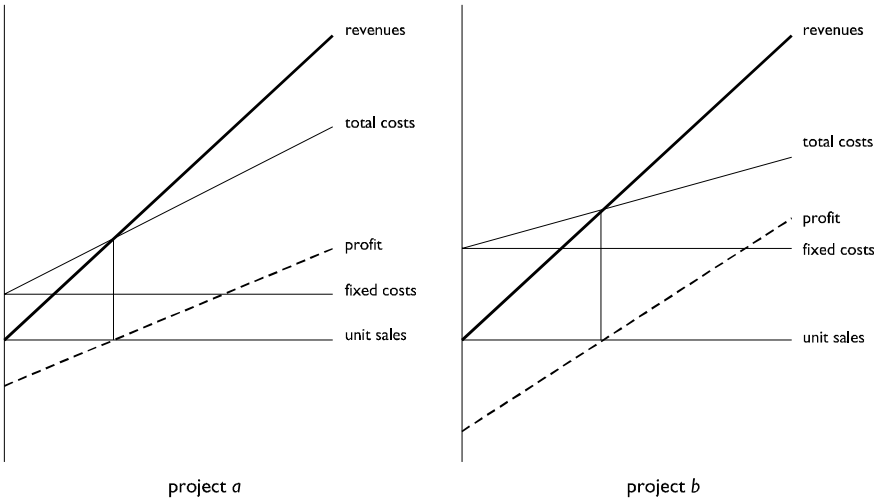

figure 2-1 two projects, the same revenues line, different profit lines: the basic mechanism of operating leverage.

Project *a* and project *b* can be thought of as two different methods to manufacture the same product. Their break-even graphs show the same revenues line. The composition of total costs differs, however. Project *a* has low fixed costs, but high variable costs. This means that the break-even point is reached at a relatively low sales level. Also, because of the low contribution margin, profit grows modestly with an increase in sales. If we look at project *b*, we see high fixed costs and low variable costs. The implication for the profit line is obvious: it has a much steeper incline than that of project *a*. So we see that two projects with an identical sales pattern behave differently in their profit

development. The cause is the difference in the cost structure of their operations; hence the name operating leverage.[1]

When looking for a definition of operating leverage in the literature, we come across two kinds of definitions (or more often descriptions) of operating leverage:

(1) cost oriented: operating leverage is defined in terms of fixed and variable costs. Brigham and Gapenski (1991, p. 483) define it as 'the extent to which costs are fixed', Emery and Finnerty (1997, p. 313) as 'the relative mix of fixed versus variable costs in the process used to produce a product or service', and Brealey and Myers (2000, p. 240) as 'the commitment to fixed *production* charges';

(2) result oriented: operating leverage is defined as the sensitivity of earnings (*ebit*) to fluctuations in sales. This is an elasticity, a common measure in economics. Neveu (1981) explicitly equates leverage with elasticity, and he defines operating leverage as 'the resulting percentage change in *ebit* divided by the percentage change in output' (p. 98). O'Brien and Vanderheiden (1987, p. 45) state that '[operating] leverage generally refers to the single-period magnification of the uncertainty of operating income relative to the uncertainty of sales'.

These approaches are two sides of the same coin: the first is related to the cause of the leverage effect, the second to its result. Equivalently, the first refers to the fixed and variable cost lines in figure 2-1, the second to the profit lines. As the tentative description of O'Brien and Vanderheiden shows, there seems to be no generally accepted definition of operating leverage. We will return to the definition issue later in this chapter. For the moment, it is enough to recognize (1) that operating leverage has an impact on the sensitivity of *ebit* to fluctuations in sales, and (2) that it has something to do with the composition of costs.

2.2 operating leverage formulas

The operating leverage concept is essentially dynamic; this is shown by the fact that two graphs are needed to illustrate it. Therefore, capturing the operating leverage in a formula seems to demand an elasticity. However, the literature also knows a measure for the operating leverage that is static, i.e. in which variables are used that are measured at one point in time instead of over a period. The two approaches reflect the two kinds of descriptions of operating leverage presented in the previous section.

2.2.1 elasticity formulas

The dynamic formula for the operating leverage is the elasticity of earnings to sales. This measure was introduced in section 1.1, and dubbed 'degree of operating leverage', or *dol* (see e.g. Neveu, 1981, p. 93ff):

$$dol = \frac{\Delta\%ebit}{\Delta\%sales} \qquad (2\text{-}2)$$

[1] according to Brigham and Gapenski (1991, p. 486), the operating leverage concept was originally developed specfically for use in capital budgeting, so for performing comparisons as shown in figure 2-1.

The elasticity simply says that a certain percentage change in sales results in a percentage change in *ebit* that is magnified by the value of *dol.* If a firm has a *dol* of 2, a 10% growth in sales will result in a 20% growth in *ebit*. Of course, a 10% *decline* in sales will result in a 20% decline in *ebit*. Since we are interested in effects resulting from the cost structure of the operations, we use the earnings before interest and taxes (*ebit*) in the numerator.
Because we will frequently return to the similarities and differences between financial leverage and operating leverage, it is useful to formulate the influence of financial leverage analogously to the degree of operating leverage. Whereas financial leverage refers to some ratio of debt to equity, the degree of financial leverage or *dfl* measures the sensitivity of net income, after interests and taxes, to changes in *ebit:*

$$dfl = \frac{\Delta\%net}{\Delta\%ebit} \tag{2-3}$$

The two leverage effects can be combined to cover the overall elasticity of net income to sales. This 'degree of combined leverage' or *dcl* is indeed the product of *dol* and *dfl*:

$$\begin{aligned} dcl &= \frac{\Delta\%net}{\Delta\%sales} \\ &= \frac{\Delta\%ebit}{\Delta\%sales} \cdot \frac{\Delta\%net}{\Delta\%ebit} \\ &= dol \cdot dfl \end{aligned} \tag{2-4}$$

Although the *dol*-formula is relatively well-known, the other two elasticities are rarely used. Financial leverage is much better known as the debt-to-equity ratio, and the combined leverage effect has no popular equivalent.

2.2.2 variable formulas

Although the elasticity formulas succeed in capturing the leverage *effects*, they do not convey much information on the *causes* of the leverage. This is due to their aggregation level. The general numbers used (sales, *ebit*, net earnings) make them easy to calculate, but do not tell us where the leverage comes from. Furthermore, they do not allow a calculation of the leverage at a specific point in time. However, it is possible to rewrite the elasticity formulas so that the leverage effects can be calculated in a static situation. To do this, we start with two simple equations for *ebit* and for sales:

$$X = q(p - v) - F$$
$$R = pq$$

The symbols are the same as in formula (2-1), the profit equation from the break-even analysis. Next to the equation for *X,* the *ebit*, we have a simple equation for dollar sales or revenues *R.* If we apply the assumptions from the standard CVP-setting (only q can vary, all other variables are held constant, just one product or a constant product mix), we can make the following derivation (where q_i is unit sales in year i):

$$
\begin{aligned}
dol &= \frac{\Delta\%X}{\Delta\%R} \\
&= \frac{\dfrac{q_2(p-v)-F-(q_1(p-v)-F)}{q_1(p-v)-F}}{\dfrac{q_2p-q_1p}{q_1p}} \\
&= \frac{\dfrac{(q_2-q_1)(p-v)}{q_1(p-v)-F}}{\dfrac{q_2-q_1}{q_1}} \\
&= \frac{(q_2-q_1)(p-v)}{q_1(p-v)-F}\cdot\frac{q_1}{q_2-q_1} \\
&= \frac{q_1(p-v)}{q_1(p-v)-F}
\end{aligned}
\qquad (2\text{-}5)
$$

Under the assumptions of the break-even analysis, the *dol* of a business entity at any point in time can be written as a function of *p, v,* and *F,* and of the unit sales *q* at that point in time.[2] What is more, however, this formula shows where the leverage effect comes from: the existence of fixed costs. For if *F* were zero, *dol* would be 1, and there would be no magnification of the sales fluctuation in the change in earnings.

Just as with *dol,* we can derive a formula for *dfl* that shows where the financial leverage effect comes from. First, we need an equation for the net profit:

$$Y = (1-\tau)(X-I)-P$$

with X = *ebit*
Y = net income
τ = tax rate
I = interest
P = preferred dividends

Again, we assume that all variables are actually constant parameters except for *ebit* (as a result of the changes in *q).* With this assumption, and with Y_i the *ebit* for year *i*, we get:

[2] it is more correct to talk about the *dol* for one *period* in time, e.g. a month or a year, since we still need a sales level. However, the difference with the elasticity formula remains: we only need information from *one* period, as opposed to two.

$$
\begin{aligned}
dfl &= \frac{\Delta\%Y}{\Delta\%X} \\
&= \frac{\dfrac{((1-\tau)(X_2 - I) - P) - ((1-\tau)(X_1 - I) - P)}{(1-\tau)(X_1 - I) - P}}{\dfrac{X_2 - X_1}{X_1}} \\
&= \frac{(X_2 - I) - (X_1 - I)}{X_1 - I - \dfrac{P}{1-\tau}} \cdot \frac{X_1}{X_2 - X_1} \\
&= \frac{X_1}{X_1 - I - \dfrac{P}{1-\tau}}
\end{aligned}
\qquad (2\text{-}6)
$$

Under the assumption that interest charges, preferred dividends, and the tax rate are constant, it can be shown that the financial leverage effect originates from the presence of interest charges and preferred dividends, the fixed financial costs. The exercise can also be undertaken for the *dcl*, which results in

$$
dcl = \frac{q(p-v)}{q(p-v) - F - I - \dfrac{P}{1-\tau}} \qquad (2\text{-}7)
$$

Again we see that leverage is caused by the presence of fixed charges. If no fixed charges were present, the *dcl* would be 1, and the net income would vary directly with the variations in sales.

It is also possible to derive the formulas in a more formal way, based on the mathematical definition of an elasticity. The elasticity of *a* with respect to *b* presupposes a certain relationship between *a* and *b*: *a* can be formulated as a function of *b*, or $a = f(b)$. The elasticity is defined as follows (Westermann, 1984, p. 56):

$$
\frac{\dfrac{\mathrm{d}f(b)}{f(b)}}{\dfrac{\mathrm{d}b}{b}} = \frac{\mathrm{d}f(b)}{\mathrm{d}b} \cdot \frac{b}{f(b)} \qquad (2\text{-}8)
$$

In the case of *dol,* we view *ebit* as a function of revenues, $f(R)$. Then we can express $f(R)$ as

$$
f(R) = m_d R - F
$$

with m_d the contribution margin per dollar sales, $1 - v/p$. Substituting in the elasticity definition from equation (2-8), we get:

$$
\begin{aligned}
dol &= \frac{\mathrm{d}f(R)}{\mathrm{d}R} \cdot \frac{R}{f(R)} \\
&= m_d \cdot \frac{R}{m_d R - F} \\
&= \frac{(1-\frac{v}{p})pq}{(1-\frac{v}{p})pq - F} \\
&= \frac{q(p-v)}{q(p-v)-F}
\end{aligned}
\qquad (2\text{-}9)
$$

This result is the same as that of the 'simple' derivation, equation (2-5). It can be shown that the formal derivations of *dfl* and *dcl* produce the same result as their 'simple' derivations.

2.2.3 assumptions

The variable formulas show clearly what causes leverage, namely fixed costs and fixed charges. The derivation of the formulas is only possible, however, under the strict assumptions of the CVP-analysis. Since these assumptions limit the practical applicability of the formulas, we will examine them in this section. Some authors regard them as uninteresting, like Magee (1975, p. 257) who states: 'Underlying this model are a number of assumptions and simplifications – too obvious to list here.' The assumptions listed by other authors are plentiful (Rayburn (1986) produces a total of 11), but they all derive from two basic ones:

(1) one variable: CVP-analysis has only one variable, the unit sales. This accounts for the popularity of the model: a graphic representation produces a simple straight line. In management accounting, this is denoted as the relevant range: the range in which we can reasonably assume that the costs will indeed continue to behave the same. It is easy to see that this concept is directly applicable to the *dol* and *dfl* formulas, since their derivation (see equations (2-5) and (2-6)) is based on it. One has to question how realistic it is to assume price to be constant over a number of years, or variable and fixed costs not to change;[3]

(2) limitations in applicability: the analysis is only applicable in certain circumstances. This follows directly from the first assumption, but it is important to emphasize the consequences. The first consequence is that only one product (or production process) can be analyzed. This means that application at firm level is only possible in the case of a single-product company, or when there is a constant product mix. Next, there is no room for new investments, changes in the operational structure, expansions, process improvements etc. The situation is totally static. Finally, it has to be possible to divide costs into variable and fixed costs.

[3] see Vickers (1960) for an interesting reconciliation of the relevant range concept and the economic approach to firms including diminishing returns and economies of scale.

There have been attempts to expand the domain in which CVP-analysis is applicable.[4] It is possible to incorporate certain flexibility issues such as setup costs, and keep the analysis simple (Newman and Hanna, 1994). However, the introduction of multiple products and stochastic variables may lead to models that are more realistic, but they result in unmanageable equations that lose the attractive simplicity of the 'traditional' model (see e.g. Miller and Morris, 1985, and Chung, 1993).
All adjustments that violate the first assumption mentioned above make the derivation of the *dol* and *dfl* formulas impossible. This indicates that their applicability is restricted to theory. A firm is not static, and the operating leverage concept specifically is dynamic by nature. Nevertheless, the formulas are very useful in understanding the importance of leverage effects and fixed charges in general. Therefore, we will pay some more attention to behavior of the *dol* formula.

2.2.4 *algebra of* dol

The *dol* formula as derived in section 2.2.2 (page 19) can be examined under the assumption that it is a function of q. To see how it behaves, we note that it is a variant of the well-known function

$$f(x) = \frac{1}{x}$$

This can be shown by rewriting the formula as follows (O'Brien and Vanderheiden, 1987, p. 46):

$$\begin{aligned} dol &= \frac{q(p-v)}{q(p-v)-F} \\ dol - \frac{F}{q(p-v)-F} &= \frac{q(p-v)}{q(p-v)-F} - \frac{F}{q(p-v)-F} \\ dol &= 1 + \frac{F}{q(p-v)-F} \end{aligned} \qquad (2\text{-}10)$$

The function $1/x$ has a horizontal and a vertical asymptote. The horizontal asymptote of *dol* is at $dol = 1$: when q approaches plus or minus infinity, the term containing q approaches zero. If we let the domain of q start at zero, the starting value of *dol* is zero. The vertical asymptote arises when the denominator in formula (2-5) is zero. This happens at $q = F/(p - v)$, and this is of course the break-even point. Around the break-even point the value of *dol* jumps from a large negative to a large positive value (see figure 2-2). Note that the line for *dol* starts at $dol = 0$, because negative sales are beyond the domain; should we allow negative sales, the line would approach the horizontal asymptote at $dol = 1$.

[4] see Schweitzer, Trossman, and Lawson (1992) for an extensive overview of variants and extensions.

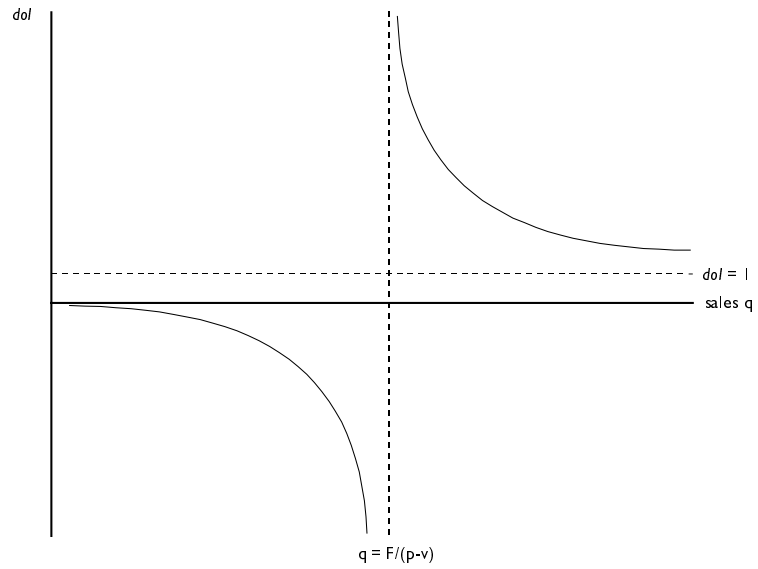

figure 2-2 *dol* versus unit sales, *q*. The dotted lines are the asymptotes at $dol = 1$, and at the break-even point $F/(p - v)$.

The *dol* of a static project process, that is a project whose fixed and variable costs are constant, is negative when it is below the break-even point (when it is making a loss), and greater than 1 when it is making profit. Care should be taken, however, to interpret the graph correctly. It is different for different operational structures, which means that every project has its own graph. Within this graph we see that every level of *q*, so every sales level, has its own *dol*. *This means that the* dol *is not a unique characteristic of a business entity*. At the most, it can be interpreted as an indication of how far the project is from its break-even point. To see this, note that a high *dol* can result not only from a large *F*, so high fixed costs, but also from a low contribution margin and thus a low profit level. This can also be shown by rewriting (2-5) through making use of the break-even formula $q_{be} = F/(p - v)$:

$$\begin{aligned} dol &= \frac{q(p-v)}{q(p-v)-F} \\ &= \frac{q\dfrac{F}{q_{be}}}{q\dfrac{F}{q_{be}}-F} \\ &= \frac{q/q_{be}}{q/q_{be}-1} \end{aligned} \qquad (2\text{-}11)$$

If we produce a graph of *dol* versus q/q_{be}, so versus the 'distance' from the break-even point, we get a standard *dol* graph, applicable to all cost structures (Van Horne and

Wachowicz, 1998, p. 431). If any firm operates close to its break-even point, the *dol* will be high, and it will approach 1 as the firm becomes increasingly profitable.

2.2.5 more on dol *and its variables*

Deriving the variable formula (2-5) for *dol* requires some strong assumptions. As noted, all variables in the equation are assumed constant. However, we would like to say something more about the influences of fixed and variable costs, and of price levels. In the previous section, we saw that the interpretation of *dol*-values is restricted to one composition of costs, so one cost structure. The *dol* is not a unique characteristic for this cost structure, but varies with the sales level. What can we say about the reaction of *dol* to changes in the other variables? At first, one could be inclined to say that it is not possible to say anything about this because of the assumptions behind the *dol*-derivation. However, since we are dealing with a 'normal' function of several variables, there is nothing that keeps us from evaluating the derivatives of *dol* with respect to *p, v,* and *F.* All we need to do is to be very clear in our interpretation of the results: we are analyzing the implications of changing one of the constant variables, so changing the starting point to calculate *dol* at the same levels of *q.* We do *not* introduce any variability in these constant variables, so we do not relax the assumptions of equation (2-5).
We know that the derivative of a division of two functions is calculated as follows:

$$\frac{\mathrm{d}\left(\frac{f(x)}{g(x)}\right)}{\mathrm{d}x} = \frac{f'(x)g(x) - f(x)g'(x)}{(g(x))^2} \qquad (2\text{-}12)$$

With this formula, we can calculate the derivatives of *dol* (see also Lord, 1995). We start with the derivative of *dol* with respect to the price *p*.

$$\begin{aligned}\frac{\mathrm{d}dol}{\mathrm{d}p} &= \frac{q(q(p-v)-F)-(q(p-v))q}{(q(p-v)-F)^2} \\ &= \frac{-qF}{(q(p-v)-F)^2}\end{aligned} \qquad (2\text{-}13)$$

For the derivative with respect to *p,* as well as for all others, the denominator is always positive except for the break-even point, where the derivative does not exist. This means that we only have to look above the line, at the numerator. We see that the derivative is negative, so an increase in price leads to a decrease in *dol.* Intuitively, we could expect that a higher price would mean a higher *dol:* the variation per unit of sales is larger because of a higher contribution margin $p - v$. However, the price increase means that at a constant level of unit sales, we are further from our break-even point. While the absolute variation in earnings will be larger, relative to the new level of earnings this variation is smaller, resulting in a lower *dol.* Bear in mind that in deriving (2-13), all other variables including *q* are held constant. We are establishing the effect of a price increase given an existing production configuration and keeping our unit sales constant.
Taking the derivative of *dol* with respect to the variable costs, we get:

$$\frac{\mathrm{d}dol}{\mathrm{d}v} = \frac{-q(q(p-v)-F)-(-q(p-v))q}{(q(p-v)-F)^2} = \frac{qF}{(q(p-v)-F)^2} \tag{2-14}$$

As is to be expected, the derivative is the opposite of that for *p*: an increase in *v* leads to an increase in *dol.* Again, we have to think twice about our intuition: the decreasing contribution margin does result in a lower absolute variation per unit of sales, but this is more than offset by the lower level at which the earnings end up. Note again that we are only looking at a change in *v*. This means that with constant *F*, *p*, and *q*, we increase the total costs while holding revenues constant. Of course, this leads to a higher *dol*: the firm moves closer to its break-even point.
Finally, we get to the derivative with respect to the fixed costs:

$$\frac{\mathrm{d}dol}{\mathrm{d}F} = \frac{0-(-q(p-v))}{(q(p-v)-F)^2} = \frac{q(p-v)}{(q(p-v)-F)^2} \tag{2-15}$$

This is what we would expect: an increase in *F* leads to higher *dol.*
The derivatives show us that we have to think twice in relating changes in the causes of operating leverage and *dol.* When we do that, however, the results are logical. Lord (1995, p. 327–329) remarks after presenting the derivatives:

> Many textbook presentations of *dol* and the break-even point leave the impression that these measures increase unambiguously when a firm increases fixed expenses and lowers unit variable costs in its production function. We demonstrate that *dol* increases with a rise in either fixed or variable costs, not just fixed costs.

As is stressed above, this is true when *everything* else (including sales) is held constant. One has to question the added value of the analysis when we realize that we are looking at a situation where the variable costs increase while the fixed costs stay constant. If this were a comparison between an existing situation and a new one, it would be immediately clear that increasing variable costs without changing fixed costs or price would lead to a lower earnings level. That it also leads to a higher *dol* is only of secondary interest.
Of course, when comparing e.g. two ways to manufacture a product, we will generally expect that higher fixed costs are offset by lower variable costs. This prompts the question of whether there is a trade-off of fixed for variable costs that leads to the same *dol* (i.e. the same *dol* graph). This amounts to having two cost structures with different fixed and variable costs that have the same *dol:*

$$
\begin{aligned}
dol_1 &= dol_2 \\
\frac{q(p-v_1)}{q(p-v_1)-F_1} &= \frac{q(p-v_2)}{q(p-v_2)-F_2} \\
\frac{qm_1}{qm_1-F_1} &= \frac{qm_2}{qm_2-F_2} \\
qm_1(qm_2-F_2) &= qm_2(qm_1-F_1) \\
qm_1F_2 &= qm_2F_1 \\
\frac{F_2}{m_2} &= \frac{F_1}{m_1}
\end{aligned}
\qquad (2\text{-}16)
$$

where m_i is the contribution margin $(p - v_i)$ for project *i*. When the ratio of fixed costs to the contribution margin is the same, the two projects have an identical *dol* at the same level of unit sales – meaning that their *dol* graph is the same. This ratio is of course the well-known break-even point. If we substitute fixed costs for variable costs at the rate of break-even sales, the *dol* remains the same.

We learn two important lessons from this observation. First, not only does the *dol* of a business entity change with unit sales *q*, if we are faced with a choice between two processes to make a product, their *dol* graphs do not necessarily differ. This implies that the *dol* apparently does not always help in making such investment decisions (which are not uncommon). Second, we keep returning to the break-even point as an important number when talking about *dol*. This stresses that revenues are an inherent aspect of *dol* – which means that there is more to *dol* than costs alone. The implications of this are discussed in the next section.

2.2.6 *operating leverage vs. financial leverage, or on the nature of* dol

In section 1.2.2 (page 5), we indicated that talking about cost structures is not possible without paying attention to revenues. If the cost structure is defined as something like 'the relative mix of fixed versus variable costs in the process used to produce a product or service' (Emery and Finnerty, 1997, p. 313), or more generally as the ratio of fixed to variable costs, we do not capture the whole picture of what *leverage* is about.[5] At this point, it is useful to take a closer look at leverage.

As a physical term, leverage means the employment of a small cause to get a large result. In a financial environment, this reinforcement effect is not quite what is meant by leverage: 'leverage refers to the use of fixed costs in an attempt to increase (or lever up) profitability' (Van Horne and Wachowicz, 1998, p. 425). In other words, leverage indicates not so much a force as it does a level.[6] In the case of financial leverage, the interest on debt is the level of earnings that has to be reached in order for the shareholders to earn anything. However, once that level has been reached, everything that exceeds it goes to the shareholders. Translated to the operational characteristics,

[5] note that we have carefully tried to avoid the term 'cost structure' in the previous sections.

[6] the term leverage was popularized by the famous article of Modigliani and Miller (1958), as mentioned in section 1.2.1. In this article, they explicitly equate leverage with 'the degree of financial risk', which differs in another direction from the physical interpretation of leverage.

we see that the total contribution margin earned first has to be used to cover the fixed costs; only when it exceeds the fixed costs, is the contribution margin added to *ebit*.[7]
Next to the fact that leverage denotes a level instead of a magnification factor, we see that the most common measures of financial leverage do not include this level.[8] The degree of financial leverage introduced in section 2.2.1 does include the interest payments, but this formula is hardly used. In general, financial leverage is defined as a ratio of debt to equity – sometimes in book values, sometimes in market values. These amounts of debt and equity are not the direct causes of the leverage effect; rather, they are the underlying quantities. *There are no such quantities for the operating leverage.* Interest is the fixed charge resulting from the use of debt; we cannot identify any quantity from which the level of fixed costs results.
This difference between measuring financial leverage with *dfl* and with a debt ratio is essential: first, a debt ratio is a static measure, that can be observed at any point in time. What's more, however, a debt ratio is not dependent on the *performance* of the firm: although the ultimate leverage effect on earnings available to shareholders is determined by *ebit*, and thus by the performance, we do not need to know this level of *ebit* to establish the debt ratio. The reason why we cannot do the same with the operating leverage, by simply taking the ratio of fixed to variable costs, lies in the fact that debt and equity are *not* (directly) connected to the causes of the leverage effect (interest and earnings), whereas fixed and variable costs are. Again, the fixed costs play the role of interest, so the fixed costs play a direct role in the leverage effect – whereas debt does not. Fixed and variable costs are of a different nature than debt and equity with respect to firm performance.
So we see that the nature of *dol* is not different from the nature of *dfl*, and consequently the mechanisms of operating leverage and financial leverage are the same. However, since financial leverage can be linked to underlying quantities, its measurement and interpretation can be different from operating leverage.[9] Consequently, we can ask whether cost structure and capital structure are really equivalent. The answer seems to be 'no'. Whereas the capital structure is represented by the right-hand-side of the balance sheet, we cannot infer the cost structure from the left-hand-side. Of course, the asset side determines in part the level of fixed costs, but even if there were no other sources of fixed costs, we would still know nothing on the level of variable costs.

---

[7] note that to keep the analogies complete, we should define the elasticity formula of *dol*, equation (1-1), as the percentage change in earnings over the percentage change in *contribution margin*, instead of sales. Just as we pay interest out of *ebit*, we cover the fixed costs with the contribution margin, not sales. But since all variables except units sold are assumed constant, the percentage change in dollar sales and in total contribution margin are the same.
[8] in an early article, Ghandhi (1966) states that there is little agreement on the precise definition of leverage. He discusses three types of leverage measures: (1) 'stock' measures like the ratio of debt to equity, (2) 'flow' measures like the ratio of interest to *ebit*, and (3) 'return' measures such as the ratio of return on equity to return on assets. Of these measures, the 'stock' measures have proven to be the clear winners.
[9] the fact that operating leverage can only be measured with a *dol*-like method will come back to haunt us in our efforts to empirically measure operating leverage.

2.3 textbooks on operating leverage

The operating leverage receives some attention in most financial management textbooks. To get an idea about the possible uses and interpretations of the concept, we will give an overview of what several more-or-less popular handbooks say about it.

Brealey and Myers (2000): operating leverage is discussed as an important determinant of systematic risk as measured with β, the risk measure from the capital asset pricing model (see section 2.4.1). 'Other things being equal, the alternative with the higher ratio of fixed costs to project value will have the higher project beta' (p. 241). No applications of the concept are given.

Brigham and Gapenski (1991): operating leverage is introduced without formulas. Next to emphasizing its influence on business risk, the possibility to control operating leverage is discussed. 'To a large extent, operating leverage is determined by technology... Still, although industry factors do exert a major influence, all firms do have some control over their operating leverage' (p. 486).

Emery and Finnerty (1997): the concept of operating leverage is introduced, but no formulas are given. The influence of the operating leverage on firm risk is stressed several times. It is noted that a firm often has little control over a project's operating leverage because of technological, efficiency, or other production considerations. No applications of the concept are given.

Gallagher and Andrew (1997): all types of leverage are discussed in their elasticity and variable formulation. The importance of operating leverage for business risk is stressed, as is the importance of leverage effects in general.

Neveu (1981): there is a separate chapter for leverage, in which all formulas are presented. Three applications of the operating leverage concept are discussed: (1) explaining magnification of percent changes in *ebit*, (2) explaining errors in *ebit* forecasts, (3) measuring business risk.

Van Horne and Wachowicz (1998): all types of leverage are discussed as elasticities and variable formulas, and their influence on firm risk as measured with earnings variability is analyzed.

The general impression from the textbooks is that the operating leverage concept is well known, and the relation between (business) risk and high fixed costs is emphasized. However, we can also state that not very much is being done with the concept. No ideas are given about when to strive for what degree of operating leverage, how to adjust the operating leverage, what can be done with the measures etc. The most concrete remarks are like the one in Van Horne and Wachowicz (1998, p. 432): 'As a general rule, firms do not like to operate under conditions of a high degree of operating leverage.'

All in all, it is presented as a concept that helps in understanding certain aspects of firm performance, most notably the earnings development and the business risk. However, hardly any attention is paid to the question of if and how it can be used as a management tool. This is even more the case for the management accounting literature. Textbooks often do not mention the concept (e.g. Kaplan and Atkinson, 1997), and the very popular textbook of Horngren, Foster, and Datar (2000) refers to it by name for the very first time in their latest edition. So our claim made in section 1.2.1 (page 4) seems

justified: not much attention is paid to operating leverage in the literature on financial management and management accounting.

2.4 research

Although operating leverage is not dealt with extensively in textbooks, there has been some research into it. It is not possible to review this literature without introducing the capital asset pricing model (CAPM) and its risk measure β. All research articles – both theoretical and empirical – that concern the operating leverage are related to the influence of the cost structure on the β of a firm. The only exception we are aware of is the article by Lord (1995, referred to in section 2.2.5, page 25) that deals with the algebra of *dol*. This is why we will start with a short introduction on the CAPM.

2.4.1 the capital asset pricing model

The development of the capital asset pricing model is usually attributed to Sharpe (1964, 1970) and Lintner (1965), while the names of Treynor, Mossin and Black are often also mentioned. It is based on the portfolio theory of Markowitz. Although the theory will not be developed here, the assumptions behind it are important in view of the subsequent discussions. They are (Bowman, 1979, p. 618):

(1) all investors are single-period, risk-averse maximizers of the expected utility of terminal wealth;
(2) they choose their portfolios based on the mean and standard deviation of assets;
(3) they have the same decision horizon in which the mean and standard deviation of all assets exist;
(4) they have homogeneous expectations regarding the means and standard deviations;
(5) there are perfect capital markets, meaning (a) no individual investor can influence the price of an asset, (b) there are no (or neutral) taxes, (c) information is equally and costlessly available, (d) assets are infinitely divisible, (e) unlimited borrowing and lending at the risk-free interest rate is possible.

Under these assumptions, it is possible to show that, in equilibrium, assets are priced so that:

$$E(r_{it}) = r_{Ft} + \beta_i E(r_{Mt} - r_{Ft}) \qquad (2\text{-}17)$$

with r_{it} = return on asset i in time period t
r_{Ft} = risk-free return
r_{Mt} = return on the market portfolio in time period t
β_i = risk measure

The main idea of the CAPM is appealingly simple: an investor, and thus 'the market', demands a certain premium for the risk he takes in buying an asset whose future value is uncertain. The larger the risk, the more return an investor demands. Moreover, this relationship between the amount of risk inherent in that asset and the demanded return is linear. The risk inherent in the asset is measured with β, which is defined as follows:

$$\beta = \frac{\text{cov}(r_{it}, r_{Mt})}{\sigma^2(r_{Mt})} \qquad (2\text{-}18)$$

with $\text{cov}(r_{it}, r_{Mt})$ = covariance of the return on asset *i* with the return on the market portfolio

$\sigma^2(r_{Mt})$ = variance of the return on the market portfolio

The risk of an asset is determined by the covariance of its return with the performance of the market. This is because the market portfolio (being all risky assets in the market) is the benchmark in developing the CAPM. Note that the denominator of β is the same for all assets. It is easy to see that equation (2-17) holds for the risk-free asset. This asset has by definition no variance in its returns, so the covariance is 0. The expected return is indeed equal to the risk-free rate.

An asset's β is also called its systematic (sometimes systemic) risk. It cannot be diversified away following the principles of portfolio theory, since it represents the portion of risk that covaries with the ultimate portfolio: the total market. This reflects the fact that the market return is a stochastic variable in its own right: not only is there uncertainty about the prices of individual assets, but the performance of the market as a whole is also subject to uncertainty. What the CAPM states is that this portion of the total risk of an asset is priced according to equation (2-17). But not *all* risk associated with an asset is reflected in its β: the nominator mentions the *co*variance, not the variance of the return. The part of the risk that is not covered by β is called the non-systematic risk (also unique, specific, or residual risk). This non-systematic risk is not priced by investors. This means that they are not willing to pay extra for an asset that bears a great deal of unique risk, because this part of the risk can be diversified away through holding a wide portfolio.

The CAPM has had an enormous influence on financial economics and investment theory. It has been accepted rapidly within the scientific community, and to a lesser extent in the investment community. This is because of its remarkable simplicity: all investors, with different risk preferences and utility functions, price all assets, with different characteristics and returns, in the same way. The theoretical derivation is rather complicated, but the result is intuitively appealing. An investor demands a certain basic return, and for every unit of risk he takes on, he demands a standard unit of return. The risk is captured in one dimensionless number. The intellectual brilliance of this achievement cannot be overestimated.

2.4.2 operating leverage, dol *and* β

Once the CAPM was accepted in the field of finance, and empirical tests to validate it were published in large numbers, a search began for a better understanding of the nature of systematic risk. What are the determinants of β? Especially during the seventies, a substantial body of literature was developed that tried to answer this question at least partly. The first – seminal – article on the subject is by Beaver, Kettler, and Scholes (1970). They do not look specifically for risk determinants, but for an association between market determined and accounting determined risk measures. Market determined risk measures refer to stock price movements, whereas accounting measures

look at the financial statements of firms. They propose several accounting risk measures that *may* influence systematic risk. These measures are:

(1) dividend payout: firms with a low payout ratio are viewed as more risky. Assuming that managers are reluctant to cut dividends, and are also not willing to have a pay-out ratio above 100%, a low payout ratio would suggest that management is uncertain about future earnings. This indicates a larger risk;
(2) growth: above-normal growth can result from excessive earnings due to a strong position in a market. These excessive earnings will attract competitors who will enter that market. Therefore, the earnings will be more uncertain than the 'normal' earnings stream, and thus more risky;
(3) financial leverage: if debt is introduced, the earnings stream of the common stockholders becomes more volatile;
(4) liquidity: the return on liquid or current assets will be less volatile, implying that liquidity measures will show a low association with market risk;
(5) asset size: larger firms have a smaller chance of default, and the variance of total earnings is relatively smaller. This could mean that their systematic risk is lower;
(6) variability in earnings: since all previous measures are thought to reflect aspects of the variability of the earnings stream, it is logical to look at the total variability in earnings;
(7) covariability in earnings: this is an accounting beta, using book earnings as the nominator in the return.

The list of accounting risk measures is also a list of possible determinants of systematic risk, with the exception of the last one. The list is a result of logical reasoning rather than rigorous deduction from theory. This means that it is not necessarily complete, and that the points mentioned do not have to influence systematic risk.[10]

The work of Beaver, Kettler, and Scholes (1970) initiated a string of articles on the empirical relations between possible determinants of systematic risk and β. They are summarized in Myers (1977), who comes to the conclusion that the empirical studies suggest four main determinants of systematic risk. These are cyclicality, earnings variability, financial leverage, and growth. Myers (1977, p. 53) defines cyclicality as 'the extent to which fluctuations in the firm's earnings are correlated with fluctuations in earnings of firms generally', which corresponds roughly with the accounting beta of Beaver, Kettler, and Scholes (the last point on their list). He views earnings variability as a proxy for cyclicality. Next to this, growth is discarded by Myers because of its weak performance in the empirical tests reviewed, thus leaving only two main determinants of systematic risk resulting from the early empirical studies: financial leverage, and something with earnings variability and cyclicality.

Next to the attempts to explain β from empirical observations, there has been a research line that tries to find the determinants from theoretical reasonings. It is this research line that truly brings the operating leverage into play. In the following sections, we will review the important articles that focus on the mathematical formulation of β as in equation (2-18).

[10] of course, theories do not necessarily capture all aspects of reality.

2.4.2.1 hamada (1972)

Hamada wants to establish the effect of a firm's capital structure on its systematic risk. He tries to do so by starting from the Modigliani-Miller (1958) proposition that firm value is independent from the way it is financed. This allows evaluation of the influence of debt on the systematic risk. Hamada starts with the following equation for the 'dollar return' to the common shareholder in one time period:

$$(X - I)(1 - \tau) - P + \Delta G = d + cg \qquad (2\text{-}19)$$

with X = *ebit*
I = interest paid
τ = income tax rate
P = preferred dividends
ΔG = change in capitalized growth
d = dividend
cg = capital gains

The dollar return to the shareholder, being dividends plus capital gains, should be equal to the net income available to common shareholders to which is added the change in capitalized growth. The inclusion of the growth term ΔG is necessary to ensure that growth opportunities for the firm – that is, future earnings above the firm's cost of capital which are already reflected in the stock price at the beginning of the period – do accrue to the shareholder.[11] With the equation for the dollar return, Hamada fills in equation (2-18) for a levered firm, so a firm that uses debt:[12]

$$\beta_L = \frac{\operatorname{cov}\left[\dfrac{(X - I)(1 - \tau) - P + \Delta G}{S_L}, r_M\right]}{\sigma^2(r_M)} \Leftrightarrow$$

$$S_L\beta_L = \frac{\operatorname{cov}[X(1 - \tau) + \Delta G, r_M]}{\sigma^2(r_M)} - \frac{\operatorname{cov}[I(1 - \tau), r_M]}{\sigma^2(r_M)} - \frac{\operatorname{cov}[P, r_M]}{\sigma^2(r_M)} \Leftrightarrow$$

$$S_L\beta_L = \frac{\operatorname{cov}[X(1 - \tau) + \Delta G, r_M]}{\sigma^2(r_M)}$$

The subscript L denotes the levered firm, and S_L is the market value of common stock at the beginning of the period. The simplification is based on the assumption that the covariance of interest and preferred dividend with the market is negligible.
If we fill in the β-equation for an unlevered firm U, being a firm without debt and without preferred stock, we get:

---

[11] in modern terms, ΔG would stand for the present value of growth opportunities (see e.g. Brealey and Myers, 2000, p. 73), but the explanation of Hamada is somewhat different and possibly not correct.

[12] the main mathematical rules used are cov $(ax + b, z) = a$ cov (x, z), and cov $(x + y, z) =$ cov $(x, z) +$ cov (y, z), with x, y, and z mutually independent variables and a and b constants.

$$\beta_U = \frac{\operatorname{cov}\left[\frac{X(1-\tau)+\Delta G}{S_U}, r_M\right]}{\sigma^2(r_M)} \Leftrightarrow$$

$$S_U \beta_U = \frac{\operatorname{cov}[X(1-\tau)+\Delta G, r_M]}{\sigma^2(r_M)}$$

The analysis leads to a very simple result:

$$\beta_L = \frac{S_U}{S_L}\beta_U \qquad (2\text{-}20)$$

The systematic risk of a levered firm is larger because of the presence of debt. If we use the Modigliani-Miller (1963) formula:

$$S_U = S_L + (1-\tau)D \qquad (2\text{-}21)$$

which states that the total market value of a firm is independent of its financial structure, we can determine the influence of debt on the systematic risk. This leads us to where we want to be. The systematic risk of a firm can be split into a financial part and an operational part, as the following equation shows:

$$\beta_L = \left(1 + \frac{(1-\tau)D}{S_L}\right)\beta_U \qquad (2\text{-}22)$$

The systematic risk of a firm is the result of the operational characteristics of the firm and the presence of financial leverage. This result is interesting in itself, but also because it allows us to concentrate on the operational characteristics by assuming an all-equity firm. Hamada performs some empirical tests, of which the general conclusion supports our contention in the introductory chapter: at the most, some 25% of the systematic risk of firms stems from financial leverage, meaning that at least 75% is the result of the operational (real) characteristics of the firm.

2.4.2.2 rubinstein (1973)

Rubinstein is the first author who tries to develop the components of 'operating risk', the operational part of systematic risk. He considers a multi-product firm, where an identifiable proportion of total assets (and thus total firm value) is devoted to producing product *m*. We follow his analysis, but restrict it to a single-product firm. Ignoring taxes and debt, and assuming that the stock return is equal to X/S, we get the following through substituting the profit equation (2-1):[13]

[13] using $\operatorname{cov}(x, y) = \rho(x, y) \cdot \sigma(x) \cdot \sigma(y)$

$$
\begin{aligned}
\beta &= \frac{\operatorname{cov}\left(\frac{X}{S}, r_M\right)}{\sigma^2(r_M)} \\
&= \frac{\operatorname{cov}\left(\frac{q(p-v)-F}{S}, r_M\right)}{\sigma^2(r_M)} \\
&= \frac{(p-v)\operatorname{cov}\left(\frac{q}{S}, r_M\right)}{\sigma^2(r_M)} \\
&= \frac{(p-v)\frac{1}{S}\rho(q, r_M)\sigma(q)\sigma(r_M)}{\sigma^2(r_M)} \\
&= \frac{(p-v)\rho(q, r_M)\sigma\left(\frac{q}{S}\right)}{\sigma(r_M)}
\end{aligned}
\qquad (2\text{-}23)
$$

where $\rho()$ = correlation coefficient
$\sigma()$ = standard deviation

Rubinstein (1973, p. 178) suggests the following interpretation of the formula:

> $[p - v]$ reflects operating leverage, $[\rho(q, r_M)]$ the pure influence of economy-wide events on output, and $[\sigma(q/S)]$ the uncertainty of output per dollar of assets which could be interpreted as a measure of the uncertainty of "operating efficiency".

The Rubinstein formula is the first attempt to incorporate fixed and variable costs, so real operating characteristics, into an equation for systematic risk. Not all components are intuitively appealing, and his 'operating leverage' is better known as contribution margin. However, at least one lesson from the formula is of interest: the basic risk that follows from operating in an uncertain economy is reinforced by the contribution margin. Rubinstein is the first to show that the increase in variability in earnings because of a larger contribution margin results in an increase in systematic risk. Next to this, Rubinstein is the first to use the term operating leverage in financial economics and as such deserves some extra attention.

2.4.2.3 lev (1974)

The first study that explicitly looks at operating leverage is by Lev, who examines the association between operating leverage and risk in order to 'advance the understanding of the risk-generating process operating in capital markets' (p. 627). He defines operating leverage as the ratio of fixed to variable operating costs, and as such tries to introduce them into the equation for β. To do so, he writes *ebit* as:

$$X_t = R_t - V_t - F_t \qquad (2\text{-}24)$$

with R_t = total revenues (sales) in period t
V_t = total variable costs in period t

Following Hamada (1972), he defines the return for common stockholders as the after-tax earnings plus the change in capitalized growth. Substituting this expression of the return in β, he gets:

$$\beta = \frac{\operatorname{cov}\left[\frac{(R-V-F)(1-\tau)+\Delta G}{S}, r_M\right]}{\sigma^2(r_M)}$$

$$S\beta = \frac{\operatorname{cov}[(R-V-F)(1-\tau)+\Delta G, r_M]}{\sigma^2(r_M)} \qquad (2\text{-}25)$$

$$= \frac{\operatorname{cov}[R(1-\tau), r_M]}{\sigma^2(r_M)} - \frac{\operatorname{cov}[V(1-\tau), r_M]}{\sigma^2(r_M)} + \frac{\operatorname{cov}[\Delta G, r_M]}{\sigma^2(r_M)}$$

In order to further analyze this expression, Lev needs to assume the existence of a homogeneous industry, where firms can be considered in the same 'risk class'. This 'risk class' concept was introduced by Modigliani and Miller (1958) in order to isolate the effects of firm characteristics (in their case financial leverage) from market influences. When we assume firms to be in the same risk class, any differences in their systematic risks have to be the result of firm specifics, instead of differences in reactions to economic events. Lev maintains that firms facing the same market conditions and producing the same output stream can be thought to have the same market value. So if we look at two firms in a homogeneous industry, having an identical sales pattern but a different level of fixed costs, we can state that the first term in (2-25) – the covariance of sales with the market return – will be same for these two firms. Also, there is no reason that the growth term should differ for the firms. The middle term will not be same, however. If we assume that firm 1 is the firm with the higher operating leverage, and thus the lower level of variable costs, relative to firm 2, the following equation holds:

$$\frac{\operatorname{cov}[V_1(1-\tau), r_M]}{\sigma^2(r_M)} < \frac{\operatorname{cov}[V_2(1-\tau), r_M]}{\sigma^2(r_M)} \Rightarrow \qquad (2\text{-}26)$$

$$S_1\beta_1 > S_2\beta_2$$

Since we assume that the market value of the firms is the same, i.e. $S_1 = S_2$, we can conclude that the systematic risk of firm 1, the firm with the higher operating leverage, is higher than that of firm 2. This is the first explicit relationship between operating leverage and systematic risk. Note, however, that its derivation requires some strict additional assumptions, the main being that growth, sales pattern and market value are the same.

2.4.2.4 mandelker and rhee (1984)

In the years after Lev's (1974) article, several attempts have been made to clarify the relation between operating leverage and risk. Conine (1980) derives that the operational part of systematic risk can be split into demand risk and contribution margin risk; Gahlon and Gentry (1982) succeed in incorporating both *dol* and *dfl* in a very complicated formula. The ultimate article on the subject, however, is by Mandelker and Rhee (1984), who show that there is a simple linear relationship between financial

leverage, operating leverage and risk. Mandelker and Rhee start their analysis by noting that it is necessary to consider 'the joint impact of the degrees of operating and financial leverage on the systematic risk of common stock. Although Hamada and Rubinstein demonstrate that operating risk and financial risk constitute systematic risk, it is not obvious how operating leverage and financial leverage are related to operating risk and financial risk, respectively, in their risk decomposition' (p. 46).
Mandelker and Rhee derive their relationship between financial leverage, operating leverage and systematic risk using the formula cov $(ax + b, y) = a$ cov (x, y). They first define the return on common stock as

$$r_t = \frac{Y_t}{S_{t-1}}$$

with Y_t the earnings after interest and taxes, and S_{t-1} the market value of the firm at the beginning of the period. Note that they do not incorporate the growth term from Hamada (1972, see equation (2-19), page 33). It seems that most authors since Bowman (1979) have taken the position that future growth is fully discounted in the stock price, and thus the firm value, so there is no need for explicit introduction of this term. Introducing the return into the equation for systematic risk yields:

$$\begin{aligned} \beta &= \frac{\operatorname{cov}(r_t, r_{Mt})}{\sigma^2(r_{Mt})} \\ &= \frac{\operatorname{cov}\left(\frac{Y_t}{S_{t-1}}, r_{Mt}\right)}{\sigma^2(r_{Mt})} \end{aligned} \qquad (2\text{-}27)$$

This is rearranged by multiplying the first argument of the covariance with Y_{t-1}/Y_{t-1}, and subtracting a constant from it as the rules for covariances allow:

$$\beta = \left(\frac{Y_{t-1}}{S_{t-1}}\right)\frac{\operatorname{cov}\left(\frac{Y_t}{Y_{t-1}} - 1, r_{Mt}\right)}{\sigma^2(r_{Mt})} \qquad (2\text{-}28)$$

The resulting first term of the covariance is the relative change in net earnings, which is also the numerator of *dfl*. By rewriting the *dfl* and *dol* formulas as

$$\frac{Y_t}{Y_{t-1}} - 1 = dfl \cdot \left(\frac{X_t}{X_{t-1}} - 1\right) \qquad (2\text{-}29)$$

and

$$\frac{X_t}{X_{t-1}} - 1 = dol \cdot \left(\frac{R_t}{R_{t-1}} - 1\right) \qquad (2\text{-}30)$$

and by successive substitution and rearranging we find

$$\beta = dol \cdot dfl \cdot \frac{\operatorname{cov}\left(\frac{X_{t-1}}{R_{t-1}} \cdot \frac{R_t}{S_{t-1}}, r_{Mt} \right)}{\sigma^2(r_{Mt})} \qquad (2\text{-}31)$$
$$= dol \cdot dfl \cdot \beta^0$$

with X = *ebit*
Y = net profit
R = revenues (sales)
S = market value (stock price)

This very elegant result tells us that there is a simple relationship between leverage and systematic risk. There is a basic risk to the firm, here denoted β^0 and termed 'intrinsic business risk' by Mandelker and Rhee (p. 50), that is magnified by the existence of fixed charges – both financial and operational. Note that the only stochastic term in the equation is R_t, the revenues in the current period. Extra insight can be gained by viewing the covariance term as last year's return multiplied by revenue growth. If there is no leverage, the uncertainty in revenue growth is the only determinant of risk. As we have seen through equations (2-5) and (2-6), in the absence of fixed charges both *dol* and *dfl* are one. The conclusion is clear: risk stems from influences from the economy – affecting the demand and thus the revenue growth – and the firm-specific characteristics measured through *dol* and *dfl*. Note the correspondence with the conclusions of Myers (1977) with respect to the empirical studies on the determinants of β. As discussed in section 2.4.2 (page 31), he identified two main determinants: financial leverage, and cyclicality. Within the Mandelker and Rhee framework, this cyclicality can be thought of as the degree of operating leverage.

Finally, the formula can only be derived under the assumptions of the break-even analysis as discussed in section 2.2.3 (page 22). Therefore, its practical applicability is limited. Its conceptual appeal, however, is not reduced by this at all. It convincingly demonstrates the importance of the operational leverage to a firm's systematic risk.

2.5 measuring *dol*

The measurement of *dol* is more complicated than its simple formula might suggest. As indicated in section 2.2.4 (page 23), the *dol* is unique for every business entity (an investment project, a business unit, a firm, etc.), and within that business entity also unique *for every level of sales*. This means that measuring 'the' *dol* of a single project over a number of years is not possible, unless its sales do not change. Nevertheless, several authors have tried to develop methods to come to a robust indication of the operating leverage of firms. Lev (1974) has tried to do this through estimating fixed and variable costs, i.e. by filling in the variable formula (2-5) from page 20. The two other important articles on the subject are Mandelker and Rhee (1984) and O'Brien and Vanderheiden (1987), who try to use the elasticity formulas to estimate *dol*. Blazenko (1996) suggests using earnings margins, and we will pay some more attention to this approach for reasons that will be explained. Aside from these, several authors use measurement methods that are inspired more by practical considerations than by theory. Of these, we

will discuss Ang and Peterson (1985), Darrat and Mukherjee (1997), and two further articles by Blazenko (1997, 1999).

2.5.1 lev (1974)

In order to find a measure for operating leverage, Lev estimates the portion of variable costs in the total costs. Although the variable costs do not completely represent the operating leverage (see section 2.2.6, page 27), it is clear that a firm with a larger share of variable costs will have a lower *dol.*[14] Lev tries to meet the assumption of homogeneous industries that is paramount to his derivations – presented in section 2.4.2.3 (page 35) – through looking at the steel, oil, and electricity industries. The sales pattern of firms in these industries, as well as the economic influences, are thought to be approximately the same across the industry. Lev estimates the variable costs of a firm with the following regression analysis:

$$TC_{jt} = \phi_j + \kappa_j Q_{jt} + \varepsilon_{jt} \qquad (2\text{-}32)$$

where TC_{jt} = total operating costs of firm j during year t
ϕ_j = regression constant
κ_j = regression coefficient
Q_{jt} = output, measured in kWh for electricity firms, and dollar revenues for the other industries
ε_{jt} = error term

This makes the regression coefficient κ_j an indicator of the variable costs of the firm under the assumption that no substantial changes in the production process occur. The reported coefficients of determination (R^2) are extremely high for this regression: from 0.93 to 0.98, depending on the industry and the time interval. The average value of κ_j for the steel manufacturers over 12 years is 0.82, and for the oil producers it is 0.72. This means that on average, some 80% of the total costs of the steel manufacturers is variable. We cannot say what this means for the average *dol*, since we lack sales data.

2.5.2 mandelker and rhee (1984)

The approach of Lev (1974) is not feasible for industries that have more diverse production processes. Since information on sales, *ebit*, and net profit is available for every firm, Mandelker and Rhee start from the elasticity formula of *dol*. If we take the elasticity of $a=f(b)$ to b, and the elasticity c is constant, we get (Westermann, 1984, p. 56–57):

---

[14] if we let the share of variable costs in total costs be κ, we get

$$dol = \frac{qp - \kappa TC}{qp - TC}$$

Clearly, increasing κ while holding total costs constant lowers *dol.*

$$\frac{\frac{da}{a}}{\frac{db}{b}} = c$$

$$\frac{da}{a} = c\frac{db}{b} \qquad (2\text{-}33)$$

$$\ln a = c \ln b + k$$

If we substitute *ebit* for a, and sales for b, the resulting regression is

$$\ln X_{jt} = a_j + c_j \ln R_{jt} + \varepsilon_{jt} \qquad (2\text{-}34)$$

The term ε_{jt} is the disturbance term, and the regression coefficient c_j is the estimator of *dol*. Likewise for the degree of financial leverage, we get

$$\ln Y_{jt} = b_j + d_j \ln X_{jt} + \varepsilon_{jt} \qquad (2\text{-}35)$$

with d_j representing *dfl*. Note that the assumption of a constant *dol* and *dfl* is essential in formulating these equations. Aside from this, the use of logarithms means that negative earnings (either *ebit* or net) are not allowed. When negative earnings are observed, Mandelker and Rhee run the regressions without the logarithmic transformation. For *dol*, this means

$$X_{jt} = g_j + h_j R_{jt} + \varepsilon_{jt} \qquad (2\text{-}36)$$

The estimator for *dol* is found by multiplying h_j with $(\overline{R_j} / \overline{X_j})$, denoting the averages of R_j and X_j over the sample period. The correction is needed because we are interested in the relative changes of *ebit* and sales.[15] The same procedure is followed for *dfl*.
In all, they use 20 years of data from 255 firms. The results of their regressions are only reported at the industry level, because their main interest lies in validating their model of the influence of leverage on risk as formulated in equation (2-31). They report average *dol*s per industry of 0.73 to 1.09, and average *dfl*s of 0.79 to 1.06.

2.5.3 o'brien and vanderheiden (1987)

The 'everything is constant'-assumption behind the measurement technique of *dol* according to Mandelker and Rhee (1984) is challenged by O'Brien and Vanderheiden. They maintain that the Mandelker and Rhee-approach is biased for growing firms. Especially when the growth trend is dominant over the 'residual variation' in sales and earnings, a regression from earnings to sales will result in *dol*-values of around 1. This is indeed what Mandelker and Rhee find. To tackle this problem, O'Brien and Vanderheiden interpret the degree of operating leverage as the ratio of the percentage deviation of operating income from its expectation to the percentage deviation of sales revenues from its expectation:

[15] we get back to this in section 2.5.5.

$$dol = \frac{\frac{X_t}{E(X_t)} - 1}{\frac{R_t}{E(R_t)} - 1} \qquad (2\text{-}37)$$

with $E()$ the expectation operator. The relationship between X_t and $E(X_t)$ is given by

$$X_t = E(X_t) \cdot \exp(\mu_t^X) \qquad (2\text{-}38)$$

The last term of this expression represents the continuous-compound rate of change, just like the continuous-compound interest rate. Therefore, this rate of change is an approximation of the discrete percentage change:

$$\mu_t^X \approx \frac{X_t}{E(X_t)} - 1$$

Note that this is the difference between this year's value and the *expected* value for this year, or the residual variation. Next, a growth term is introduced to get an expression for the expected value:

$$E(X) = X_0 \cdot \exp(g_X t) \qquad (2\text{-}39)$$

Here, X_0 is the beginning level of *ebit*, and g_X the continuous rate of growth. Substitution and conversion to logarithms leads to

$$\begin{aligned} X_t &= X_0 \exp(g_X t + \mu_t^X) \\ \ln X_t &= \ln X_0 + g_X t + \mu_t^X \end{aligned} \qquad (2\text{-}40)$$

The same procedure for R_t, the level of revenues, leads to

$$\ln R_t = \ln R_0 + g_R t + \mu_t^R \qquad (2\text{-}41)$$

Finally, the two residual variation series are taken together:

$$\mu_t^X = D\mu_t^R + \varepsilon_t \qquad (2\text{-}42)$$

In this regression, D is the estimator of *dol*. This somewhat elaborate procedure should produce better results, according to O'Brien and Vanderheiden: 'There is an important difference between our formulae and the typical textbook ones: the equations here are careful to measure *dol* at and only at the *expected* levels of sales and earnings' (p. 46). However, this is only true if the growth terms are constant. And even then, there is still no room for abrupt changes in the constellation of the firm, nor for price fluctuations. Nevertheless, their handling of growth does seem an improvement in measuring *dol*. They show this through an empirical analysis, which also demonstrates the limitations of their method: only firms that had no obvious major structural shifts such as mergers or divestitures, and firms that had no operating losses, are included. When applying their method to a sample of 100 firms meeting these conditions, they find a larger variation in their *dol*-values compared to the results of the Mandelker and Rhee approach, which tend to cluster around 1. Also, 72 of the resulting *dol*-values are larger than 1 for the O'Brien and Vanderheiden method, as compared to 41 for Mandelker and Rhee.

2.5.4 blazenko (1996)

Blazenko (1996, p. 1101) discusses net operating margin as an alternative measure of operating leverage. The net operating margin measures 'the average impact – including fixed costs – of one dollar sales on operating cash flows'. There is an inverse relationship between net operating margin and degree of operating leverage: the larger the net operating margin, the lower the degree of operating leverage. To see this, bear in mind that a large net operating margin implicates large earnings relative to sales, meaning that the firm is further away from its break-even point. Conversely, if the net operating margin is close to zero, this means that the firm makes almost no profit. In this situation, the degree of operating leverage is high since a small increase in sales will lead to a relatively large increase in earnings.
What is the difference between the two approaches? If we look at the formulas, we have the following:

$$dol = \frac{q(p-v)}{q(p-v)-F} \tag{2-5}$$

$$nom = \frac{q(p-v)-F}{qp} \tag{2-43}$$

Obviously, they use the same information. However, there is one important characteristic of *nom* that makes it interesting in analyzing firms: it is a continuous measure. Unlike *dol*, it has no point at which it jumps from a large negative to a large positive value. This is because the denominator of *nom* is simply sales revenues, whereas *dol* uses *ebit*. And *ebit* can be negative, positive, or zero. Of course, in measuring *dol* empirically, we start from the elasticity formula:

$$dol = \frac{\Delta\%ebit}{\Delta\%sales} \tag{2-2}$$

Here we have the same problem: the denominator, the percentage change in sales, can take on any value, including zero. When we also take into account that measuring *dol* requires the use of regression analysis (with the method of O'Brien and Vanderheiden (1987, section 2.5.3) even three times), there is much to say for a simpler, more stable method of estimating the cost structure. And the net operating margin is both easy to measure and stable. Finally, it can also handle negative values. Before discarding it, it seems useful to evaluate it on the same aspects as the methods for measuring *dol*.
First, let us see how the two measures behave with respect to changes in the variables. In table 2-1, we present the various derivatives of *dol* and *nom.* It is important to note that the *dol*-formula is based on the assumption that all other variables remain constant. This means that only the derivative of *dol* with respect to q can be interpreted as a characteristic of a production configuration. Of course, when we think further this is logical: changes in the other parameters imply a change in the cost structure. And as we know, this in turn means that the *dol* changes. The derivatives with respect to F, v, and p should therefore be interpreted as the impact of changing the cost structure.

	dol	*nom*
formula	$\frac{q(p-v)}{q(p-v)-F}$	$\frac{q(p-v)-F}{qp}$
$\frac{\mathrm{d}}{\mathrm{d}q}$	$\frac{-F(p-v)}{(q(p-v)-F)^2}$	$\frac{F}{pq^2}$
$\frac{\mathrm{d}}{\mathrm{d}F}$	$\frac{q(p-v)}{(q(p-v)-F)^2}$	$-\frac{1}{pq}$
$\frac{\mathrm{d}}{\mathrm{d}v}$	$\frac{qF}{(q(p-v)-F)^2}$	$-\frac{1}{p}$
$\frac{\mathrm{d}}{\mathrm{d}p}$	$\frac{-qF}{(q(p-v)-F)^2}$	$\frac{v+F}{p^2}$

table 2-1 derivatives of *dol* and *nom* with respect to unit sales q, fixed costs F, variable cost per unit v, and price p.

What we see is that *dol* and *nom* behave completely opposite as long as p is larger than v. This means that interpreting them regarding changes in cost structure will produce the same general results: an increase in fixed costs leads to a larger *dol*, and to a smaller *nom*. An increase in price results in a smaller *dol*, and a larger *nom*. Unfortunately, this does not mean that analyzing *nom* and *dol* in a cross-sectional evaluation of business entities will produce consistent results: when comparing two firms, the one with the larger *nom* does not necessarily have a lower *dol*. This can be shown through a simple example. We take a look at three possible configurations to manufacture a product. We assume that the selling price is 10. The specifics of the processes are:

	a	*b*	*c*
fixed costs	600	200	300
variable cost per unit	2	6	6
contribution margin	8	4	4
break even point	75	50	75

table 2-2 three cost configurations to manufacture a product.

As was noted in section 2.2.5 (page 25), the *dol* of processes with the same break-even point are identical. Therefore, the *dol*-lines of processes *a* and *c* coincide, as shown in figure 2-3. We also see that the lines of *nom* cross the *x*-axis at the break-even points. They all have a horizontal asymptote at their contribution margin percentage, since this will be the ultimate net operating margin in the case of infinite sales. But we do not see an overall consistency in the behavior of *dol* versus *nom*. Because of their identical contribution margin percentage, *b* and *c* do not cross, and their *dol* and *nom* show opposite behavior. However, if we look at *a*, we see that it starts as the lowest of three, and crosses both the other curves: the behavior of *nom* is not consistent with *dol*. If we take *dol* to be the theoretically correct concept to represent the importance of fixed costs, and therefore the correct indicator of the cost structure, it is obvious that *nom* is not ideally suited to measure the cost structure.

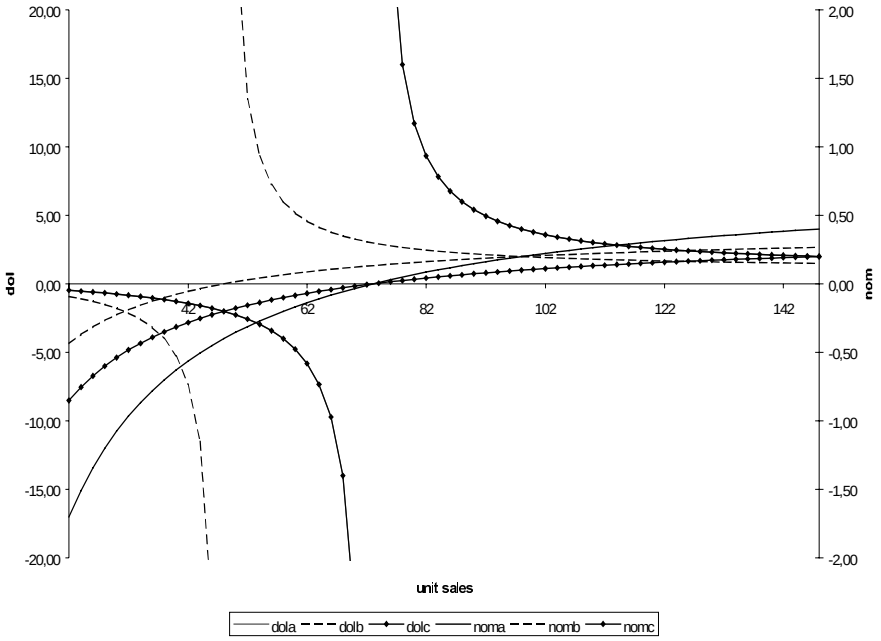

figure 2-3 *dol* versus *nom:* per individual project completely inverse, cross-sectionally not consistent.

Part of the problem is that net operating margin is first an indicator of *overall* profitability, including the effects of fixed costs. Because of this, it does not fully succeed in estimating the effects of fixed costs as such. In fact, a wholly different interpretation of *nom* is possible. For this, we look at the sensitivity of changes in *ebit* to changes in sales because of *price* fluctuations. We can think of this as a sort of degree of price leverage – let's call it *dpl*.

$$
\begin{aligned}
dpl &= \frac{\Delta\%ebit}{\Delta\%sales} \\
&= \frac{\dfrac{q(p_2 - v) - F - (q(p_1 - v) - F)}{q(p_1 - v) - F}}{\dfrac{qp_2 - qp_1}{qp_1}} \\
&= \frac{q(p_2 - p_1)}{q(p_1 - v) - F} \cdot \frac{p_1}{p_2 - p_1} \\
&= \frac{qp_1}{q(p_1 - v) - F}
\end{aligned}
\qquad (2\text{-}44)
$$

What we evaluate here is the link between the cost configuration of the production process and price changes. Of course, the assumptions behind the derivation are even less realistic than with *dol*. A price change will almost certainly influence *q*, the units

sold. Nevertheless, the formula for *dpl* is familiar: it is the reciproke of *nom*. The effect of a price increase is smaller for a process with a larger *nom*. Again, we see that *nom* is much more a measure of overall performance than it is an indicator of the cost structure. This makes it is not ideally suited as an indicator of the cost structure from a theoretical point of view. But it is possible that the practical measurement issues, and especially its stability, make *nom* a useful measure of the cost structure.

2.5.5 ad hoc *methods*

Several authors have used other methods to estimate the operating leverage, sometimes specifically to measure *dol,* other times more generally to estimate the portion of fixed or variable costs. The most basic approach is the one taken by Petersen (1994). He looks at a specific part of firm costs, namely pension costs. In the USA, firms can choose between two types of pension systems: a 'defined benefit plan', where the firm's pension contributions are largely fixed, or a 'defined contribution plan', where the pension contributions are dependent upon firm performance. When earnings (i.e. firm performance) are higher, the firm contributes more; also, a minimum earnings level can be defined below which no contributions are made by the firm. Through isolating an identifiable part of total costs, Petersen (1994) in effect looks at the operating leverage: these costs can be either fixed or variable, meaning that we can look at the much desired variable costs-fixed costs trade-off without any further assumptions. However, it seems that this ingenious method of Petersen (1994) cannot be reproduced with other items on the financial statement.
Ang and Peterson (1985) use the operating leverage in an article on leasing. Their method for estimating operating leverage is rather crude: they regress *ebit* on sales without any subsequent correction. This results in the following regression, which we know from Mandelker and Rhee (1984):

$$X_{jt} = g_j + h_j R_{jt} + \varepsilon_{jt} \qquad (2\text{-}36)$$

If we look at this regression, we can think of two interpretations. If we take g_j to be zero, we estimate the net operating margin. Alternatively, we can interpret g_j as the fixed costs, in which case h_j would represent the contribution margin. Net operating margin has been discussed in the previous section. The contribution margin is used as an indicator for operating leverage by Blazenko (1997, 1999). To force an estimate of contribution margin, he fits (2-36) with the earnings before, interest, taxes, depreciation and amortization *(ebitda)*. Although depreciation can be assumed to be a substantial part of fixed costs, we are still left with the same problem: are we estimating the *ebitda* margin or the contribution margin? Blazenko (1999) reports an average estimate for h_j of 0.211, and an R^2 of 53%. Although the explanatory power is impressive, if we compare it to the results of Lev (1974, section 2.5.1, page 39) we see an R^2 of over 90% for a similar simple relation (estimating the portion of variable costs in total costs). The lower explanatory power can be due to the noted double interpretation of (2-36).
Even if we were able to estimate the contribution margin, we still need to realize that it is not enough to evaluate the cost structure. Again, we can clarify this through simply noting that a high contribution margin can mean low variable costs as a result of high

fixed costs (as with the DSMs of this world), but it can also mean a high price relative to the (full) cost price (as with the Coca-Cola's and Nike's of this world). Fortunately, we can establish a simple link between contribution margin and *dol:*

$$dol = \frac{q(p-v)}{q(p-v)-F} = \frac{m_d R}{X} \qquad (2\text{-}45)$$

where m_d = contribution margin per dollar of revenue, $1 - v/p$
R = revenue
X = *ebit*

This is, of course, precisely the correction applied by Mandelker and Rhee (1987) on their formula (2-36) from page 40. However, bear in mind that the regression coefficient h_j does not necessarily measure *contribution* margin, but can also measure *operating* margin. Therefore, from a theoretical point of view, this method is not consistent in measuring *dol*.[16]

The last article that presents a method to measure *dol* is by Darrat and Mukherjee (1995). Their adjustment lies in using first differences rather than absolute levels in computing their estimate for *dol*. This means that they run the following regression:

$$\Delta X_{jt} = a_j + b_j \Delta R_{jt} + \varepsilon_{jt} \qquad (2\text{-}46)$$

where $\Delta X_{jt} = X_{jt} - X_{j,t-1}$, and a similar interpretation of ΔR_{jt}. The regression coefficient b_j is the *dol*-estimate. By using first differences, spurious correlation problems can be avoided. Using absolute first differences is intuitively correct: we relate the absolute change in *ebit* with the absolute change in sales, and we would expect firms with a larger *dol* to show more change in *ebit*, and so to have a higher b_j. However, under the break-even assumptions, b_j equals the contribution margin, with the corresponding caveats:

$$\begin{aligned} \Delta R_t &= p(q_t - q_{t-1}) \\ \Delta X_t &= q_t p m_d - F - (q_{t-1} p m_d - F) \\ &= m_d p(q_t - q_{t-1}) \\ &= m_d \cdot \Delta R_t \end{aligned}$$

2.5.6 comparing the methods

How do the different methods of measuring *dol* compare when used on one population? The answer to this is not just a question of running some tests on a database of financial statements. As indicated several times, the degree of operating leverage is not unique for a project, but for every level of sales of one project. This goes likewise for a whole firm, for which there are more problems, by the way: it will rarely consist of only one process,

[16] note that it is not necessary to evaluate the contribution margin as extensively as the net operating margin in the previous section, since (1) theoretically it is a constant, and (2) because it does not take into account all aspects of the cost structure, we cannot say anything conclusive about it. Besides this, the measurement problems discussed prevent the direct observation of the contribution margin.

and even more rarely keep all costs constant (meaning it does not invest or even improve its processes), even when we disregard the violated assumptions when the firm does not consist of one process, and there are changes in price levels, labor costs etc.
The approach of Lev (1974) will not be used because it requires an indicator of unit sales. This can be only found in industries with a very homogeneous production process like the steel and electricity industries. The approach of Mandelker and Rhee (1984) (hereafter M&R) is based on a constant *dol*, and therefore on an unrealistically static situation. O'Brien and Vanderheiden (1987) (hereafter O&V) maintain that their method can cope with growth, but they seem to be looking for a special kind of growth: one which allows a constant *dol* (see section 2.2.5, page 25, for the circumstances under which this is possible). They provide an example in which the variable cost per dollar of sales is constant. In this situation, the fixed costs have to grow at the same rate as the expected sales. This means that we trade in one assumption (constant fixed costs) for another (fixed costs grow at the same rate as expected sales). The problems of the assumptions made in both deriving the *dol* and *dfl* formulas in equations (2-5) and (2-6) on page 20, and in the measurement techniques introduced in the previous sections, are mostly related to the erratic nature of reality, whereas models in general presuppose some kind of stability. The main issues that can be identified before performing any tests are:

(1) stability of the cost structure: although it is true that the elasticity approaches look at the results of the operations (sales, *ebit*), and not at the causes of these results (costs, prices), interpretation of the numbers these approaches produce is only possible if the physical constellation of the firm in terms of costs is supposed to be constant – effectively meaning that its break-even point remains the same. As Lord (1995) shows, changes in the level of costs can have a large impact on *dol* measured with the elasticity formula (1-1), leading to incorrect conclusions about the earnings' true sensitivity to fluctuations in output. A small change in unit variable costs can lead to a very large elasticity result when the firm is operating near its break-even point;

(2) negative earnings: a poignant problem with the techniques of both M&R and O&V results from their use of logarithms. This means that the occurrence of negative earnings is not allowed. Because of this, examination of the prime example shown in section 1.1 of DSM is not possible. One solution to this problem could be substituting a small positive number for the negative earnings, but unreported tests show that both methods are very sensitive to the magnitude of this number. Besides this, the choice of the number is quite arbitrary;

(3) constant *dol*: next to the first point in this list, the elasticity approaches assume a constant *dol* to come to a formula that can be tested empirically. O&V explicitly select the firms within their sample on this basis: they maintain that if growth in sales and earnings are within 80% of each other, it is more likely that a firm has a constant operating leverage due to identical growth of (fixed) costs and sales. As indicated above, this is just swapping one assumption for another. The problem of a constant *dol* leads to a self-contradictory method. This is not directly because of the improbability of constant variables: it does not seem unlikely that at least a certain part of the firms in the real world will operate under constant conditions, that is to

say in a reasonably stable market and with a stable investment base (i.e. no acquisitions or expansion investments). But even then, we still cannot say that the *dol* is constant, because the sales volume is also changing. When we want to show the effects of the operating leverage, we look at companies like DSM and see the reaction of the earnings to a *change* in sales volume. But every sales volume has its own *dol* – even for otherwise constant conditions. Since application of the regression techniques requires a change in sales, they can only be used when their assumptions are violated.

Of course, the *ad hoc* methods present fewer technical measurement problems. They can only achieve this through causing fundamental theoretical problems: contribution margin and net operating margin may tell us *something* about the cost structure, but they do not capture the complete leverage effect. The *dol* measured with first differences cannot be theoretically linked to the operating leverage. But as the saying goes, the proof of the pudding is in the eating. So let us first make the pudding according to the various recipes described. After that, we will take a bite out of the empirical reality to test the taste.

The *dol* measurement methods are applied to a sample of Dutch non-financial firms listed at the Amsterdam Stock Exchange. The data come from Worldscope, a CD-ROM from the professional data supplier Datastream. Since this is not a much used information source in academic research, the quality of the data has been checked (Bol *et al.*, 1999): of the Dutch sample set of firms that is used in the empirical tests, the financial figures of 1995 and 1996 as presented in the printed financial statement from the firms and on the Wordscope CD have been compared. For 138 firms[17], this produced only one error in a supplementary data-item. Thus it seems we can rely on the *numbers* from Worldscope. However, the overall financial *statements* have to be used with some caution. Since Worldscope uses a standard format that is based on U.S. accounting rules, the statements of Dutch firms have been rearranged to fit that format. This is especially important with respect to the earnings number that we are going to use in the empirical tests. We have used *ebit* in our previous discussions, but this is not a clearly defined number. Specifically, *ebit* can include extraordinary items (e.g. gain or loss on sale of assets), non-operational items (e.g. equity in earnings), and financial accounting items (mostly withdrawals from reserves and provisions). Fortunately, U.S. accounting rules require firms to disclose the operating income, which is what most resembles the operational result that we are looking for. In appendix i, starting on page 158, the operating income following the Worldscope definition is reconciled with a financial statement from a Dutch firm. Next to the result from operations, the numerator in the *dol* leverage formula, we only need sales.

As with all financial statement analyses, the question arises of how big the sample should be. Tests reported in the literature use data panels consisting of hundreds of firms over a long period of time. Mandelker and Rhee (1984) use 255 firms of which they analyze 20 years of data. Such a long time period could lessen the influence of incidental large fluctuations; on the other hand, one can question the reality of the assumption that there have been no major shifts and changes in the cost structure, or that fixed

[17] the number of firms in the tests is somewhat smaller due to missing data-items for some firms.

costs have grown at the same constant rate as sales. Next to this, we are limited by the fact that the Worldscope database only provides up to 10 years of financial statement information. With respect to the number of firms, the restriction is more fundamental: there simply aren't that many listed firms in the Netherlands.
To be included in the sample, a firm had to have at least 6 years of sales and operating income data. Other requirements are not set. One could argue that firms should not undergo major structural shifts, like mergers and acquisitions, but we only want to know how the measures behave. Besides this, it is not clear why shifts of external origin should be excluded and internal investments ('organic growth') included. Finally, one could argue that the practical use of *dol* as a characteristic of a firm should not be restricted to textbook cases, but rather should be tried as broadly as possible. The requirements lead to a total of 125 firms that were listed through 1997 and had 6 years of data. Although some 80 firms had information covering 10 years, we are only using information from the years 1992 to 1997.[18]

2.5.6.1 values

First of all, we are interested in the absolute values that the methods produce. In table 2-3, summary statistics on the values are presented. Since the methods of O&V and M&R involve logarithms, they can only be applied to firms without negative earnings; this explains the lower valid *n* for OVDOL and MRDOL.

method	mean	median	std dev	min	max	av R^2	*n*
OVDOL	1.428	1.021	2.301	–4.717	15.238	0.50	101
MRDOL	1.408	1.221	2.087	–9.107	13.115	0.67	101
MRABS	2.937	1.276	9.713	–8.204	83.916	0.65	125
DOLDIFF	0.088	0.065	0.105	–0.092	0.549	0.50	125
ABSOPSAL	0.087	0.070	0.106	–0.304	0.419	0.65	125
ABSOPDA	0.116	0.093	0.116	–0.253	0.753	0.67	125
NOM	0.055	0.049	0.038	–0.063	0.196		125

table 2-3 statistics for several *dol* measures from a sample of 125 non-financial Dutch firms over 1992–1997. OVDOL denotes the O'Brien and Vanderheiden method (2-42), MRDOL the Mandelker and Rhee method (2-34), MRABS the Mandelker and Rhee method with absolute values (2-36), DOLDIFF the use of first differences (2-46), ABSOPSAL the regression of operating income to sales, ABSOPDA the regression of operating income before depreciation and amortization to sales, NOM the average net operating margin; av R^2 denotes the average coefficient of determination for the firm regressions, *n* denotes the valid number of firms for each method.

We see that the MRDOL values and the OVDOL values do not show much difference.[19] The claim from O&V that their method produces more variation cannot be supported with our results. Apparently, their results are limited to their sample of steady growing firms without major structural shifts. Since *dol* values for firms with positive earnings

[18] to check for the stability of the measures, the tables presented in this section are repeated in appendix ii (starting on page 161) for those firms that have data over 10 years, so from 1988–1997. The results are not comforting.

[19] one note with respect to the calculation of the O&V *dol*: formally, the growth terms should be calculated by fitting a regression line through the logarithms of the financial statement items with the line being forced through the first observation. As do O&V themselves, we keep it simple and leave the intercept free.

theoretically should be greater than 1, we note that 31% of OVDOL values and 48% of MRDOL values are below 1. In fact, we even see negative values, although all their firms consistently have positive earnings (because of the logarithms).
The M&R *dol* with absolute values shows more variation, but here firms with negative earnings are included. Its statistics indicate that it produces values in the same range as MRDOL. This implies that using MRABS to estimate MRDOL for firms with negative earnings – as M&R do in their empirical analyses – seems acceptable at first glance. As was suspected on theoretical grounds, the *dol* measured with first differences has values in the same order as the absolute values measured with ABSOPSAL and ABSOPDA. As we would expect, the value of ABSOPDA is higher; however, if we compare it to the results of Blazenko (1997, 1999), who reports an average of 0.211 for his ABSOPDA, the result reported in table 2-3 is rather low. But even an average of 0.211 for the contribution margin (which is Blazenko's interpretation of ABSOPDA) does not seem very high: this implies that almost 80 cents of an average dollar (or euro) of sales would go to the variable costs. It is therefore altogether unclear whether we succeed in estimating the contribution margin with these methods.
Since all methods claim to measure the same effect, it is instructive to look at their respective correlations. We present both normal (parametric) Pearson correlations and non-parametric Spearman correlations. Analysis of the results of each method shows that they are not normally distributed,[20] which means that the assumptions for the significance test of the Pearson correlation are violated.

	normal Pearson correlation						
(1) OVDOL	1.00						
(2) MRDOL	0.65**	1.00					
(3) MRABS	0.55**	0.96**	1.00				
(4) DOLDIFF	0.31**	0.24*	0.33**	1.00			
(5) ABSOPSAL	0.27*	0.49**	0.36**	0.83**	1.00		
(6) ABSOPDA	0.03	0.09	0.30**	0.69**	0.78**	1.00	
(7) NOM	–0.06	–0.04	–0.16	0.49**	0.56**	0.51**	1.00
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	non-parametric Spearman correlation						
(1) OVDOL	1.00						
(2) MRDOL	0.38**	1.00					
(3) MRABS	0.34*	0.95**	1.00				
(4) DOLDIFF	0.57**	0.30**	0.36**	1.00			
(5) ABSOPSAL	0.18	0.67**	0.75**	0.61**	1.00		
(6) ABSOPDA	0.08	0.45**	0.58**	0.56**	0.89**	1.00	
(7) NOM	–0.20*	–0.20*	–0.21*	0.33**	0.37**	0.42**	1.00
	(1)	(2)	(3)	(4)	(5)	(6)	(7)

table 2-4 correlations of the *dol* measures from a sample of 125 non-financial Dutch firms over 1992–1997. OVDOL denotes the O'Brien and Vanderheiden method (2-42), MRDOL the Mandelker and Rhee method (2-34), MRABS the Mandelker and Rhee method with absolute values (2-36), DOLDIFF the use of first differences (2-46), ABSOPSAL the regression of operating income to sales, ABSOPDA the regression of operating income before depreciation and amortization to sales, NOM the average net operating margin; * denotes a two-tailed significance at the 0.05 level, ** at the 0.01 level.

[20] as checked with the Kolmogorov-Smirnov procedure in SPSS.

The resulting correlations tell us that whatever the leverage effect is, the methods differ very much in the number they attach to it, as the less than perfect correlations show. On the other hand, several groups of methods perform similarly. We see for example that the two M&R-measures MRDOL and MRABS very much coincide. Apparently, the *dol* based on first differences seems to capture part of what each method measures, since it shows a significant correlation with all other measures. Especially when we look at the Spearman correlations, we see that the net operating margin indeed has a negative correlation with the first three methods. This supports the interpretation as an inverse indicator of operating leverage, as Blazenko (1996) suggests. However, the relationship with the alternative measures is positive, so no clear pattern emerges.

2.5.6.2 dol*-values and firm characteristics*

A major problem in judging empirically measured values for the cost structure is the absence of a 'true' number to capture the cost structure of a firm. Theoretically, *dol* seems most suited to measure the cost structure. However, as noted previously, a firm's *dol* will almost certainly change each year, even if there is no change in the level of fixed costs (i.e. no change in the physical configuration of the production process). The question is whether this is a problem: if the cost structure changes, this should be reflected in its indicator. But this in turn implies that the cost structure *itself* is not stable. This poses first a problem with respect to the measurement methods of both M&R and O&V, which both assume a constant *dol*. A much bigger problem, however, is that we cannot arrive at a unique number for the cost structure to relate the indicators to.

Of course, this problem is not unusual in the social sciences. What makes it more problematic is the absence of clear, testable hypotheses where we can introduce the empirical values of the indicators. If we look at the CAPM and its major variable β, we also have the question of the correctness of the empirical values of β – due to measurement problems, especially in constructing the market portfolio, and due to the question of the stability of β. But the equation in which to fit the values of β is simple and clear. There is no such relationship for the cost structure. A possible exception could be the Mandelker and Rhee equation (2-31), introduced on page 38, but this involves *three* variables that have to be estimated.

A possible way around this is to look for certain firm characteristics that can be thought to have a relationship with the cost structure of the firm. For example, the operating leverage concept is often associated with industry influence. The chemical industry is often cited as an industry where the cost structure, and thus the operating leverage is of paramount importance. While this is correct, if we analyze the methods in relation to firm level characteristics we remove the need for including the industry as a characteristic. This is because the industry is thought to capture the firm characteristics at an aggregate level: a high level of fixed costs in the chemical industry, a high asset turnover in the retail sector. Through specifically looking at these characteristics at the firm level, we can expect to find more direct relationships (if there are any). In this, we are limited to what financial statements can offer us. The firm characteristics that are possibly related to the cost structure are largely very general in nature. The data available allows us to calculate the following:

* sales to total assets: the asset turnover implies the intensity with which assets are used. If they are used intensively, their importance in total costs decreases. A high asset turnover therefore suggests a low operating leverage. As O&V put it, it could be 'a reasonable gauge of the intensiveness of physical capacity relative to labor and raw materials' (p. 49);
* sales to fixed assets: related to the previous measure, one could expect that a higher turnover of fixed assets implies a lower importance of fixed costs in total costs. It is used by S. Huffman (1989);
* fixed assets to total assets: this ratio is used in many studies (see e.g. M&R and O&V), but precise definitions are rarely given. It seems logical to take the ratio of non-current to total assets. We also look at the ratio of property, plant and equipment to total assets as a measure of fixed to total assets;
* depreciation to total assets: suggested by O&V, this is another measure of the importance of fixed assets relative to total assets. It is not clear whether it should succeed better in estimating this importance. Although depreciation is indeed a cost, not all fixed assets are depreciated, and even then not all under the same scheme, making a consistent relation between this ratio and the operating leverage not directly self-evident;[21]
* depreciation to total expenses: used by O&V, and by Balakrishnan, Linsmeier, and Venkatachalam (1996). Depreciation is arguably the most recognizable form of fixed costs. It need not be the most important, however: when we look at service firms, the fixed costs will largely consist of staff costs;
* staff costs to total expenses: unlike U.S. corporations, Dutch firms disclose their staff costs each year. In the Dutch legal and social context, staff costs are largely fixed. Unfortunately, data on staff costs is generally not available for a period of longer than 6 years;
* staff costs plus depreciation to total expenses: following the previous arguments, these two items combined should cover a substantial part of fixed costs over all industries.

Of course, we are confronted here with the same problem that we face with all *dol*-indicators that do not rely on the elasticity formula of *dol*. Just like contribution margin and net operating margin, a characteristic like depreciation to total expenses covers only part of the cost structure. However, we are not suggesting that such a characteristic can serve as an indicator, merely that it is related to the cost structure. That is to say, we expect that a firm with a larger ratio of depreciation to total expenses in general will have more fixed costs. It is possible that a firm has relatively more depreciation, but lower total fixed costs, e.g. because of lower overhead and less labor costs. However, the other way round seems more likely.

In table 2-5, the Spearman correlations between the values from the *dol* methods and the firm characteristics are presented. Except for the asset turnovers, we expect a positive relationship for all characteristics: they imply more fixed costs, so they should lead to a higher *dol*.

[21] this gives rise to the question why assets that are not written off should be of interest. Roughly speaking, we could say that they represent a sort of opportunity cost: a firm cannot move its location, or only at very high costs. This is why such assets are important even if they cause little or no depreciation costs. We will get back to this in chapter 4.

	sales / tot ass	sales / fix ass	fixed / tot ass	ppe / tot ass	depr / tot ass	depr / op exp	staff / op exp	depst / op exp
OVDOL	0.10	0.15	–0.19°	–0.10	–0.15	–0.18°	–0.06	–0.09
MRDOL	0.04	0.05	–0.08	–0.07	–0.11	–0.11	–0.02	–0.05
MRABS	–0.03	0.00	–0.02	0.01	–0.07	–0.02	0.02	0.00
DOLDIFF	–0.32**	–0.15	–0.05	–0.02	–0.13	0.11	0.23*	0.23*
ABSOPSAL	–0.35**	–0.26**	0.11	0.11	–0.04	0.19*	0.18°	0.19°
ABSOPDA	–0.34**	–0.31**	0.21*	0.22*	0.13	0.31**	0.17°	0.19*
NOM	–0.45**	–0.34**	0.18°	0.15°	–0.01	0.27**	0.24*	0.28**

table 2-5 Spearman correlations between *dol* values and firm characteristics for 125 non-financial Dutch firms over 1992–1997. OVDOL denotes the O'Brien and Vanderheiden method (2-42), MRDOL the Mandelker and Rhee method (2-34), MRABS the Mandelker and Rhee method with absolute values (2-36), DOLDIFF the use of first differences (2-46), ABSOPSAL the regression of operating income to sales, ABSOPDA the regression of operating income before depreciation and amortization to sales, NOM the average net operating margin; ppe is property, plant and equipment, depr is depreciation, op exp is operating expenses, staff is staff costs, depst is depreciation plus staff costs. ° denotes a two-tailed significance at the 0.10 level, * at the 0.05 level, and ** at the 0.01 level.

What we immediately notice is the almost complete absence of significant relationships between the theoretically correct methods of O&V and M&R and the characteristics. There are only two significant correlations, between OVDOL and the ratio of fixed tot total assets, and OVDOL and the ratio of depreciation to operating expenses, both of which have the wrong sign. With respect to the other methods, the picture seems more like what we expected. However, we have to wonder if we are really measuring the influence of fixed costs, given the results of the first three methods. Therefore, we will take another look at these measures, but this time to establish their relationship with firm *performance*.

Looking at performance indicators and *dol*-values should give us some idea as to whether we are measuring something like overall firm performance, or more specifically an effect like the operating leverage. We will look at two return measures: book return, measured by return on assets, and market return, as measured by the total shareholder return (capital gains plus dividends over beginning price). We will also look at several risk measures. First, we include market risk, as measured by the β reported by Worldscope.[22] We also look at book or accounting risk. A standard measure in this respect is the variation coefficient of earnings. However, since accounting numbers are time series, we can encounter the situation where we have a firm that grows at a high but stable rate to show a large variation coefficient. We would like to correct for this trend, but in doing so we have to realize that growth is exponential. Therefore, we must look at the trend of the logarithm of operating income. If we regress this logarithm over the years, we can say that the R^2 of this regression is an inverse measure of the variability: a higher coefficient of determination implies less deviation from the trend line. Finally, we will look at two generic measures: the average sales as a size indicator, and average sales growth.

What relationships would we expect for these performance indicators? This is not altogether clear. Preferably, the indicators without any theoretical relationship with the

[22] the β-calculation from Worldscope is not very clear, and should be judged with reservation. Since no other measure of market risk is available, it is used anyway.

operating leverage should have no significant relationships: average sales and sales growth. With respect to book return on assets, one could make a case for a negative relationship between return on assets and *dol*. This is related to interpreting *dol* as the standardized distance to the break-even point (see section 2.2.4, page 23). The negative relationship between net operating margin and the first three *dol*-measures in table 2-4 supports this interpretation. Given the theoretical link with the systematic risk, we would expect a positive relationship with β, and through this with market return. Finally, accounting variability measures can be expected to show a relationship: positive for the variation coefficient, and negative for the R^2 of the operating income growth trend.

	roa	tsr	beta	vc oper income	R^2 ln op income	av sales	av sales growth
OVDOL	−0.06	−0.31**	0.01	0.15	−0.26**	−0.15	−0.17°
MRDOL	−0.21*	0.10	0.32**	0.39**	−0.06	0.06	−0.25*
MRABS	−0.25**	0.04	0.24**	0.44**	−0.09	−0.01	−0.21*
DOLDIFF	0.19*	0.06	0.13	0.23**	−0.05	−0.06	−0.05
ABSOPSAL	0.18*	0.21*	0.23*	0.28**	0.20*	0.02	−0.02
ABSOPDA	0.24**	0.19*	0.15°	0.20*	0.22*	0.06	0.01
NOM	0.69**	0.42**	0.07	−0.31**	0.41**	0.10	0.34**

table 2-6 Spearman correlations between *dol* values firm characteristics for 125 non-financial Dutch firms over 1992–1997. OVDOL denotes the O'Brien and Vanderheiden method (2-42), MRDOL the Mandelker and Rhee method (2-34), MRABS the Mandelker and Rhee method with absolute values (2-36), DOLDIFF the use of first differences (2-46), ABSOPSAL the regression of operating income to sales, ABSOPDA the regression of operating income before depreciation and amortization to sales, NOM the average net operating margin; roa is average return on assets, tsr is average total shareholder return (capital gains plus dividends), beta is the β as reported by Worldscope, vc oper income is the variation coefficient (standard deviation/average) of operating income, R^2 ln op income is the coefficient of determination for the regression of the logarithm of operating income to time. ° denotes a two-tailed significance at the 0.10 level, * at the 0.05 level, and ** at the 0.01 level.

The results of table 2-6 are not very conclusive (all the more since extending the sample time period leads to poignant shifts in the significance and sign of certain correlations, see appendix ii starting on page 161). We do see some significant correlations with the correct sign. This is especially the case for the M&R methods: they both show a negative significant correlation with return on assets, and a positive one with β. Furthermore, the negative relationship for OVDOL with the R^2 of operating income is what we expected. Several other relationships are not what we would expect, however. Most important in this respect is the positive correlation between the contribution margin approaches ABSOPSAL and ABSOPDA, and the return on assets. Apparently, more than the operating leverage, they seem to measure overall performance – which also causes us to rethink the results of table 2-4, in particular the positive correlations with the net operating margin. The significant relationships of NOM with the accounting variability measures are in the expected direction for indicators of *dol,* but NOM is thought to be the *inverse* of *dol.*

Ultimately, of course, our analyses can only bring about tentative conclusions, since we have no 'true' *dol* available, nor any validated hypotheses into which we can plug our *dol*-values. The overall picture, however, is that of a fine mess: we have some direct *dol*-

measures that have a theoretical basis but are plagued by implementation problems, we have some alternative measures that perform reasonable when linked to certain firm characteristics that *can* be related to the operating leverage but also measure other effects, the correlations between the two groups of measures is very inconclusive, and we have no valid benchmark for the measures.

At this point, we might be tempted to say: so what? We know that there is a substantial relationship between the alternative measures and the sophisticated ones of O&V and M&R. Why can't we just take the contribution margin, or the net operating margin, and use these as an indicator of the cost structure? At least we could use them in our empirical analyses, so as to draw some conclusions with respect to the influence of the cost structure on risk and return? The answer to these questions lies, as before, in the concept of the operating leverage. With the operating leverage, we specifically look at the influence of the presence of fixed commitments to firm performance. This can only be evaluated by looking at all of variable costs, fixed costs, and sales. Again, fixed costs levels are only important relative to sales levels, contribution margins can only be judged in relation to (unit) sales and fixed costs, and net operating margins tell us nothing about the composition of costs. The alternative measures really seem to capture an overall performance effect, i.e. something like operating efficiency or profitability. At the same time, we know that the operating leverage, provided it is properly measured, plays an important role in explaining the risk profile of a firm. However, in order to draw any conclusions from analyses of financial statements, it is imperative that the operating leverage is indeed properly measured – if we should want to say anything about the relationship between firm performance and operating leverage, instead of the relationship between certain performance measures (e.g. market return), and other performance measures (e.g. net operating margin or operating efficiency).[23]

2.6 how to use *dol* – ideas from theory

Suppose a manager or controller finds himself at the end of the year with his firm data. This manager can calculate his firm's operating leverage, assuming he has some ideas on the levels of fixed and variable costs, and the product prices. The big question then is: what can he do with it? The literature has provided us with some ideas on the relationship between leverages and risk – and with little else. Of course, there is the M&R formula, which states that operating leverage and financial leverage have a direct multiplicative effect on the systematic risk of a firm:

[23] to illustrate this point, we refer back to Ang and Peterson (1985), mentioned on page 45. They try to explain financial lease ratios of firms, and find that there is a negative correlation for the lease ratio with the return on assets, and with the operating leverage (as measured with ABSOPSAL, the regression of operating income to sales). When we see that their *dol* value is really just another overall performance measure, we have two correlations with the same implications. If we should take their *dol* value to be a good indicator of the operating leverage, we would get a very different line of reasoning: financial leasing increases financial flexibility, even though the resulting costs are just as fixed as when assets are bought. Although this interpretation can be used to arrive at some very interesting conclusions about the relationship between financial leasing and flexibility, these conclusions are totally wrong when ABSOPSAL is really just a performance measure.

$$\beta = dol \cdot dfl \cdot \beta^0 \qquad (2\text{-}31)$$

So what does this tell us about the optimal *dol?* Well, not very much – nothing, to be exact. To infer any conclusions from equation (2-31) with respect to target levels for *dol* would require a body of literature with respect to the optimal level for the systematic risk β. This body of literature does not exist. What research there is concentrates on explaining observed systematic risk levels, not looking for optimal levels. In discussing risk management, Brealey and Myers (2000, p. 1014) state that

> less risk can't always be better. The point of risk management is not to reduce risk but to add value. We wish we could give general guidance on what the *appropriate* level of risk is.

Also, we can once more point to the vast amount of research that has been done on financial leverage and observe that this did not result in clear and consistent advice on the optimal leverage. There is no 'simple, satisfactory theory of optimal capital structure' (Brealey and Myers, 2000, p. 528). This means that we have no theoretically desirable level of *dfl,* and no such level for β. This makes it impossible to use the M&R analysis to come to any conclusions. Only if we had *dfl* and β levels, could we try to draw conclusions from empirical data.

Despite the fact that there is no optimal β, M&R follow an early observation of Van Horne (1977, p. 731) with respect to the operating leverage-financial leverage trade-off:

> Operating and financial leverage can be combined in a number of different ways to obtain a desirable degree of overall leverage and risk of the firm. High operating risk can be offset with low financial risk and vice versa.

The logic behind this is appealing, but overlooks the fact that there is no general desirable degree of overall risk for the firm. However, Mandelker and Rhee (1984, p. 54) note that, provided we accept the notion that managers want to stabilize their firm's systematic risk,

> ... the two types of leverage can be chosen so that changes in the level of β are minimized. If the level of intrinsic business risk is constant, a change in *dol* can be offset by a change in *dfl* and vice versa.

Although this may be true, it does not justify their next conclusion: 'Therefore, one would expect a cross-sectional negative correlation between *dol* and *dfl*.' If any conclusion can be drawn at all, it is that *changes* in *dol* and *dfl* can be expected to be negatively correlated – provided that firms look for a stable systematic risk.

However, before discarding the ideas of M&R, let us look at their empirical results. Remember that they estimate *dol* by regressing the logarithm of *ebit* to the logarithm of *sales* (equation (2-34), MRDOL) for firms with positive earnings, and use absolute values with a correction when firms encounter losses during the sample period (equation (2-36), MRABS). They try to fit their equation (2-31) by running the regression

$$\beta_p = \gamma_0 + \gamma_1 \ln dol_p + \gamma_2 \ln dfl_p + e \qquad (2\text{-}47)$$

The subscript p indicates that the analysis is done at the portfolio level, to get more stable values for the variables. Their results are presented in table 2-7, and they seem to be very encouraging. All coefficients are positive, and the R^2s are acceptable. If we look at the result for the most logical grouping variable β, we see two significant coefficients, and a high R^2. What is more, they also find a negative relationship between *dol* and *dfl* at

portfolio level. These results fit nicely with their theory, and they also seem to suggest that their procedures for estimating *dol* and *dfl* are capable of capturing the 'true' degrees of leverage. Given our discussion in section 2.5, it is especially the apparent correctness of the M&R methods for measuring *dol* and *dfl* that is surprising.

grouping variable	γ_0	γ_1	γ_2	R^2
debt ratio	0.09**	0.32*	1.30**	0.43
fixed/total assets	0.09**	0.37**	0.94**	0.38
β	0.12**	0.73**	1.98**	0.48
dol	0.07**	0.14**	0.37*	0.17
dfl	0.07**	0.14	4.32**	0.34

table 2-7 results of fitting equation (2-47) at portfolio level. The sample consists of 255 U.S. manufacturing firms during the period 1957–1976, divided into 51 portfolios of 5. Portfolios are formed based on the grouping variable, e.g. the five firms with the highest debt ratio in the first portfolio, etc.; regressions are run on the portfolio averages. * denotes a two-tailed significance at the 0.05 level, ** at the 0.01 level. Source: Mandelker and Rhee (1984, p. 53).

The empirical analyses of M&R are replicated by S. Huffman (1989), mainly because M&R are the only ones to empirically find the trade-off between operating and financial leverage. He follows their procedures, but uses different samples: one sample of 376 U.S. manufacturing firms over 1966–1985, and a subset of that sample of 268 firms that always have positive earnings. His results are somewhat to very different from those of M&R. He does not find the positive coefficients for *dol* as can be seen in table 2-7, but instead finds significant *negative* coefficients when fitting equation (2-47). When using only firms with positive earnings, so when estimating *dol* only with equation (2-34), the negative coefficients turn into insignificant positive coefficients. Furthermore, the correlation between *dol* and *dfl* shows a very mixed picture, that is influenced by whether or not only firms with positive earnings are included. Both significant positive and significant negative correlations are found, depending on the portfolio grouping and the sample.[24]

The mixed results of M&R and S. Huffman (1989) could be due the measurement method of the degrees of leverage – making one of the two articles present accidental results, either positive or negative – or due to incorrect theoretical deductions. This is what is suggested by L. Huffman (1983) and Prezas (1987). Both L. Huffman and Prezas start from the assumption that there is an interaction between decisions regarding capacity (i.e. investments) and financial leverage. They consequently both succeed in showing that this interaction can be modeled so that it can be incorporated into the leverage formulas.[25] Should operating leverage and financial leverage be related, then

[24] while the estimation of *dfl* is not of major interest, it is interesting to note that the industry with the highest average debt ratio (utilities) has the lowest *dfl*. This leads S. Huffman to question 'the internal validity of [equations (2-34) and (2-35)] as being good proxies for *dol* and *dfl*' (p. 88).

[25] note that L. Huffman (1983) does find some theoretical arguments for a trade-off between operational and financial risk. She arrives at this by modelling firm value as a one-period option with an exercise price of operating cost at capacity production plus debt, while assuming the variance of revenue is known and its distribution is lognormal. This cannot be translated to real-world examples, mainly because the optimum capacity level in general cannot be set freely, an issue to which we will come back *ad nauseam* in the remainder of this thesis. Furthermore, her analysis is made in terms of total business risk and not

viewing *dol* and *dfl* as independently multiplicative with respect to β is not correct, meaning in turn that the formulation of the regression equation (2-47) is not allowed. This has been picked up by Li and Henderson (1991) and by Darrat and Mukherjee (1995). In both articles, there is explicit room for interaction between *dol* and *dfl,* and support is found for the hypothesis that operating and financial leverage interact.
The discussion on how to use *dol* seems a bit *ad hoc*, especially in light of our extensive discussion on how to measure it. However, this is the result of the lack of theory on how to use it. As pointed out by Shrieves (1981, p. 690),

> [w]hile some attempts to define the association between operating leverage and firms' risk positions have been made, they are incomplete in the sense that they do not constitute a *theory* of (optimal) operating leverage, but treat it as a given technical parameter.

This is no less true today. If we look back at the overview of textbook treatments of the operating leverage in section 2.3 on page 29, we noted that there is no attention for the operating leverage as a management tool, no ideas on how to use *dol* in managing a firm other than explaining a part of firm performance. At the most, we have the articles of Shrieves (1981) and L. Huffman (1983) who claim that a certain trade-off does exist: Shrieves maintains that increasing 'environmental' or demand risk requires a reduction in operating leverage, Huffman states that increases in financial leverage or in business risk can be partially offset by the capacity decision, i.e. the level of fixed costs. However, both these articles are very economic in their orientation, and therefore hard to translate to real life situations. To put it bluntly: of course it is beneficial for the firm to have more flexibility whenever there is more uncertainty. But where does it stop – how much flexibility is optimal? The complex models of Shrieves (1981) and L. Huffman (1983) only allow analysis of changes in certain variables, not of absolute or target levels.

2.7 conclusion – *dol:* what's it worth?

Papers on the operating leverage have concentrated on the relationship between operating leverage and systematic risk, and on the empirical measurement of the operating leverage through the degree of operating leverage. The current chapter reflects this. Reviewing our discussions in this chapter, we can draw the following conclusions:

(1) as has been said previously, the *dol* as main indicator for the operating leverage suffers from the strong assumptions governing the break-even-analysis. This means that the simple relationships between *dol* and β as derived by Rubinstein (1973), Lev (1974), and Mandelker and Rhee (1984) only hold under conditions that will not be met in reality. They provide much insight into the mechanisms behind the relationship between operating leverage (and financial leverage as measured with *dfl)* and systematic risk. However, it is difficult to translate their findings into practical situations, all the more because we cannot set any desirable *dol*-levels from theory;

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systematic risk. This makes it hard to reconcile with traditional finance (although the current debate surrounding the CAPM shows that it is not necessarily wrong).

(2) related to the previous point, we are confronted with the fact that a firm will rarely ever have a unique *dol* over a number of periods. The *dol*-concept is very static: a business entity (a project, process or a whole firm) has a different *dol* for each configuration, i.e. for each level of fixed and unit variable costs, and for every level of sales. When additional investments are made, when prices go down or the contribution margin changes, this leads to a new value of the *dol* of that firm. When sales change, the *dol* of a firm changes. Since firms change over time (all the time) in both costs and sales, the real *dol* of a firm also changes. The lack of unique numbers makes analyzing, discussing and using the operating leverage concept difficult;

(3) this lack of unique numbers shows up in full when trying to measure *dol*. Since we do not have information on fixed and variable costs at the financial statement level, we have to estimate *dol* from the elasticity of earnings to sales. To minimize the effects of accidental or incidental influences on the sales and earnings used for measurement, it is necessary to use data from several years. However, the techniques that are aimed at measuring the real *dol*, those of Mandelker and Rhee (1984) and O'Brien and Vanderheiden (1987), are based on the assumption that *dol* is constant, so this creates an inherent imprecision (unless there is the very unlikely situation where the cost structure really is static). And even then, we come back to the observation that even a constant configuration will have different *dol*-values for different levels of sales. In all, it is not possible to empirically assign a *dol*-value to a firm like one would a β.

To drive home this last point, look back once more to table 2-3 on page 49. Here we noted with respect to the Mandelker and Rhee (1984) and O'Brien and Vanderheiden (1987) methods that they showed a large percentage of values below 1, even though they were applied to profitable firms. Together with the disappointing results of linking the values of the methods to firm characteristics, as reported on page 53 in table 2-5, this seems to suggest that the methods do not succeed in capturing the operating leverage of a firm. This is probably not so much due to the methods as such (the average R^2 is quite acceptable for all regression techniques), as to the fact that the firms do not behave as neatly as is assumed for almost the whole of chapter 2. So the conclusion must be that a real firm – one that is confronted with price changes in its materials, that adjusts its selling price to market changes, that changes its output levels, that invests, merges, and divests, that improves its production processes, and that changes its product mix – cannot be assigned a single, unique *dol*-value over a period of time. This makes it impossible to come to empirical conclusions with respect to *dol*-levels and firm performance. Since we also do not know what to do with it from a theoretical point of view, this leaves us at a dead end.

Or a beginning, of course. We are now confronted with the question of how to implement the operating leverage concept in such a way that it is useful in practice. We know that the basic idea, as presented in section 2.1, is clear, simple, and appealing. The basic application of explaining why the earnings variability of one business entity is larger than that of another can be enlightening, and should be subject matter in all financial management textbooks and courses – as it is. But we want more than just that. We want to actually do something with it. It is clear from the analyses in this chapter

that the course of action to follow in developing applications does not lie in devising better measurement methods. We know that the methods of Mandelker and Rhee (1984) and O'Brien and Vanderheiden (1987) are theoretically correct, and because of that practically not applicable, and we know that other estimates of *dol*, like the contribution margin or the net operating margin, are more convenient but theoretically incorrect. In fact, any method that is not based on the elasticity formulation of *dol* as originally presented in formula (1-1) does not capture all of what operating leverage is about, and therefore can only hope to accidentally stumble across the phenomenon it wants to measure in empirical analyses – something that is furthermore impossible to assess because we do not have the true values of that phenomenon. But rather than aiming at a better measurement of *dol,* we are going to look beyond the numbers. We will focus on the cost structure that underlies the leverage effect, and try to find out what its determinants and influences are.

3 cost structure

In the previous chapter, we discussed the operating leverage with a focus on its effect: the magnification of sales variability into earnings variability. This effect is measured with *dol,* and we discussed the *dol*-concept, measurement methods and possible applications. In the end, it turned out that *dol* can not be reliably measured at the financial statement level, can be interpreted only under very strict assumptions, is not a stable firm characteristic even when these assumptions are met, and does not have any target level suggested by theory or empirical data. Of these points, it is the last that is the most interesting. Why is it that the operating leverage is treated as a 'given technical parameter', as Shrieves (1981, p. 690) puts it? That it is hard to derive insights from empirical data because of the measurement problems is clear. Likewise, it is difficult to test any hypotheses with real world data. But where does the lack of these hypotheses come from? Why do we not see a substantial body of theory surrounding *dol* as a variable to be manipulated in order to achieve e.g. maximum firm value, or maximum financial flexibility? The absence of a link between theory and empirical reality hasn't hindered the development of capital structure theory. In fact, Cools (1993, p. 46) posits that '[capital structure] theory could have developed with the same speed and could have taken the same course as it has done, if no econometric research had been undertaken'. So why is it then that operating leverage has received only modest attention within both business economics and business management? Why hasn't operating leverage been picked up in a way analogous to financial leverage? In order to pick up the pieces that chapter 2 has left of the research, we ask ourselves:

1 why has operating leverage received so little attention?

The answer to this question is not only interesting from the point of completeness of the research. It also points towards the issues that are important.[1] Consider some probable answers to this question: it just isn't interesting; it is interesting but impossible to analyze; it is interesting and analyzable, but not useful for management, or it has simply been overlooked all these years – maybe because it has always been called something else, like flexibility. The first answer would give us the task of explaining why it is interesting; the second would oblige us to devise feasible methods of analysis; the third would lead us to perform better analyses so as to give some ideas of how it can be used as a management tool. The last answer would make our task appealingly simple: just point out to people in the scientific and business community what a dazzling concept it is, and we're there!

Several aspects have been dealt with or touched upon in the previous chapter, most notably the question of theoretical importance, and the 'technical' issue regarding the analytical problems with respect to measuring *dol.* The interested reader will therefore know several possible answers to the first question of this chapter. However, we will take

[1] although somewhat presumptuous, it is hard to resist quoting Miller (1988, p. 100): '...showing what *doesn't* matter can also show, by implication, what *does*.'

the conclusions from the previous chapter and integrate them into a more coherent judgement of the importance of operating leverage. Next, we will make a new start in tackling the central issue of this thesis. To emphasize the new road, we will now talk about the cost structure. Operating leverage and cost structure can be regarded as being the same, but the operating leverage is directed at the *effect* of the cost structure, as measured with *dol*. We still think the effect is important, but it is no longer the phenomenon at which our research is centered. Instead of focusing on the number that rolls out of any combination of *q*'s, *p*'s, *v*'s, and *F*'s, we are now going to look at the underlying structure – what can we tell about these variables? To do this, we start with the following question:

2 how can we position the cost structure in related fields?

This somewhat awkward formulation is needed to broaden the scope of the research. Interest in the operating leverage has largely been restricted to the field of financial management and financial economics. Since we have concluded that this field is too limited to fully cover the importance of the cost structure for firm performance, we have to see how we can bring in knowledge from other fields of science, and how we can introduce the cost structure (and through this the operating leverage concept) into these fields. This also prompts another question:

3 what is the importance of earnings variability for firm performance?

Because of our findings in chapter 2, we are letting go of *dol* as the prime measure of the cost structure. The theoretical importance of *dol* was discussed within the framework of the capital asset pricing model. In the CAPM, variability is only important insofar as it adds to systematic risk. Now that we are leaving the field of financial economics, we need something else to relate the cost structure with firm performance. The best candidate for this something is earnings variability, a simple, directly observable measure. We need this measure to be able to say something about the implications of any cost structure, since this shows its effects in earnings variability.[2]

4 what are the determinants of the cost structure?

This is where we truly depart from the research path that is required for discussing *dol*. More than just asking how the cost structure influences firm performance, we want to know what the variables, influences and circumstances are that determine the cost structure of a firm. This means that we no longer view the cost structure as a degree of freedom, as something that can be largely set any way management wants – as is the case in the financial economics literature, sometimes explicitly, more often implicitly – but that we are going to look at the possibilities and constraints a firm faces when it sets its cost structure. This implies that we are not going to look at the financial statement level, but at the actual processes within a firm, and at the market it operates in.

5 how is the cost structure viewed in practice?

Based on the ideas generated with the fourth question, we enter the real world and discuss the cost structure, its importance, and the role it plays in practice. We then round up the chapter by looking back to our research goal and asking ourselves how far we have come towards an answer.

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[2] note that it is very difficult to put earnings variability into the research questions beforehand. Its importance will become clear afterwards; for now, we have to do with the cumbersome justification presented here.

3.1 about the unimportance of operating leverage

When the CAPM rose to fame and to widespread acceptance in the late 1960s and early 1970s, a quest started to find the determinants of systematic risk, as measured by the famous β of the CAPM. The string of literature which resulted is analyzed in section 2.4.2, and one of the articles mentioned there (on page 33) is by Hamada (1972). This much-cited article aimed to quantify the importance of the capital structure for the systematic risk of a firm. Hamada succeeded in obtaining an empirical estimate for the portion of the systematic risk that was attributable to the amount of financial leverage. He reported that some 21 to 25% of the systematic risk was due to the financial leverage. This obviously means that at least 75% can be awarded to operational characteristics. However, it was the 25% of the risk that took up more than 75% of the attention – Pareto in action. The financial leverage of the firm was the center of attention, not the operating leverage.

The financial leverage concept has been the subject of numerous studies starting with the famous Modigliani-Miller (1958) article. This can be explained in part, perhaps, because of the many theoretical challenges it offers. Within a rigorous financial economics framework many theories about both the observed and the 'correct' financial leverage have been developed, tested, refined and confuted (cf. Cools, 1993). Another attractive feature is its measurability: it can be calculated from a basic balance sheet, and it is important in any industry (except maybe the financial sectors). On the other hand, the amount of attention is somewhat surprising given the limited influence of financial leverage on firm value. The original Modigliani-Miller article even stated that there is no relationship at all between financial leverage and firm value.

The attention paid to a certain section of a discipline can be explained only partly by looking at the importance of the subject at hand for the overall phenomena under investigation. It is as much a sociological question (as in sociology of science) as it is a scientific one. An important reason for all the effort directed towards the theory of capital structure seems to be largely sociological. It is a 'hard' section of the discipline of business economics, which allows the use of economic and econometric methods. This makes it intellectually challenging, but more importantly, it makes the student of financial economics a 'real' scientist, ultimately eligible for a Nobel Prize. Furthermore, the use of standardized methods facilitates the scientific discussion about a subject: when agreement is reached over definitions and techniques, the results that are presented are to be evaluated on their contents, and cannot be easily brushed aside as not pertaining to the real issue. And whatever one might think about the reality of the theories developed about the capital structure, as a research program it has reached a very high degree of sophistication, as Cools (1993) has shown.

This general explanation serves us little in the current research. Fortunately, there are some more specific reasons for the low popularity of the operating leverage concept. Perhaps the most important is the fact that operating leverage can only be defined and measured in management accounting terms. Whereas debt and equity are clearly defined through the legal rules a firm has to follow in drawing up a balance sheet, there is no such guideline for determining the degree of variability of a cost. It is a subjective choice that is very much dependent on the purpose the observer has. From a strategic

point of view, it makes sense to say that all costs are variable. One can choose to invest in a fixed asset, just as it is possible to dispose of that asset. In managing the day-to-day operations of the firm, almost all costs can be considered fixed: it is not possible to fire employees from one day to the next, raw materials are ordered in large volumes and buildings and machinery cannot be closed down or sold one day and used again the next. Therefore, the concept of variability is a question of definition: costs that can be avoided within a certain time period are called variable, costs that are incurred over a longer period are called fixed, and the time period considered depends on the point of view taken.[3]

Whatever the problems surrounding the categorization of costs into either fixed or variable, these problems are not important from a financial economics point of view since firms are not required to report their cost structure in their financial reports. Even if the ratio of fixed to variable costs is known to management, this information is not publicly available. This means that the cost structure as an empirical variable is not directly observable, but requires estimation procedures like the ones discussed in the previous chapter. And these measurement problems are exacerbated by the fundamental issue of *dol* being different for every level of sales. When a variable is not observable, it is hard to use in explanations and even harder to explain. It may be possible to estimate the variable, or to look for proxies, but this makes it a less interesting subject of research. As we tried to show both theoretically and empirically, no amount of econometric methods is likely to overcome the problems associated with estimating the cost structure. Since the operating leverage can only be defined in management accounting terms, it is not readily available from the databases used in financial economics, such as Compustat or Datastream. This means that the econometric tools used in analyzing financial leverage and the capital structure of the firm are not directly applicable to the operating leverage and the cost structure of the firm. This would explain the lack of empirical studies on the subject.

But why do we see hardly any theoretical exercises? Why is it that our section on the uses of *dol* (2.6, page 55ff.) is just a few pages long? The reason for this seems plain and simple: financial economics is not concerned with the operational aspect of a firm. The chapter on debt policy in the excellent textbook of Brealey and Myers (2000) starts as follows: 'A firm's basic resource is the stream of cash flows produced by its assets' (p. 473). Capital structure theory starts with cash flows or earnings and next concentrates on how these cash flows should be divided among the fund providers. The cost structure, however, interacts directly with the operational processes that generate these cash flows: on the one hand it determines the cash flows through the fixed and variable costs, on the other hand the level of the cash flows (or more precisely the level of

[3] note that a similar problem occurs in analyzing the balance sheet of a firm: the problem here is to categorize an asset as either fixed or current. In financial accounting, there is a legal distinction at a time period of 1 year. Balance sheet items that mature within one year are current items. However, the need is often felt to distinguish a certain core of current assets and liabilities, that are induced by the normal activities related to the firm's present situation. From a going concern-perspective, these items can be considered fixed or long-term. Although these problems do not affect the measurement of financial leverage, it goes to show that even within a strict legal framework an unequivocal categorization of items is not always possible along lines that facilitate the analysis.

revenues) is an essential part of the cost structure. These operational characteristics – as summarized in financial terms with the cost structure or with *dol* – are not interesting once the cash flows are given, as is usual in financial economics analyses (with the exception of their influence on the 'risk generating processes', as Lev (1974) puts it).

Now, if it were possible to derive some clear recommendations with respect to the cost structure from theory, we could expect that a small but substantial string of articles would exist in the field of financial economics. Small, since it is a phenomenon at the fringes of this field, and substantial because the recommendations would regard the value of the firm, either through cash flows or through the risk position of the firm. However, the two articles we could find that try to establish an optimal cost structure (Shrieves (1981) and L. Huffman (1983)) not only rely on very heavy abstractions of the operating process, their recommendations do not go beyond establishing a simple trade-off between risk and operating leverage. If the risk is higher – either because of an increase of overall (demand) risk, or because of an increase in financial leverage – this can be mitigated (partly) by lowering the operating leverage. Nowhere in the literature do we find suggestions about an absolute optimal operating leverage. And as noted, it is not clear why there should be an optimal operating leverage. This makes any theory development surrounding the cost structure difficult. What is more, it also makes it uninteresting from a financial economics point of view, and consequently almost non-existent.

All in all, the lack of interest for the cost structure within the field of financial economics is readily explained. So we have established that the central theme of this thesis does not fit too well within a subsection of business economics, of which the practical relevance for management is limited to say the least. This doesn't explain why it has received so little attention in business administration and management in general – although it should be noted that financial leverage itself is also not such a prominent subject, both in research and in education, outside of financial economics. A first, tentative explanation would be that it is not clear whether managers think in terms of fixed and variable costs. This can be caused by the categorization problem. And if there is no clear view of the fixed and variable costs, the cost structure of the firm is not known, so there is no subject to pay any attention to. If this is really the case, then it makes no difference what the applications of the operating leverage concept are, since it cannot be identified by management. This leads to a sort of self-fulfilling prophecy: variable and fixed costs are not known, so the cost structure is not known. But the cost structure is a major result of classifying costs and therefore can be seen as one of the major reasons for classifying. When it is viewed as not useful, there is no need for categorization of costs.

It would seem that the classification problem can be rectified, so if this were the major obstacle to applying the concept it would be likely that management practice as well as research would have taken steps to do so. Unfamiliarity with the concept, as suggested in the previous paragraph, could be part of the explanation, but not the whole story. Not only has the operating leverage been around for a long time, it is also treated in the important textbooks on financial management – and it would reduce our research to a very practical marketing problem. Apparently, something more is going on. There are three important possibilities: (1) the operating leverage concept is not interesting, since

its effects are not important enough, (2) the concept is interesting, but it is not feasible to use it as a control variable, (3) what we define as operating leverage or cost structure is dealt with through other concepts and variables.

It is easily shown that the cost structure can have major effects on firm performance as measured by the earnings variability. This is immediately apparent in the example of DSM, and in the chemical industry in general. It can also be shown through some simple calculations. In general, in any industry where capacity utilization is essential – i.e. in every industry – the importance of the cost structure is evident: it is necessary to generate sufficient margins so as to cover the fixed expenses. So the absence of attention cannot be the result of a lack of effects.

The second reason, that the cost structure cannot be used as a control variable, is reflected in the treatment of the operating leverage as a 'given technical parameter' (Shrieves, 1981). If it were possible to fully control the cost structure, meaning that its parts could be set deliberately at a chosen level, its practical relevance would increase significantly. It seems fair to say that until now, there has not been any research in this respect, and it is a valid explanation for the limited application of the operating leverage concept. Therefore, this will be one of the main questions to be answered during the research. There are two aspects to this point. The first is that while the importance of the cost structure is easily demonstrated, it is not necessarily useful to set targets for it. It may be that it can only serve as an indicator of the sensitivity of earnings to sales fluctuations, as it is too crude a measure to let it prevail over market expectations, technology choices, etc. In other words, although the importance of the cost structure is recognized, its effects are deemed less important than the other factors a firm considers when setting its cost structure. The second point is more fundamental: is it at all possible to set targets for the cost structure? It is not unlikely that the availability of production technology is a constraint rather than a choice. This can be seen in the chemical industry, where the scale of production often has a certain lower boundary and there is only one way of producing. This leads to a relatively small bandwidth in choosing the technology of the production process. It is not clear whether technological constraints are prevailing in other sectors of industry. It should be noted that these constraints do not necessarily mean that there is only one way of production, it is sufficient if there is one way that is clearly dominant in its performance. Whenever technology prescribes a specific configuration of the production process, and thus a specific cost structure, the operating leverage is not a degree of freedom. Both usefulness and feasibility are important aspects in the research. It also may be that it is not possible to distinguish between the two, since having a choice in setting your cost structure is a measure of degree: if a technology choice is only possible at very high costs, it is not really a feasible option.

Finally, the cost structure may be regarded as unimportant because its influence is captured in other concepts and variables. Decisions about the level of fixed assets are the subject of financial management (specifically capital budgeting) and strategic management. There is a broad set of well-developed management tools available through these disciplines: break-even analysis, discounted cash flows and net present value analysis, real options, scenario analysis, etc. These methods typically analyze a business situation over a number of periods to come to a conclusion about the

attractiveness of that situation. They are not ideally suited to analyze an existing structure that faces a changing environment, the situation where the operating leverage effect is most poignant. Furthermore, there are several important general concepts, of which flexibility and cyclicality deserve the most attention.

Flexibility is a very broad subject, and there are many definitions of it. However it is defined, it is clear that variability and flexibility are closely linked, and that reducing the operating leverage and increasing flexibility can be essentially the same. We see this in the continual increase in the use of temporary workers. Replacing workers on a fixed contract by people hired on a short-term basis is a prevalent theme in management and society. Although it is normally not viewed in light of the cost structure, it is directly related to it. This is not always the case with flexibility issues. When we look at flexible production systems, we can discern two counteracting types of flexibility: these systems are designed to provide product and production flexibility, but require a large investment. While increasing one kind of flexibility, they also increase the operating leverage. With this example in mind, it seems fair to say that the cost structure is a valuable concept on its own right. One can interpret it as a specific measure of flexibility: financial flexibility. This is what *dol* originally measured: the sensitivity of *changes* in earnings to *changes* in sales.

The operating leverage concept can also be coupled to the notion of cyclicality, which is a very important topic in (general) economics. Cyclicality can be defined as the covariability of earnings (or cash flows, or value added) with the economy as a whole, e.g. the gross national product. Typically, highly leveraged firms such as DSM and the chemical industry in general are known to investors as cyclical funds because of the nature of their earnings pattern. In economics, the interpretation is somewhat different. The most important distinction seems to be that in this case attention is not aimed at the behavior of earnings, but rather at the behavior of production. This results in some counterintuitive explanations within the economics approach. Most important is the prediction that 'the greater an industry's fraction of variable costs to total costs, the more cyclical the industry should be in response to either demand or cost shocks' (Petersen and Strongin, 1996, p. 190). The idea is that industries with a large portion of variable costs are better able to react to a demand 'shock', because they can quickly adjust their production level. This seems exactly opposite to a cost structure approach. However, it means that a firm with a lower operating leverage can adjust its costs to a larger extent, and thus will react less strongly in its earnings.[4] Clearly, cyclicality and cost structure are related, as Myers (1977, see section 2.4.2, page 31) noted, but cyclicality is a more aggregate phenomenon. As such, we can say again that the cost structure is more specific than, or at least different from cyclicality.

In summary, we can identify the following reasons for the perceived low popularity of the cost structure and the operating leverage concept, ignoring the possibility that it is not known to scholars and practitioners. Within financial economics, the field where it originated and where it draws the most attention, it suffers from measurement problems and the absence of any theoretically desirable levels. In the general field of business administration, we can think of three possible reasons: it is not important in practice,

[4] strange folks, those economists... (cf. Asterix and Obelix).

which we discarded as unlikely, it is practically not useful because it is not very well controllable, or it is covered through other concepts.
If we want to attain some real progress in our understanding of the cost structure, it seems best to focus on the issue of controllability. Next to this, the question lingers whether there is such a thing as a desirable level of operating leverage, and thus an optimal cost structure. Both these questions require a different approach to the subject. We need to free ourselves from the limited worldview of financial economics, where the world consists of financial statements and stock exchanges, and look behind the cost structure: what is it that these costs represent? And what variables are there that influence the levels of fixed and variable costs and prices, and so the actual constellation of the cost structure? This implies a different approach to the research. The first step that we have to take is to position the research in related fields of research.

3.2 positioning the research

To get a feel for the possible ways in which the research can develop, it is necessary to take a look into the subdisciplines of business administration where the cost structure can possibly be a useful concept. This means that not all sections of business administration will be treated. Attention will be focused on financial economics, financial management, management accounting, production management and strategic management. Other sections related to the operating leverage are organization science, marketing and accounting, but they will receive less attention. It should be noted that these fields overlap to some extent.

3.2.1 financial economics

The leverage concept stems from the field of financial economics. Although its roots are not exactly traceable, the term 'leverage' now generically means the extent to which the firm is financed with debt capital. There has been a vast amount of research directed at financial leverage. Starting with the famous Modigliani-Miller article of 1958, theories and empirical tests have gone side by side to come to a theory of the capital structure of a firm. Considering that one important justification for the current thesis is the meager attention paid to operating leverage compared to financial leverage, it should be noted that the vast majority of the research is aimed at describing and explaining the observed phenomena regarding the capital structure.[5] Also, financial leverage is often used as a control variable or even an explanatory variable in empirical research (see e.g. Lang, Ofek, and Stulz (1996) for the influence of financial leverage on investment), so there are some applications (implications). However, the use of financial leverage in management decisions – other than in determining the desired capital structure – is almost never discussed.
One exception is Sandberg, Lewellen, and Stanley (1987), who try to develop a tool for establishing the 'best' degree of financial leverage. They try to relate the risk associated with the cash flow and earnings to the level of fixed financial charges that a firm faces. Starting from a historic mean return on assets (*roa*) and an acceptable probability of not

[5] in high-brow terms: it is very much a positivistic research program.

meeting the fixed charges, they derive the appropriate leverage position. Although their result is most charming, there are many drawbacks to their model. The main assumption is that the firm has a stable *roa* with a normal distribution. As Sandberg *et al.* note, this is a very strict assumption, one which will most likely not be met in practice. The model has not had a great impact on theory or practice, but it is one of the very few in which financial leverage is seen as a target variable. In other words, corporate finance policy is not seen as being determined by characteristics like firm size, growth, risk, or profitability (e.g. Van Dijk, 1997), but as a true *policy*, one that states that the financial leverage should be decided upon based on expectations regarding the operating performance of the firm and a maximum acceptable default chance. Should either of these change, the firm needs to adjust its leverage position.

Chapter 2 has been written wholly from the financial economics view of the firm. It is clear that this is not the view that will lead to a full understanding of the importance of the cost structure for firm performance. However, since the shadow of the financial leverage continually looms over this thesis, it is useful to once again point out the differences. Regarding the research on financial leverage, this is aimed at explaining the observed levels of financial leverage. Now, looking back to the first research goal formulated in section 1.2.1 on page 4, we see that we want to learn more about the importance of operating leverage for firm performance. It would seem that this is very much a descriptive, exploratory research goal. Why do we maintain that looking at the cost structure requires a different point of view than looking at financial leverage? The answer lies in the issue of being able to set the cost structure any way you want to. Whereas the financial leverage can be set – within practical limits – at any level, the restrictions on the composition of the cost structure are much stricter. Doing something about the operational characteristics of a firm is very different from changing the mix of debt and equity. This means that using the cost structure as a *policy* variable is not so straightforward as it is for financial leverage. But even more than this, *explaining* the observed cost structures also requires more than just linking observed levels of operating leverage to firm characteristics.

3.2.2 financial management

Financial management is concerned with the financing decision and with the investment decision (Brealey and Myers, 2000). The financing decision is concerned with how a firm should finance its operations, and the result of it is the capital structure of the firm. The investment decision, also known as the capital budgeting decision, tells a firm what (real) assets it should buy. Investments determine the cost structure to a substantial extent. Capital budgeting problems can be viewed as decisions that fix the costs over a number of years (or more general time periods). This implies that the operating leverage concept is a useful tool for sensitivity analyses within capital budgeting problems. Applying it together with scenario-analysis (e.g. Schoemaker, 1995) makes for an even better basis for investment decisions. However, we have to bear in mind that investment decisions look at the future, and try to determine the net present value based on expected future cash flows – both inflows and outflows. Basically, everything is variable and nothing is fixed until the investment is actually made. As

such, the influence of the cost structure is not important because it is incorporated in the net present value of the investment. It is only when things do not go as planned, when a firm's sales and earnings graph starts to resemble that of DSM, that the effects of the cost structure are felt. Consequently, even while it is sometimes claimed that the operating leverage concept has been developed specifically for capital budgeting decisions (Brigham and Gapenski, 1991), tackling the cost structure as a variant on break-even or net present value analysis, or even as part of the latter, will not produce the results we are looking for.[6] It is not the simple application of the operating leverage in capital budgeting, as described in section 2.1 (page 16), that interests us, but what happens once the capital budgeting decision is made.

Next to the standard net present value approach to capital budgeting, the last years have witnessed the rise of real options theory. Real options theory applies the mathematics and the logic of financial derivatives to real investments: investments in real assets, new products, research and development, new product-market combinations (Dixit and Pindyck, 1994; Trigeorgis, 1996; McGrath, 1999). The advantage of the options approach can be found in two aspects, according to Dixit and Pindyck (1994, p. 6): (1) there is a value in the possibility to wait with the investment, and (2) investments are largely irreversible, that is, they cannot be undone. Especially the second aspect sounds interesting, even more so when we combine it with the options to alter operating scale (to expand, to contract, to temporarily shut down). Then we seem to have covered all there is to fixed costs: we take into account that they are fixed, but that it is also possible – at a significant cost – to get rid of them. Applying real options to investment decisions thus seems to rule out the need for a concept like operating leverage. Or does it? We have to remind ourselves that real options techniques, like net present value decisions, make a single, integrated decision with respect to undertaking an investment. In fact, real options are advocated as a prime tool in valuing flexibility – i.e. in capturing the value of the choices that can be made in the future *at this moment*.[7] Again, the effects of the cost structure are felt especially when the real world develops along different lines than expected.

But what about options to expand, contract, or temporary shut down? This is not quite what we have in mind when we talk about the cost structure of a firm. It is the *absence*, or rather the limited availability of options to change the operating scale that results in a leverage effect. Real options theory does focus on one possibility to mitigate any leverage effects: build as many choices into the level of the fixed costs of a process as possible. Nevertheless, the very nature of options runs counter to the phenomenon of the cost structure, and of fixed costs in general, where the lack of choices creates the leverage effect.

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[6] to prevent any misunderstanding: the net present value rule is the only correct way to make an investment decision. Break-even analysis and the operating leverage can help in evaluating the outcome of the NPV-analysis.

[7] Amram and Kulatilaka (1999, p. 181) use the following case to illustrate the application of real options to flexibility: 'MidAmerica Manufacturing is choosing between three industrial boilers to generate steam. The first boiler burns natural gas, the second burns No. 2 fuel oil, and the third can switch between the two inputs. The price of the third boiler is $2,000 more than the first boiler and $5,000 more than the second, a premium for the built-in flexibility. Which boiler should MidAmerica buy?'

A major practical problem is the mathematical complexity of option theory, coupled with the importance of the distribution of the variables (the standard deviations). Although the ideas in the field of real options have been known for some twenty years, they have met with little enthusiasm from managers. This is because there is no real intuitive approach to options to get a feel for the mechanisms. The greatest barrier seems to be the fact that increasing uncertainty makes a project *more* attractive.[8] Furthermore, because of the need for good estimates of standard deviations, practical application can be hindered by the lack of knowledge about the future. Whatever the reasons, however, it is not standard practice to use real options in evaluating investment proposals, let alone in the monitoring of ongoing operations. One of the latest surveys on management accounting practices to appear in the literature is by Wijewardena and De Zoysa (1999). They conducted their survey in 1997, and no mention is made of real options for use in investment appraisal by the Australian and Japanese firms in their sample. Earlier surveys also do not report on the use of real options.[9]
In summary, although financial management probably is the breeding ground for the operating leverage concept, we can take it as only one of the fields of interest and not as our basis. This is because the nature of the decisions taken is more static than dynamic. A capital budgeting decision is made at a specific point in time. The effects of the cost structure show *over* time. What we can take from the field is the issues that are considered in a capital budgeting decision.

3.2.3 management accounting

It has been noted already that the cost structure is a management accounting concept. Management accounting is defined by Atkinson *et al.* (1997, p. 728) as 'producing financial and operating information for organizational employees and managers.' We are specifically interested in the question of which costs are fixed, and which can vary. The classification of costs into fixed and variable is an important topic, although the actual process of classification does not get that much attention. It is difficult to judge the importance of this field with respect to the cost structure other than providing the measurement of it. As mentioned in section 2.3 (page 29), the cost structure in terms of the operating leverage is rarely discussed in management accounting textbooks. This can be explained if we consider that in general, management accounting deals with existing situations: we have a constellation of costs, consisting of machines, buildings, overhead, employees, raw materials, etc., that we want to allocate to cost objects. Management accounting tries to determine what the best decision is *given* this cost constellation. We do see that more and more attention is paid to what the allocated costs tell about the efficiency and effectiveness of the operations, especially in the activity-based costing approach to cost allocation.
In all, management accounting information is the input for determining the cost structure. It provides the link between the operations a firm performs and the cost

[8] Amram and Kulatilaka (1999, p. vii) begin their very readable book by noting that '[m]any managers believe that uncertainty is a problem and should be avoided'. Of course, they go on by claiming that if 'your firm is properly positioned... uncertainty will create value and take you to market leadership'.
[9] but see Pike (1996) for a critique of management practices surveys.

structure that those operations bring about. However, we need to look further than only these numbers. For a number of years, the importance of looking beyond the accounting numbers has been stressed in the management accounting literature. One of the prime examples in this respect is by Shank and Govindarajan (1993). They talk about strategic cost management, and emphasize the need to incorporate management accounting decisions into a broader context which they (unfortunately) call strategic: '[a] sophisticated understanding of a firm's cost structure can go a long way in the search for sustainable competitive advantage' (p. 6). So the field of management accounting promises to deliver some interesting insights with respect to the cost structure.

3.2.4 strategic management

Why are fixed costs and fixed charges so important to firm performance? After all, from a strategic point of view, all costs are variable. For an example, we look again at Shank and Govindarajan (1993, p. 151–152), arguably some of the more influential writers in the field of management accounting. They explicitly state that 'many now believe that variable cost is essentially useless as a strategic concept ... It is far more useful today to consider all costs as variable in a strategic sense.' Although they emphasize that this observation is made from a strategic point of view, it is hard to reconcile with the attention paid to flexibility at the present, flexibility in operations and production, but most certainly also in costs. Once, integration and diversification were the key words in strategy; nowadays outsourcing, core activities and short-term labor contracts are the buzz words. Most modern concepts indicate a trend towards short-term variability: through outsourcing of parts of the production process no investment in research and development nor in production facilities is needed, and the use of temporary workers really makes labor costs variable.

Also, real options theory is becoming increasingly popular as a way to translate flexibility and strategy into financial figures. But the essence of real options is the timing of fixed investments: when is it optimal to dedicate a large amount of funds to a project, and when is it better to wait? If variability is of no concern in strategic management, these advanced financial methods are essentially useless in a strategic sense, something that directly contradicts the current stream of articles and books on the subject.

Thus, it seems safe to say that the demise of fixed costs as an issue in strategic management is not reflected in the trends of today. This is fortunate, since the field of strategic management has a lot to offer for our research. Among other things, it has a lot of different views of itself to offer: Mintzberg and Lampel (1999) recently identified ten major schools in strategy formation. We will not try to find the right one, or the most appropriate. What we need to learn from strategic management is the link with the outer world: a firm cannot be successful only on the basis of its efficiency, or the quality of its products, it also has to answer the needs of its customers. The position of the firm with respect to its customers, but also with respect to its competitors, translates into the important q variable in the *dol*-equations.

3.2.5 production and operations management

Within the 'financial' fields, we have financial management, which is aimed at configuring the operations of the firm, and thus the cost structure, and management accounting, aimed at controlling the operations. If we take strategic management as the 'non-financial' input to configuring the operations, production and operations management is the 'non-financial' input to control.[10] In the end, it is in the operational activities that the variability of costs is determined. The field of production and operations management could possibly provide insights, especially with respect to the short term variability of costs and changes therein. Furthermore, any issues regarding technology choice on the one hand, and flexibility on the other hand, are related to the physical constellation of the firm and its production processes. Also, an issue like outsourcing is directly linked to the organization of the production. It would seem that production and operations management is important in helping us realize how the actual operations of the firm can be represented as a cost structure.

3.2.6 other fields

The research fields discussed are all more-or-less part of business administration. There are more fields within business administration that can be linked to the cost structure. Because of the important place that earnings variability has, we can look at financial accounting. We have stressed that we are interested in the operations of a firm, which is why we used an operational income measure in our empirical analyses. As such, issues like earnings management and window dressing (the fine art of financial accounting) are not addressed. Basic financial accounting does come into play – mainly in the shape of depreciation – because we work with costs, and not cash flows. However, it is not an area on which we will focus our attention. Other possible disciplines of interest could be organization science and marketing. The physical structuring of production processes, and also of service processes, can have an impact on the firm's organization. Marketing could be of interest because we look at p and q, and thus at pricing decisions and unit sales. These fields can yield valuable insights with respect to the role of the cost structure and maybe even more on how to do anything with (or about) the cost structure.

3.2.7 so where do we position the research?

We have identified various parts within business administration that can be of interest in discussing the cost structure. The field of financial economics does not fit very well into business administration, and (perhaps not surprisingly) it has shown to be not the appropriate approach in chapter 2. We can think of the main fields of interest that we identified as follows (see figure 3-1). The overall strategy of the firm should govern the structuring of the operations. At this point, the cost structure is variable in that the choices that determine it are open. When the strategy is decided, capital budgeting decisions that take into account the strategy will fix the cost structure. The operations

[10] but of course, in the end *all* business decisions should be based on their financial results.

are then carried out with the cost structure. To emphasize the fact that management accounting information, and thus costs, is a picture of what is really going on, management accounting is placed alongside the other fields.

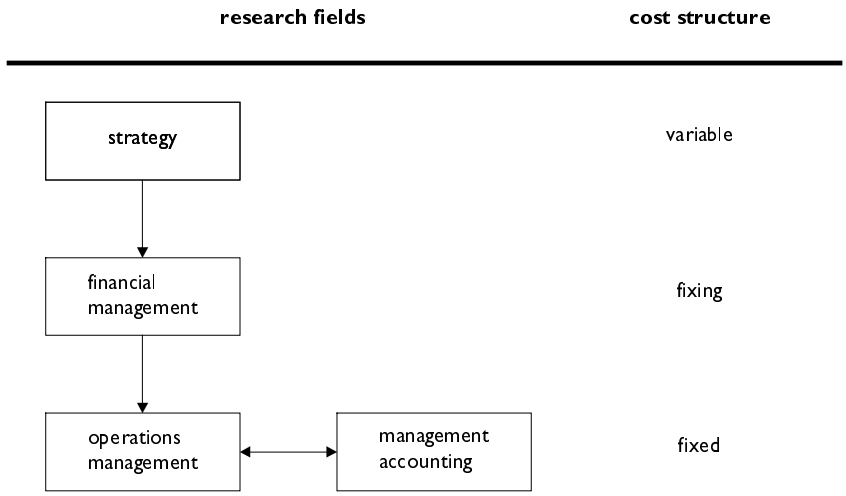

figure 3-1 relating the relevant research fields in business administration with each other through the cost structure: in the field of strategy, decisions are made that govern the choice of the cost structure. It can be considered (a) variable. In the field of financial management, the capital budgeting choices are made that set the cost structure. In the fields of operations management and management accounting, the cost structure is given, and attention shifts towards optimal use of the cost structure.

3.3 earnings variability, or the importance of the cost structure

In the introductory chapter, we started by noting that the variability of earnings is important in managing a firm. In discussing *dol*, we did not need this observation because it proved possible to relate it directly to the systematic risk of a firm as measured with β. However, we have left the safe theoretical environment of financial economics. We now look at the cost structure, noting that it influences the earnings variability of a firm. Interest in the cost structure is justified if earnings variability truly is important. Therefore, we will discuss earnings variability from several viewpoints.

3.3.1 earnings variability and financial theory

In economics, the risk of a variable is measured through its variance or deviation. There is no rigorous theoretical explanation as to why risk should be equated with variability. It is safe to say that variability is defined as risk, rather than the other way around. The connection between variability and risk is questionable, and possibly not as direct as is sometimes implied.[11] Despite the very interesting theoretical considerations regarding

[11] see the current debate surrounding the CAPM, especially Fama and French (1992, 1996), and also Haugen and Baker (1996) who find a *negative* relationship between risk and return – this in the *Journal of*

the correct measurement of risk, we will not go into them, simply because both theorists and practitioners in the field of finance accept deviation as a measure of risk.

Having said that, it is somewhat surprising to learn that in the theory of financial economics, or to be more precise the capital asset pricing model, earnings variability is not important.[12] Only the *covariability* of the return in market values is a correct measure of the risk associated with a share.[13] The variability of this return as such is not a measure of risk. To be sure, systematic risk does include earnings variability, but only a part of it: that part that systematically covaries with the market return. Shapiro and Titman (1986, p. 215–216) formulate this as follows:

> Indeed, the theory of risk in modern finance, as embodied by the capital asset pricing model (CAPM) and the more recent arbitrage pricing theory (APT), seems to regard as irrelevant, if not actually wasteful, a range of corporate hedging activities designed to reduce the total risk, or variability, of the firm's cash flows. Both the CAPM and the APT demonstrate that, under reasonable circumstances, diversifiable risks are not 'priced' by sophisticated investors and, hence, do not affect the stock market's required rates of return. Systematic or 'market' risks (those which cannot be diversified away by investors) are priced; but because the price of risk is the same for all market participants, there is no gain to shareholders from 'laying them off' to financial markets.

Furthermore, earnings are necessarily measured in book values. While book earnings are an influence on the share price, it is not a one-on-one relationship. Evidence can readily be found in today's newspapers. While the book earnings of Dutch listed firms fell during 1996, share prices rose by an average 33% (*Financieele Dagblad*, 11 June 1997). Over a longer period of time, Jacobson (1987) shows that there is a significant correlation between return on investment in book values and the market rate of return.[14] All this means that from a theoretical point of view, there is a large gap between variability of book earnings and firm risk measured in market values.

Much can be said about the correctness of the CAPM and the APT. Although they go largely undisputed on theoretical grounds, the APT has never really been widely accepted, and the CAPM is under increasing fire because of its dismal empirical record (cf. Fama and French, 1992, 1996, 1997). It is not necessary, however, to discuss the validity of these models in order to justify directing attention towards earnings variability, since it can be argued that even within the CAPM it *does* pay to reduce earnings variability.

Shapiro and Titman (1986) argue that the influence of earnings variability on firm value does not result from higher risk, but from a decrease in expected cash flows. Volatile firms are more likely to get into financial distress. This threat of financial distress can affect the behavior of managers, investors, and customers. For example, customers will

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Financial Economics! Also, see McGoun (1995) for an interesting though somewhat biased history of risk measurement.

[12] Smith and Stulz (1985) explain the irrelevance of earnings variability through Modigliani and Miller (1958). The reasoning is that when the financing policy is irreleveant, financial instruments cannot influence the value of the firm. This seems questionable, because hedging practices *do* affect the real cash flows produced by the assets.

[13] see Van Triest and Bartels (1997) for the relationship between earnings variability, operating leverage, and systematic risk.

[14] but see Salomon (1985) for an opposite view.

not buy durable goods that need servicing from a company over which the threat of bankruptcy looms. The management of a firm in trouble may be tempted to lower quality in order to save cash; this will have a negative effect on long-term expected cash flows. All this means that high total risk can lower the value of the firm. Therefore, risk management need not be irrelevant or wasteful.

Even for healthy firms that are in no danger of getting into a situation of financial distress, it can be useful to reduce the variability of earnings. Froot, Scharfstein, and Stein (1993) state that capital market imperfections can make externally obtained funds more expensive than funds that are generated internally. If this is the case, then it can influence the investment plans of the firm as well as the financing plans. This is because a shortfall in cash, resulting from the variance in cash flows, can be met with an increase in outside financing or a decrease in investment. This can affect the value of the firm: not only because outside financing is costly, but also because it can impair the utilization of valuable growth opportunities.[15]

The existence of capital market imperfections, most notably costs of financial distress, is also used by Petersen (1994) to emphasize the importance of earnings variability. An increase in the variability of cash flows raises the probability of financial distress, and therefore increases the expected costs of financial distress. He relates earnings variability directly to the level of fixed costs, and notices that lowering fixed costs in favor of variable costs reduces this variability.

Jagannathan, Stephens, and Weisbach (1999) examine stock repurchases and their relationship to dividends in the United States. Noting first that firms are reluctant to cut dividends, and that actual dividend cuts are heavily punished by the stock markets, they analyze the empirical data with respect to stock repurchases. They find that repurchases are more volatile than dividends, and appear to follow the business cycle: popular during years of economic prosperity, and dropping in times of recession. Furthermore, they find that

> [r]epurchases do not appear to be replacing dividends; rather they seem to serve the complementary role of paying out short-term cash flows ... Firms with higher operating cash flows are more likely to increase dividends, while firms with higher non-operating cash flows are more likely to increase repurchases. Firms with a higher standard deviation of cash flows are more likely to use repurchases. Subsequent to the payout increase, cash flows of repurchasing firms continue to be lower than those of dividend-increasing firms. (Jagannathan *et al.*, 1999, p. 26)

Stock repurchases offer a way to distribute income to the shareholders, while maintaining the firm's financial flexibility. Since dividend cuts are difficult to sell to the market, increasing dividends generally commits the firm to higher levels of cash outflows, which can lead to reduced availability of internal funds. The choice of firms for (incidental) repurchases can be seen as support for the argument of Froot *et al.* (1993).[16] More generally, it is clear that firms value financial flexibility, and thus are not so happy with earnings variability.

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[15] there is a large (and largely contradicting) body of literature on the empirical evidence regarding the relationship between funds availability and investments. See especially Fazzari, Hubbard, and Petersen (1988), and Kaplan and Zingales (1997); also see Lamont (1997) and Cleary (1999).

[16] although there is much more to the issue of stock repurchases, as Jagannathan *et al.* (1999) note.

Earnings variability is addressed indirectly in financial economics through the subject of hedging. Hedging implies the use of tools or instruments to reduce the exposure to a certain risk; it reduces the dependence of firm value on changes in value-influencing variables (Smith and Stulz, 1985). Since risk is measured by variability, as noted above, the reduction of earnings variability is 'nothing more' than hedging. Smith and Stulz (1985) provide several reasons as to why firms hedge. They identify the presence of a convex tax-rate, and the presence of transaction costs of bankruptcy as determinants of corporate hedging. Of course, it is not the variability as such which deserves attention, but due to the convex tax rate, an increase in variability around the same expected value of pre-tax cash flows results in a lower expected after-tax cash flow. Nevertheless, arguments for hedging are also reasons for a firm to lower earnings variability within the field of financial economics.

Now, financial theory relates hedging to the use of financial instruments: 'Corporate hedging refers to the use of off-balance-sheet instruments – forwards, futures, swaps, and options – to reduce the volatility of firm value' (Nance, Smith, and Smithson, 1993, p. 267). This is too limited a view. It is very well possible to use real tools and instruments to cope with risks. The nature of real instruments is very different, however, from financial instruments. Whereas financial instruments are relatively easily applicable, and can be bought and sold at almost any time at a relatively low price, real instruments affect the real operations of the firm. Real instruments include reduction of the operating leverage, avoidance of high-risk projects, and abandonment of existing high-risk projects (Shapiro and Titman, 1986). Obviously, the market for swaps is more liquid than the market for high-risk projects.

If hedging can be achieved with cheap, liquid financial instruments, why would we want to use expensive and irreversible real instruments to reduce the earnings variability? This is simply because the most important earnings variability driver is almost impossible to hedge: the overall sales or revenues, as well as the overall costs of a firm cannot be locked in with a forward or futures contract. If we want to reduce the risk in this respect, we need to use real instruments. From a financial perspective, one can view the operating leverage as a hedge against sales fluctuations.[17] The lower the operating leverage, the smaller the variability in earnings as a result of fluctuations in sales. It should be noted again, however, that this view of the operating leverage is too simple: the operating leverage is not the single most important parameter of an investment decision, and we would never base our decision of whether or not to undertake an investment solely on the level of fixed costs.

In conclusion, despite the fact that earnings variability seems irrelevant in the field of financial economics, it can be shown that it does matter when the strict assumptions of the CAPM and the underlying efficient markets hypothesis are relaxed and real world imperfections are introduced.

[17] the term 'operational hedging' is also used by Harrison and Van Mieghem (1999). They analyze a specific situation: the trade-off between selling 'no' and not using capacity in a 'multi-resource setting', e.g. two production lines whose outputs go through the same assembly line. They derive an optimal hedging strategy that sets the capacities for each production line, but not an overall fixed cost level.

3.3.2 earnings variability and accounting

The stability of earnings development has been the subject of research in an indirect way. In the accounting literature, much attention has been given to the subject of income smoothing. Income smoothing refers to deliberate actions from management to dampen fluctuations of net earnings around an expected earnings trend. The research on this subject has concentrated on managed smoothness of income, i.e. the use of discretionary accounting procedures to shift the occurrence of costs and/or revenues in time. Three types of income smoothing can be discerned (Brayshaw and Eldin 1989; Bitner and Dolan, 1996):

(1) real smoothing: management can time the actual occurrence of certain discretionary expenditures, most notably research and development expenditures;
(2) artificial smoothing: management can allocate costs to different periods, for example provisions for reorganizations. It can also add foreign exchange differences to the reserves and allocate them to the profit and loss account over several periods of time;
(3) classificatory smoothing: by classifying certain items as ordinary or extraordinary, management can influence the ordinary income.[18]

These three types of smoothing bear little or no relevance to the subject of operating leverage, since they do not incorporate real actions. This also shows in the fact that they work only on net income, where our interest lies with the *ebit*. The research on smoothing is interesting, however, because it gives support to our suggestion that firms strive for stable earnings development. There have been several studies into the occurrence of smoothing, and the reasons why firms smooth. It is somewhat disappointing to note that the reduction of earnings variability is treated as beneficial *per se*. Trueman and Titman (1989, p. 130) analyze the effects of income smoothing from the point of view of a (potential) creditor of the firm. They state that the interest a firm has to pay over its debt

> ...is a function of the risk-neutral debt holders' beliefs about variance of the firm's economic earnings, since the probability that the firm will go bankrupt is directly related to this variance. The greater the probability that this variance is high, the greater the probability of bankruptcy and the lower the selling price of debt.

Brayshaw and Eldin (1989, p. 621) even state that 'the higher the variability of reported earnings the higher the risk attached to the firm by investors and creditors'. Note the obvious contradiction to the financial economics literature, where earnings variability is only important insofar as it is systematic. Bitner and Dolan (1996) therefore view these explanations as coming from an agency setting: through smoothing earnings, management influences the *perception* of investors and debtholders. Income smoothing is also related to managerial benefits. If managerial compensation is linked to firm performance, variability in earnings will result in variability in managerial compensation. Trueman and Titman (1989) show theoretically that if smoothing is costless, it is optimal for the manager to smooth reported income. If it is costly, smoothing is more

[18] a typical Dutch application of this practice can be found in the recently abolished 'VAR', a secret reserve that banks used as a provision for bad debt.

beneficial when the probability of going bankrupt is higher. These results stem from the assumption that the perceived variance of the firm's economic income influences the price a firm can receive for its debt. Bitner and Dolan (1996) assess the relationship between income smoothing and the value of the firm. Their analysis is rooted in the risk-adjusted discount rates of debt and equity. To the extent that earnings variability is the result of systematic risk, the cash flows and debt payments should require a higher discount rate with increasing variance, implying that the variability of earnings does influence firm value. Bitner and Dolan try to establish whether firms with a smooth income stream are more highly valued by the equity market, and alongside this if the market distinguishes between naturally smooth income (i.e. 'real' low variability) and managed smoothness. They find that the market does value smooth income, and also appears to distinguish natural smoothness from managed smoothness. Market value, as measured by Tobin's *q* (market value over replacement value), is affected positively by income that is smooth and growing (Bitner and Dolan, 1996, p. 28). All this once again supports the assumption that a stable earnings development is favorable to firm value.

3.3.3 earnings variability and strategic management

Earnings variability is not considered as such in the field of strategic management. However, there has been a considerable amount of research related to risk and strategic management. In the early 1980s, there was a lengthy discussion on the risk-return paradox of Bowman (1980), who maintained that risk and return were negatively related; i.e. the firms with larger returns on investment overall had a lower variance of that return. His findings were challenged by others (e.g. Marsh and Swanson, 1984; Figenbaum and Thomas, 1986), but his research did result in increased attention for the role of risk in strategic management. Bowman's original result did not attract any attention in the field of financial economics, possibly because it emerged from book values instead of market values (it is noteworthy that Haugen and Baker (1996, see footnote 11) established an analogous result using market values, which has subsequently also been ignored).

Bettis (1983) noted several contradictions between financial theory and commonly observed strategy. The most interesting of these is the importance of unsystematic risk. According to the CAPM, only systematic risk is important. It is difficult to get an idea of the share of systematic risk in the total risk of a firm, since all reported tests on the CAPM have been performed at portfolio level, and not at the level of the individual firm. The only article in which individual regression results are reported is from Fama and French (1992), but since they found no significant relationship between β and return at all, this is not of much use. A tentative indication can be found in Haugen and Baker (1996, p. 410), whose multi-factor model explains on average some 15% of the variance in return. Since their model seems to perform very well, and since researchers who perform tests on the CAPM do not have the courage to report firm level R^2s, it can be taken to be an upper limit for the systematic risk. This means that at least 85% of the variability of returns is attributable to non-systematic factors.

So we come to the question posed in the previous paragraph: just how do we discern unsystematic risk from systematic risk? Ross, Westerfield, and Jaffe (1993, p. 318) think

that 'we may not be able to define a systematic risk and an unsystematic risk exactly, but we know them when we see them'. Emery and Finnerty (1997, p. 220) give as examples of unsystematic risk successes or failures in launching a new product, getting a contract, or settling a strike or lawsuit. Pike and Neale (1996, p. 268) mention industrial relations problems, equipment failure, and research and development achievements.

Given these ideas about the nature of the two types of risk, Bettis (1983, p. 408) rightly asks the question if we can really expect managers to concentrate solely on systematic risk:

> ... the idea that unsystematic risks should not be managed runs directly counter to the notion of corporate strategy ... In fact, strategic adaptation by skillful, rigorous, and continuous management of unsystematic risk lies at the heart of strategic management.

The example Bettis (1983) uses is the relevance of entry barriers. A typical example of unsystematic risk is a competitor who begins to produce a directly competitive product. Financial theory instructs managers to ignore this. However, strategic management, as well as the theory of industrial organization put heavy emphasis on the existence and management of entry barriers, showing that they can significantly enhance the profitability of a firm. Another example can be found in the famous 'valuable growth opportunities'. These are just that: an opportunity, a unique chance for a firm to gain a competitive advantage. Probably, it would have to be developed by the R&D department (no surprise there), it would have to be marketed successfully, and the competition would have to be kept at a distance. All these aspects of profiting from a valuable growth opportunity are very firm-specific, and thus part of the unsystematic risk. Surely we would not want managers to disregard this part of their business? Bettis (1983) further notes that the term 'risk' in modern financial theory denotes a probabilistic distribution of future earnings, whereas in strategic management it is a much broader concept, incorporating manager's subjective judgment of the personal and organizational consequences of actions.

The arguments of Bettis (1983) encourage Amit and Wernerfelt (1990) to establish the relationship between business risk (ie. unsystematic risk) and firm value. They formulate three hypotheses for this relationship:

(1) agency: managers may try to reduce business risk in order to reduce the threat of bankruptcy, so as to enhance their job security. This can result in actions that are harmful toward shareholders, e.g. excessive use of insurance. According to this hypothesis, a positive relationship between business risk and firm value is expected: low business risk, as a result of value-destroying actions, is associated with low firm value;
(2) cash flow: when a firm's cash flow is volatile, it will affect the operations in that a stable cash flow allows firms to operate in a stable environment, resulting in efficient operations. So low business risk should result in higher cash flows and therefore higher firm value;
(3) rate of return: transaction costs impair investors from diversifying efficiently, so they do appreciate low total risk. This means that there is a negative relationship between risk and return: firms with low business risk are valued higher.

Note that the hypotheses are not geared towards the management of unsystematic risk as a key interest for strategic management, but try to explain why total risk is important

within a financial framework. It is not the firm-specific threats and opportunities that justify managerial action towards total risk, but the consequences of total risk for firm value.[19] The idea of looking at business risk is strange to financial economists, but from a strategic management point of view very sensible. Although the methodology of Amit and Wernerfelt is not always convincing (they use data on stock returns from only 1 year), they do find some interesting results. They measure the unsystematic risk as the standard deviation of the error term in the CAPM-equation, and find a significant negative relationship between business risk and firm value: a lowering of business risk results in an increase in firm value. As an aside, they also find a significant relationship between the measure of diversification and firm value, suggesting that investors do value diversification by firms, and thus risk reduction. From the empirical results, they conclude that the cash flow hypothesis is the most likely explanation for the relationship between business risk and firm value: stable cash flows allow management to perform the operations more efficiently, thus resulting in a higher level of cash flows. 'This finding suggests that not all risk reduction is counter to stockholders' interest and that enhanced operational efficiency is the main reason it is not' (Amit and Wernerfelt, 1990, p. 530).

The authors mentioned above try to find a rationale for making risk, and thus earnings variability, a focus point in strategic management. There are other papers in which this link is completely skipped. Amit and Livnat (1989, p. 881) limit themselves to assuming that 'the objective function of management is to minimize the standard deviation of cash flows, subject to an expected level of cash flows'. Again, the rationale is that firms have a greater chance of being in a difficult financial position when they have larger cash flow variability, resulting in worried creditors, managers, and employees, who will all demand a larger compensation to bear this firm-specific risk.

Throughout the strategic management literature, book values, market values, β's, variances and risk are mingled up,[20] and care should be taken to distinguish the (questionable) result of Bowman (1980) from the findings of Amit and Wernerfelt (1990). Nevertheless, the overall implication is clear. It seems fair to say that the strategic management literature accepts the reduction of total risk and thus the reduction of earnings variability as an important, legitimate objective for management, and that a stable earnings development is desirable because of its beneficial effects for the firm.

3.3.4 earnings variability and the goal of the firm

When reviewing the literature, several reasons emerge why earnings variability should matter for the firm. In the theory of financial economics, we view the firm as an investment object. When the 'owners' of the firm keep their shares as part of a well-diversified portfolio, and when these shares are liquid in the sense that they can easily be traded, this theory says that we do not have to care about the firm's performance and long-term viability any more than the loss that is incurred when stocks are discarded in

[19] research on the relationship between R&D and advertising expenditures and firm value can be seen as research into firm-specific risk, though it is never named as such.

[20] see for example Aaker and Jacobson (1987), who relate unsystematic market risk to *book* return.

times of trouble. Insofar as earnings variability does play a role, it is because it influences the level of the expected cash flows and in this way the value of the firm. This argument can also be found in the accounting literature: if the earnings variability of a firm becomes too large, the cost of capital rises because investors as well as suppliers of debt require a premium for the perceived increase in risk. In strategic management, reducing earnings variability is accepted as a common goal of the firm. Next to the common argument of lowering the expected costs of financial distress, it is suggested that a stable cash flow allows firms to perform their operations more efficiently: there are no unexpected financial constraints in production scheduling, inventory management and the amount and timing of labor and raw materials supplies.

A final thought on the importance of earnings variability arises when we view the firm not as an investment object or a management tool, but as an independent entity in economic and social reality. First of all, not all firms are listed on a stock exchange. Often, they are owned by only one or a few investors, who hold a very undiversified portfolio (in the language of financial economics). This means that the risk of financial distress is a very real risk for them, one which they do not want to be too large. This mechanism has even been established in research in the field of financial economics, discussed in section 3.3.1 (page 74). Mayers and Smith (1990) examined the use of reinsurance in the insurance industry. Insurance is a waste of money according to financial economics theory, because it reduces only non-systematic risk. However, Mayers and Smith (1990) found that insurance firms with a 'Lloyd's-type' structure – i.e. insurance firms who have relatively few underwriters ('shareholders') who are liable for (a large part of) their personal wealth – use reinsurance more often than widely held firms: 'Generally, the less diversified the owners' portfolio, the greater the reinsurance purchases. Thus Lloyd's reinsure most, while widely held stocks reinsure least' (p. 39).

So for firms with concentrated ownership, and thus for unlisted firms in general, reducing earnings variability is an attractive, if not compulsory managerial focus point. Even when ignoring the consequences for the individual owner, it can be thought desirable to follow a course of action which will support the viability of the firm. This is reflected in the opinions of chief financial officers of major Dutch firms, as reported by Cools (1993, p. 263): 86% of the interviewed CFO's mentioned 'profit maximization, aimed at continuity' or 'continuity' as the primary goal of their corporation.[21] It is consistent with the view that a firm as such has an intrinsic value – both economic and social. Should one accept this view, then achieving a stable earnings development is a legitimate, important goal for the firm.[22]

3.4 a model

Having discussed the research fields that can help us in understanding the role of the cost structure, and having established the relevance of the cost structure through doing this for earnings variability, the time has come to actually look into the firm and start our search for the true role of the cost structure in firm performance. Starting from

[21] it should be noted, however, that Cools' research was undertaken before the current shareholder hype had taken off.

[22] see Weimer (1995) for a general treatise on firm financial goals.

financial economics, we get an approach that makes the value of *dol* the central focus of the research. We would be trying to find what variables influence that value, and maybe ultimately aim at identifying the optimal value given a certain set of conditions. As has been noted repeatedly, this is not feasible due to conceptual and measurement problems with *dol*. Besides, it is a very unsatisfactory approach for a scholar in business administration and management, since it reduces the complexities surrounding managerial decisions to a single number. The other fields leave more room for modeling such decisions with more context, and with less assumptions about the behavior of the real characteristics of the firm, but it is not necessary to choose one as the prevailing field.

If we review all the literature on the operating leverage and do some additional thinking of our own, we can identify a number of important variables that deserve consideration. We started with earnings variability, so this obviously is a characteristic of the firm that has to find its place in the model. Next to this, technology is deemed important since it can be a constraint to the possible choices in organizing the production process. This variable also captures the production management aspects, with which we mean the operational characteristics of the production process (although this is a somewhat simple interpretation). The possibilities a firm has with respect to financing its investments can also act as a restriction on the operating leverage: it may not be possible for a firm to choose a high level of fixed costs because it cannot put up the funds for it. Strategy is an influence in that it partly determines the risk attitude of the firm, but also the choice to be a technologically advanced firm or not. Flexibility seems an overall important characteristic. Finally, we need to take into account the market conditions: the nature of the demand, the intensity of the competition, the industry structure. After some thought, these variables can be placed into a model as follows:

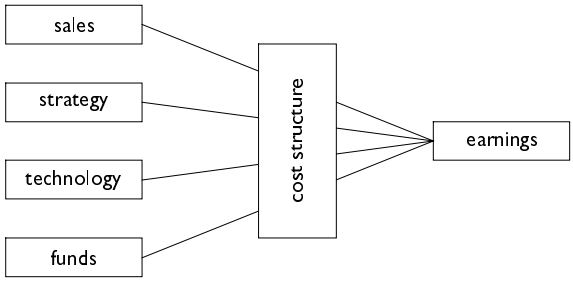

figure 3-2 a conceptual model of the position of the cost structure with respect to firm characteristics and earnings.

This model tries to put the importance of the cost structure for firm performance in perspective. Rather than seeing it as the decisive variable, it is regarded as nothing more (and nothing less) than a mechanism through which the important influences on earnings variability are translated.

earnings

Given the focus on earnings variability, it is no surprise that we need it in the model. It is helpful to see it as something different from a pure financial result, however: it is one of the main proxies for the aggregate flexibility of a firm. The concept of flexibility is hard to define, as will become clear later on. It can be identified at many levels, and all are important for firm performance. For example, if we want to assess the impact of a flexible manufacturing system (FMS) on the flexibility of the firm, we are confronted with two conflicting influences. On one hand, we achieve a product *mix* flexibility, which can translate itself in stable earnings because it allows the firm to adapt to changes in the nature of the demand. However, an FMS also results in high fixed costs, and therefore high operating leverage. This means that the sensitivity for demand *volume* fluctuations is increased, and overall flexibility is decreased. It is very well possible that these influences offset each other, resulting in an improved flexibility for the firm. It is also possible for certain flexibility measures to result in worsening performance in other aspects. The use of temporary workers enhances volume flexibility, but can result in a decrease in product quality. If we should choose a special form of flexibility, whether it is product, process, or cost, we would not be able to cope with these situations. We are looking for the overall flexibility of the firm, and since earnings is the bottom line for firm performance (despite all its shortcomings, and provided that we look at a longer term than only next quarter's results), it is the most appropriate overall measure of firm performance.

sales

In the equation for *dol*, unit sales are the only variable, whereas price, and fixed and variable costs are fixed parameters. While the current model tries to circumvent these restrictions, it must still be noted that sales are the first and most important driving force for earnings. Changes in demand will, under constant conditions, lead to earnings variability. The *dol*-formula calculates the magnitude of that variability. There are two basic ways in which sales play a role in the model. The first one is as part of the investment decision process, and the second one is as a contingency (environment) factor.

In investment decisions, expected revenues are the main source of uncertainty. In order to cope with this uncertainty, several methods have been developed. Two categories can be distinguished: assessing the risk associated with the project, and estimating the possible revenue patterns and their probabilities. The first method is connected with capital budgeting techniques, while the second one originally was developed within the field of strategic management. Of course, these two approaches greatly coincide, and should both be part of the investment decision process. For the purpose of evaluating the cost structure, the risk approach seems less useful, since it condenses all possibilities ultimately into one figure: the discount rate, possibly augmented with an extra risk premium, or rather risk charge, in case of greater perceived risk. In order to give meaning to the cost structure in this context, we would view it as a hedging instrument against demand (revenue) variability. Although this is an interesting approach from a theoretical point of view, it is hard to connect it to the proposed conceptual model because of its emphasis on business economics and risk management (see also section

3.2.1 on page 68). Since the cost structure expresses itself more when revenues fluctuate more, we are especially interested in the explicit changes in revenues, and not so much their expected value and variance. Therefore, approaches in the tradition of scenario analysis also seem appropriate to use. This would bring us to the type of analysis with which we introduced the operating leverage concept in section 2.1.
When we are evaluating actual firm performance, we look at the market in which the firm operates as a contingent factor. The market forces in turn can cause certain strategic decisions, but this will only be the case when demand does not develop as expected (because then the firm would have incorporated it into its investment decision). Basically, the question is what a firm does with the development of, and in, its market(s). Once it is confronted with the leverage effect of its cost structure, how does it react to this? And what possibilities does it have?

strategy

Strategy is concerned with the goals a firm wants to achieve, and how it will go about that. There are many definitions of strategy. Hill and Jones (1989, p. 5–6) list the following:

(1) the determination of the basic long-term goals and objectives of an enterprise, and the adoption of courses of action and the allocation of resources necessary for carrying out these goals (attributed to Alfred Chandler);
(2) the pattern or plan that integrates an organization's major goals, policies, and action sequences into a cohesive whole (James B. Quinn);
(3) a unified, comprehensive, and integrated plan designed to ensure that the basic objectives of the enterprise are achieved (William F. Glueck).

These definitions are what Hill and Jones call 'traditional', since the basis is a rational planning process. They also point to a new approach, in citing Henry Mintzberg's definition of strategy as a pattern in a stream of decisions or actions, the pattern being a product of whatever intended (planned) strategies are actually realized and of any emergent (unplanned) strategies.
For our purposes, these definitions tend to be too broad. Of course, the so-called 'new approach' is not really a definition of strategy; at the most it can be seen as an *ex-post* assessment of strategy. A 'good' strategy is one in which emerging new influences can be adequately dealt with, for example by making the processes of the firm more flexible. But definitions involving long-term plans and objectives are also not very practical (but then, the same can be said for strategy). What we really mean by strategy is not just the decision to enter a specific market, or to develop a new product, or to acquire or sell a business unit, but also the choice for a certain technology, the choice for one investment project over another, the scale of the projects; in all, just one level less than the esoteric level of 'real' strategic management. The main thought behind the inclusion of this variable was the fact that a company will decide on investments based on expectations for the future, which can lead to certain decisions that are not wholly justifiable through capital budgeting techniques – for example, because they result in approximately the same financial results. Firms will then make their decision based on certain strategic choices, like being a technology leader.

The concept of strategy is rather elusive. When we talk about strategy, this often happens in terms like long-term goals, core competences, strategic intents, cost leadership etc. This can be characterized as strategy at its highest level. On the other hand, we can talk about strategic decisions. This is much more down-to-earth, with the most strategic aspect being the irreversibility of the decision. What we are looking for in our model is not quite clear yet. The choice for a certain technology can be based on the fact that a company wants to be a high technology-company, or solely on capital budgeting reasons. On the other hand, when a firm has a certain asset constellation, resulting in a given operating leverage, it is possible that industry effects make it pursue a different strategy. This can be observed in the chemical industry, where in times of overcapacity, companies can try to beat their opponents by offering the lowest price in the belief that their unit price is lower, thus trying to squeeze the competitors out of the market. Here we see a strong connection with sales as a variable in the model.
So strategy is concerned with the way the irreversible investments are made, and also with the way in which the assets are deployed due to the changing business environment. Ideally, these changes are incorporated into the original investment decision, and therefore do not require an adjustment in strategy.

technology

Technology is at the heart of many investment decisions. In recent years, there has been increasing attention for technology and its importance for firm performance. This has been initiated by the growing importance of flexibility, because of the perceived turbulence and even chaos in the modern firm's environment. Milgrom and Roberts (1990, p. 511) identify several major changes in manufacturing, resulting in 'a vision of a flexible multiproduct firm that emphasizes quality and speedy response to market conditions while utilizing technologically advanced equipment and new forms of organization.' Technology often is associated with innovation, change, R&D, and competitive advantage. In the model, however, we are interested in technology at every level, even the most common and basic one. The focus point is not on *advancement* of technology, but on the *choice* of technology made by the firm. It is only through the possibility of having a choice in the way a process is structured that firms can adjust their operating leverage. If the technology of the firm's processes requires a minimal scale, the cost structure is not relevant as a decision variable. For our purposes, technology can be defined as the way a production process is physically (materially) structured.

funds

Although the theory of financial economics says that a firm will be able to attract money for every NPV-positive project, in reality this will not be the case. First of all, only listed firms have full access to the capital markets. Non-listed firms, especially smaller ones, are not always in the position to find investors that are willing to provide the funds needed for a particular investment project. The acquisition of a flexible manufacturing system typically is an investment which requires a large amount of money. Should the firm not be able to obtain the funds, then it cannot invest in what may very well be the

most sensible way. Therefore, the degree to which firms can finance their investment seems an important influence on the operating leverage of the firm.

so where is flexibility?

In identifying the important variables influencing the operating leverage, we also mentioned flexibility. Although it was mentioned that the concept of flexibility is hard to operationalize, the question still stands why it is not incorporated in the model.

There are many definitions of flexibility. The original economic definition of flexibility is attributed to Stigler, who in 1939 stated that a flexible plant (process) has a flat short-run average cost curve. This means that the production level can vary without resulting in large unit costs. As originally indicated by Stigler, this means that 'flexibility is secured by transferring resources from the fixed to the variable category' (cited by Aranoff, 1989, p. 142). Translated to our research theme, this means that flexibility would be achieved by lowering the operating leverage. However, this is too simple a view.

Sethi and Sethi (1990) conducted a survey on flexibility in manufacturing and found 'at least 50 different terms for various types of flexibility' (p. 289). They continue:

> Usually, there are several terms referring to the same flexibility type. Definitions for these terms that have appeared in the literature are not always precise and are, at times even for identical terms, not in agreement with one another ... Not much work has been done to develop analytical models that deal with the concepts of flexibility rigorously, and of course, to determine the optimal levels of flexibility.

This is somewhat discomforting for the researcher trying to find a clear definition and operationalization of flexibility – especially since the survey of Sethi and Sethi is limited to manufacturing flexibility.

All this would not be such a problem if flexibility were a one-way street. However, it is not so difficult to show that different kinds of flexibility are working in different directions. The easiest example is found in flexible manufacturing systems. As explained previously, in these systems we have two major flexibility types: volume and product mix flexibility. As the product mix variety of an FMS increases, so will the magnitude of the investment. Therefore, a high operating rate is required, thus causing a *reduction* in volume flexibility. Although this is a relatively simple example, it shows that flexibility is the result of the variables in the model. Market demand and technology, and even strategy all influence the ultimate flexibility. And this ultimate flexibility is well defined in our model: a stable development of earnings, meaning low earnings variability. This also shows that flexibility is a *result*, and not an input into a process. We cannot set the level of flexibility as an operating characteristic.

3.4.1 a generic application of the model: franchising

In franchising, a firm exploits its product, brand name or marketing concept not (only) through units which are operated under direct control of the firm, but (also) through independent outlets. These outlets or establishments can sell the service under some conditions, and are entitled to some residual profit. From a contract point of view, franchise contracts are characterized by quality standards, common opening hours and

price controls imposed on the franchisee, and require the franchisor to provide national advertising and training programs (Mathewson and Winter, 1985).

From an economic point of view, franchising is a means of sharing profits: instead of one recipient of the residual income, there now are two. This calls for special attention to the relationship between the two parties, since it is possible for one party to increase its residual income through actions that hurt the income of the other party. Due to the importance of the contractual obligations, franchising is often analyzed from an agency perspective. It is claimed that agency relationships 'are important determinants of certain dimensions of the contract' (Brickley and Dark, 1987).

A financial explanation for franchising is raising capital: the franchisor is able to expand his business more rapidly than if he relied on wholly owned subsidiaries. This argument bears some resemblance to one of the arguments for leasing, which is supposed to be a way to work around restrictions from the capital market. Rubin (1978) claims that until the time of his paper, raising capital was the only explanation for franchising. He states that financial economics shows the 'raising capital' argument to be false. Since the franchisee will own only one or a few outlets, his investment will be much riskier than that of the franchise chain. Therefore, he will require a higher rate of return, resulting in a lower rate for the franchisor, since the total return will not differ. It would be better for the franchisor to create a portfolio of shares of all outlets and sell these to the managers (i.e. the former franchisees), thus diversifying the risk for them without any capital affect on the franchisor (Rubin, 1978, p. 225–226).

Although Rubin's argument may be consistent from a theoretical point of view, raising capital as an explanation for franchising is reasonably consistent with the observed reality. Several studies on an aggregate level show a life-cycle explanation of franchising; that is, firms will grow via franchising, but once the franchisor firm has reached a certain critical size, it starts opening its own outlets and even buying back franchised ones (cited by Carney and Gedajlovic, 1991).[23]

The typical agency explanation for franchising was first formulated by Rubin (1978, p. 226) to replace the raising capital argument:

> ...franchising is usually undertaken in situations where the franchisee is physically removed from the franchisor, and thus where monitoring of the performance and behavior of the franchisee would be difficult. In this situation, it pays to devise control mechanisms which give the franchisee an incentive to be efficient – to avoid shirking and excessive consumption of leisure ... The simplest way to motivate the franchisee is to give him a share of the profits of the franchise.

Carney and Gedajlovic (1991) try to analyze franchising from both perspectives, which they label 'resource scarcity' and 'administrative efficiency'. Resource scarcity emphasizes the importance of brand name capital and economies of scale in promotion, and the limited access to capital and managerial talent, especially for young, fast growing firms. This also implies that a full-grown, successful firm can go back to full ownership for new outlets. Administrative efficiency focuses on the costs of monitoring manager performance: since from an agency-theoretical perspective management by profit is the

[23] Rubin (1978, p. 229) also addresses this issue. He explains it from an agency perspective: if there are enough outlets in a concentrated geographical area, the costs of monitoring are sufficiently low to regain full control of the outlets.

only way in which control can be executed, managers can be expected to perform better if they are entitled to a share in the residual income. This results in other agency-problems, such as inefficient investment (no franchisee will undertake local promotion because of spill-over effects to other franchisees), and the 'free rider' problem (the franchisee delivers below-quality products, thus gaining more than he loses in customer satisfaction because that is spread out over the whole franchise chain). The administrative efficiency perspective is very static: it requires an established brand name and a perceived uniform product quality. Firms first establish units, and then decide upon ownership in consideration of monitoring costs. Because of this, it seems less useful for starting, growing firms. Not surprisingly, Carney and Gedajlovic (1991) conclude that there is some truth in both views, and that neither of them completely cover the two main benefits they see to franchising: (1) in certain situations franchising is more efficient than vertical integration, and (2) franchising can alleviate resource constraints and facilitate growth – which are of course the agency explanation and the raising capital argument, formulated slightly differently.

Combs and Ketchen (1999) explicitly try to combine the two perspectives. They look at the expansion of franchisors through new franchises and company-owned outlets. The dependent variable in their research is the share of new franchises in the total of new outlets (both franchises and company-owned). They find that both agency variables and capital scarcity variables have a significant relationship with the dependent variable, in the expected direction. Also, including capital scarcity variables does not change the direction of the agency variables, but does improve the explanatory power of the tests substantially. So it seems that both perspectives help in explaining franchising.

The empirical evidence presented in the literature shows that there is much more to franchising than just the level of fixed investment. Several agency-related explanations are very well supported by tests. Nevertheless, due to the explicit choice in the cost structure that franchising offers, it is interesting to see if we can explain the findings from the literature within our model as presented on page 83 in figure 3-2. The starting point of our model is a stable earnings development. We have identified four factors that influence the earnings development, and the operating leverage as an important mechanism that translates these influences into earnings variability. Suppose we have a starting firm that wishes to grow. It has a certain concept, is developing a brand name, and wishes to open some new outlets. How can it do this while still achieving a stable earnings development? This is not so different from a 'normal' starting firm: you keep your fixed investments as low as possible. This is best achieved through franchising. The new outlets will be financed by the franchisee. Of course there will be costs for the franchisor: training and advertising will require considerable investments. Nevertheless, this is much lower than setting up a self-owned outlet. This is the same result as the resource scarcity or raising capital hypothesis, but based on a different reason: it is a *choice* in the first place, and perhaps in the second place a necessity. If we should try to establish a pattern through time for franchising firms, we would expect a start with some wholly owned outlets, in order to develop the concept and establish a brand name. After a certain critical mass had been achieved, it would become possible to attract outside investors who would want to be a franchisee, thus allowing a growth of the firm without incurring a correspondingly great operating leverage. The operating leverage of a

franchising firm is lower than its non-franchising counterpart, because the franchisees take in a large piece of the fixed investment. The same goes for the franchisee, since here there is no expenditure for building a brand name and costly exposure to customers which normally results in large fixed (sunk) costs. This reduced risk results in a much higher survival rate for franchisees vs. independent ventures: typical figures are 70% and higher for franchisees and 10% or less for independent businesses (Hoffman and Preble, 1991, p. 76). Despite the attractive simplicity of this explanation, it does not cover certain empirical aspects of franchising as documented in the literature. There are several agency explanations, especially regarding monitoring costs: Brickley and Dark (1987) find a strong positive relationship between the ratio of franchised units vs. wholly owned and distance from headquarters. Nevertheless, we will now discuss the variables from our model in relation to franchising.

First, there is an overall distinguishing variable: the technology must enable franchising. In a service industry, it is possible to franchise; in a manufacturing industry, it often is not. This is because a manufacturing process cannot be captured by a few handbooks and some weeks of training. The nature of the technology must be such that it is easily transferable, which is more common in the service industry, e.g. hotels and restaurants, or retailing. Combs and Ketchen (1999) find that *within* the restaurant industry, firms use less franchisees when the specific knowledge required for operating an outlet is higher.[24] The agency problems that are put forward as a rationale for franchising are dealt with in other ways in a manufacturing industry. This is the field of responsibility accounting.[25]

If franchising is feasible, we can look at the other variables in the model to determine their influence on the decision to use franchising. When a firm is operating in a stable market with relatively little uncertainty, there is no need to use the operating leverage to reduce earnings variability. Conversely, when a firm enters a new market, it can rely on franchising until the market is well-known. International expansion should follow this pattern. Since the marketing concept of the firm can be assumed to be well developed, it allows the firm to start with franchising in the new market. This is what is found by Combs and Ketchen (1999): in opening new outlets, firms rely more on franchisees when they expand in foreign countries.

Strategy plays a role in the choice to undertake franchising if it is possible. Hoffman and Preble (1991) suggest that franchising is a generic strategy in its own right, because it concerns choices about products and markets, technology, and administrative organization. It may very well be that a firm does not want to use franchising as a means of expanding, because it does not want to share its technology with outsiders, or because it wants to exercise full control over its operations. The choice to revert to wholly owned outlets can be a strategic one, but more often it will be a simple business decision: it is possible that it is more profitable to run the business than to use franchisees. Should the firm choose to abandon franchising, it would also have to buy out all existing franchisees, which may not always be possible.

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[24] the level of specific knowledge inherent to a restaurant chain was assessed by an expert panel numbering 182 people.

[25] agency issues can be explained from the control perspective used in management accounting. We will get back to this in chapter 4.

Finally, the role of funds is analogous to the financial aspect of the resource scarcity of Carney and Gedajlovic (1991). Franchising is a means of financing growth, whatever the complications of this simple argument in the more sophisticated theory of financial economics. However, this also means that a company with a good financial position should think twice about starting up a franchise when it can finance an expansion from its own resources. There are drawbacks to franchising, the main being the giving up of control over the firm's operations. Again, Combs and Ketchen (1999) find that if a firm has a high debt to equity ratio, or a low cash position, it relies more on franchising.
A final observation on the application of our model to the franchising decision is related to the life-cycle explanation mentioned above. While expanding through growth in market share, and also through opening up new markets, there is much uncertainty: that is, the demand or market variable suggests a low operating leverage. In this respect, it is important to note that the decision to franchise is a *reversible* decision. Should the firm wish to do so, it can regain full control of the operations and the profits by buying back outlets (Hoffman and Preble, 1991). This will normally be the case when the market has stabilized, and the availability of capital is no longer a restriction. In these circumstances, it is very well feasible to maintain a stable earnings development while increasing the level of fixed investments.
What do we learn from this discussion of franchising? Since the choice for franchising versus opening company-owned outlets is unambiguously translatable into a choice with respect to the cost structure, we can evaluate the empirical findings on franchising in the terms of our model. We see that our model identifies some major influences on the patterns of franchising found in practice. This does not mean that we have found a new or better explanation of franchising, but it does gives us some confidence that we are on the right track in exploring the role of the cost structure.

3.5 the real world

3.5.1 what we want to know

Now that we have a model that we can use as a handle or starting point in discussing the cost structure at the level of an individual firm, we can go to the real world and see what ideas we can find about the role and importance of the cost structure. For this, we need to take a look beyond the financial statements. Since we do not have a coherent theory with respect to our topic, it is difficult to go into practice with structured instruments, be they questionnaires or structured interviews. The current state of knowledge implies that practical research will be largely exploratory: what is going on in practice? Therefore, the most appropriate method is that of a series of semi-structured interviews.
We have two starting points to generate questions that can be used in the interviews. First, we have the conceptual model, developed in section 3.4. The model states that the operating leverage is a mechanism through which several important variables influence the earnings development. Demand is the link between the internal affairs of the firm and the market. Strategy refers to the choices a firm makes: what to produce,

how to produce it, at what scale, where to sell it, at what price. Technology denotes the possible choices the firm has in structuring its production processes. Funds refers the financial possibilities of the firm, both in investing and in pursuing certain strategies. All variables seem to interact: the technology determines the choices from a strategic point of view, and the choice for a certain technology can be based on strategic rather than technical considerations. The funds can enable a certain strategy, and strategy in part determines the availability of funds (e.g. through the decision to go public). However, it is not possible to unequivocally define the strength and direction of the relationships between the variables. Therefore, they are seen as the important independents determining the cost structure, through which the earnings are influenced.

The nature of the model is such that there are no explicit theories about the nature of the relationships. So it seems helpful to start from a second point: the reasons for the unimportance of the operating leverage. Apparently, these are practical problems, and so they can be applied relatively easily to a practical setting. And besides, if we can determine which of the reasons has the greatest impact, we have some ideas about how we can improve the popularity of the operating leverage. Ordered along lines of 'fundamentality', the reasons identified in section 3.1 were:

(1) the effects of the cost structure are not important, and therefore it serves no purpose as either performance indicator or management tool;
(2) it is not measurable due to the categorization problems of fixed and variable costs;
(3) it is not useful as a control measure since it is of lesser importance than other variables in managing firm performance;
(4) it is useful, but it is not a degree of freedom in structuring operations due to technology constraints;
(5) it is covered by other, apparently better concepts like flexibility or cyclicality.

Note that the first reason is the most fundamental, while the others deal with various degrees of problems in a practical application. Also, we assume that the operating leverage concept, as well as its mechanism, is known. Next, there are a number of issues that can addressed:

* cost categorization: is it possible to group costs on a firm-wide basis into fixed and variable costs – with the existing management accounting information?
* when are costs variable? Is the idea correct that from an operations point of view everything is fixed, and that an increasing part becomes variable when we take an ever more strategic view? What are the consequences for operations management? For strategic management?
* capital budgeting: how can we incorporate the cost structure into investment decisions? Does it give an extra dimension to the decision? Does it make it better? Or is it already covered in the decision process?
* technology choice: is there a choice in the structuring of operations? If there is a choice, is it weighed from the perspective of technology, or from a cost perspective?

For our first round of interviews, we want to talk to people at a relatively high level, like a general manager, a site manager, or a controller. If there is any level at which the cost structure can be influenced, it is that of the firm, or a business unit thereof. This is not to say that it is very well possible that for instance an operations manager understands the issue better because he is confronted with it on a daily basis. However, we are first

looking for clues as to why the concept is not used at a level where it most certainly can be influenced. Next we have to decide what the consequences are of whatever the outcome can be of the preliminary interviews. There are two major categories of outcomes: either it is wholly unknown, we are thanked for bringing it to attention and it will consequently be used from now on in investment decisions, operations management etc. (to put it in somewhat extreme terms), or we get some ideas about why it has been ignored for otherwise valid reasons. If we take the first outcome as being less likely (and less challenging from a scientific perspective), it seems fair to concentrate on the second possibility. Then we would have to look at what will be brought about by the different reasons:

(1) the effects of the cost structure are not important: if this proved to be true despite all our thoughts about this, we would have a big problem. Nevertheless, it may be true that firms operating in either an extremely stable market, or in a market that experiences enormous growth, do not care about their level of fixed assets.[26] Therefore, this possibility cannot be ruled out beforehand, but it will almost certainly be restricted to a small, identifiable group of companies. The result would be that a (small) line of the research would be aimed at finding the characteristics of this group of companies;

(2) there is no clear picture of the variable and fixed costs. This would mean that we try to get an idea about which costs are fixed over which time span; i.e. we would look at the friction between the operations view on costs and the strategic view on costs. Next to this, it would be interesting to try and estimate the true segmentation of costs for a process, and preferably for a whole firm;

(3) the cost structure is subordinate to other aspects of firm performance. That is to say, it does not deserve the attention it needs to use it adequately, because market conditions, strategic considerations, or even organizational aspects are more important. In still other words, it is possible to make well-founded decisions without looking at the cost structure – while acknowledging its importance. It can serve only as an indicator, a parameter of a process. Should it turn out that incorporating the cost structure into the decisions would lead to other outcomes, the research could be aimed at evaluating previous investment decisions, mapping possibilities in the current structure, and demonstrating the importance of the cost structure;

(4) there is no technology choice. This need not be the result of unique products or production processes, it can also result from a lack of funds or because one method is clearly dominant. If there is a real lack of choice that also extends to the scale of production, as in (part of) the chemical industry, there is little use in demonstrating the importance of the cost structure since management will most likely have been confronted with it;

(5) the cost structure is covered by other concepts, especially flexibility. It should not be difficult to translate choices regarding flexibility to a cost structure setting. Other

[26] the telecom sector at the turn of the 20th century is such a growing market. Take the example of cable company UPC: it has still to record its first positive earnings, yet it takes over one company after another. Meanwhile, its shareprice has risen by more than 300% in 1999 (*Het Financieele Dagblad*, 24 December 1999). Of course, this lack of care for fixed cost levels is temporary: it is essential to build up market share, in order to obtain a competitive position in the future.

concepts may turn up during the interviews, but we firmly believe that the cost structure is so basic that it can always be applied. It should be especially enlightening to see if this results in a clearer picture.

As indicated, we would like to talk to people who look at the big picture, and who are not directly confronted with the existence of fixed costs or lack of variability, as will more often be the case at the operations level. This means, in effect, that we look for people who are in the position to overlook the effects of the cost structure. One category of managers that comes to mind is controllers, because they tend to have a general overview of their unit, can see further than just day-to-day operations, and can also be expected to have a clear view of the costs and the cost behavior within their unit.

Some thought was given to the structure of the interviews. There were two approaches possible, based on the identified reasons for the low popularity of the concept. If the unfamiliarity of the concept is the main reason, it would be wise to start with a very general introduction, avoiding words like cost structure, fixed assets and fixed charges as much as possible. We can begin by illustrating some problems resulting from the cost structure, most notably earnings variability, but also lack of flexibility, perhaps briefly discussing temporary workers, and from that point suggesting one of the possible causes: the cost structure. The other approach is to simply put forward the concept, explain its relevance and consequences, and look for examples in the current firm. Due to practical reasons – mainly that it is a bit difficult to talk about the cost structure without mentioning it – the second approach was taken.

Following this introductory part of the conversation, we would like to find out something about the ideas mentioned above. Preferably, all variables from the model should come up, and all possible reasons for not using the concept should be covered in the interview. Care should be taken to let the interviewees point at specifics in their organization, i.e. to look at the context and not to abstract from that context. For instance, certain choices may be suboptimal from a financial point of view, but can be explained through the strategic choices the firm has made.

The semi-structured nature of the interviews implies that there was room to pick out certain aspects or issues that came up during the conversations. Although this implies that each interview developed in its own fashion, the basic questions that were used to guide them are:

* how important is a stable earnings development for your firm?
* do you recognize the operating leverage effect in your firm?
* are you approximately familiar with the cost structure of your firm? That is to say: do you have a good estimate of the levels of fixed and variable costs within your firm?
* what are the choices the firm has in technologically configuring its production process, and consequently, what are the choices in setting the level of fixed costs?
* in which parts of your firm can fixed costs be replaced by variable costs, e.g. through hiring temporary workers, or through outsourcing?

3.5.2 interviews

For the first interview round, seven firms were approached. Within each firm, a person was contacted who was active as a controller, or had been active in that position (with

the exception of one managing director). They were sent a letter together with an introduction to the topic of the interview, as well as some questions that were to be addressed during the interview. All seven were willing to cooperate. The basic firm characteristics are:

* the machine producer: an independent firm with some 100 employees and sales of several tens of millions of guilders that produces cutting machines. The production is carried out with relatively old machines, the process is well known and well controlled. Stable product range, sold in a mature market with modest competition. Sales growth of some 20% per year;
* the producer of power supply installations: a wholly owned subsidiary of a listed foreign multinational with 60 employees and sales of *f* 15 million. The production process has been outsourced and subcontracted as much as possible. Active in a mature market where quality is paid for. Sales growth of some 13% per year;
* the fiber producer: a division of a listed firm, 330 employees and sales of *f* 130 million. Industrial supplier, partly of commodities. Process industry in a down cycle, showing very low profitability at the moment;
* the industrial services company: a division of a listed firm with several thousand employees. Installation and maintenance of machinery and processes in a very competitive market;
* the media company: listed firm with several thousand employees and over *f* 1 billion in sales. Large newspaper division which is partly cyclical (with respect to the advertisement volume);
* the measurement instruments producer: a division of a listed firm with 800 employees and several hundreds of millions in sales. Produces measuring instruments based on advanced technology. The production has been outsourced to a great extent except for the high-tech parts. Traditional market is stable, new product-market combinations provide growth;
* the beverages producer: listed firm with 750 employees and several hundreds of millions in sales. Active in a saturated market where premium prices are paid. Growth is slow but stable.

The list shows a broad range of industrial firms: from firms in the process industry to a service company. This should enhance this exploratory stage of the research.

The interviews lasted from 50 minutes to one and a half hours and were taped via dictaphone. They were subsequently transcribed. The main findings are:

* earnings development: listed firms note that investors force them to strive for a stable earnings development. The producer of power supply installations and the fiber producer have to show a stable earnings development to their headquarters. Not everyone agrees that it is necessary for a firm to look at earnings in this way. For example, cuts in research and development expenditures could result in less variation in earnings in the short term, but can damage the long term competitiveness;
* impact of the cost structure: partly due to the positive economic situation of the past few years, the effects of the operating leverage are limited to differences in positive growth rates for most firms. There are two exceptions: the industrial services company is active in a highly competitive market where there is not much room for

extra margins, and the fiber producer faces the problems associated with commodities. As a result, these companies find themselves around their break-even point, which is exactly where the operating leverage works most profoundly. Next to these two, the beverages producer sees the effects within one year due to seasonal influences;

* fixed costs: the difference between fixed and variable costs is relative. In the long run, or under pressure, everything becomes variable. Not every firm has categorized all costs as fixed or variable, and not every firm thinks it is useful to do so. The machinery producer does not see much use in it: you change your fixed costs when you buy a new machine, for the day-to-day operations it is not relevant. The beverages producer has made a complete categorization and uses this in management decision. In general, fixed costs and break-even points are thought of as important in strategic issues, such as capital budgeting and sensitivity analysis. All firms view labor costs as fixed. This goes for the industrial services company as well as for the fiber producer. This is partly due to Dutch employment regulations, which render it impossible or very costly to lay off employees. However, what is also very important is the fact that employees increasingly need to be highly trained and highly experienced. Temporary workers often lack this, giving rise to quality and efficiency problems. In other words, temporary workers can become a control problem. Besides this, there are certain motivational issues that make it necessary to rely on permanent employees. Finally, fixed costs as such are an important issue for all firms. It seemed as if every interviewee felt that he had to deal with a lot of, or indeed too many, fixed costs. This is true even for the firms that have outsourced a large part of their entire production process;
* outsourcing: with respect to the cost structure, outsourcing can make costs more variable, and thus lower the operating leverage. This was incidentally mentioned as a reason for outsourcing, but more often the decision to outsource is based on quality and cost efficiency. For example, outsourcing the catering is typically a cost decision. The decision to buy rather than make certain parts can be based on quality: the supplier typically has the production of the part as its core business, and therefore will be better equipped to manufacture it and also have more experience at this. The producer of power supply installations has taken this to its extreme: it only performs the final assembly. Its own qualities are in design and service, not manufacturing;
* technology: there is not much interest in technology choices, i.e. in possibilities to structure processes differently with accompanying different cost structures. In investment decisions, there is more interest in the sales potential of the product than in the cost structure of its production process. In other words, an investment is made because of the sales line in the CVP-graph, and not because of the cost line. Technology choices are important insofar as they provide options within the production process, and not so much with respect to allowing different cost structures;
* market structure: although the literature directs its attention towards sales patterns and their fluctuations, the interviewees stressed the importance of the market conditions and competitiveness. The nature of the competition in the market is very

significant, because it determines whether cost or quality is the profit source. A typical example is the beverages producer: although the market for its main product is fully saturated (a change in market share of 0.5% is considered very large), it is still possible to demand a premium for quality. Therefore, the cost structure is less important than the quality of the product. On the other hand, the industrial services company and the fiber producer operate in markets where competition is based on price, making costs the most important way to do something about profitability;

* flexibility: as noted previously, flexibility is such a broad subject that it is sometimes hard to identify as a reason for a decision. An interesting point brought up during the interviews was that firms do not strive for flexibility through hiring temporary workers – although they do use them – but rather through employing their staff in different positions. This is because skills and experience are important, and temporary workers are deficient in these. This means that the 'simple' form of flexibility in costs (changing fixed for variable costs) is not feasible. Therefore, attention shifts toward the flexible employing of labor: the industrial services company has created an internal 'temp agency' to make sure that its employees do not sit idly in one business unit while another unit has to hire temps. So the emphasis is not on the flexible *hiring*, but on the flexible *employment* of labor.

Talking about the cost structure with practitioners is difficult. It is very difficult to separate attention for the cost structure from costs in general. This means that the discussion shifts quickly from the leverage effect of the cost structure to cost awareness in general. This is not because the concept is unknown, nor because it is not important. It seems that operating leverage as a performance indicator is too general, too aggregate. It is the result of a series of decisions, and not a variable for which specific targets are set. It helps in understanding certain empirical phenomena, but a certain cost structure does not lead to a corresponding profitability. In the words of the industrial services company: 'We have the same cost structure as Baan, but they make 10% on their sales and we 2%.'[27] It would seem that market conditions are more important to profitability than the cost structure. Within that market the cost level is more important than the cost structure.

If we look once again at the possible reasons for the perceived low popularity and the issues to be addressed in the interviews, we can conclude the following:

(1) the effects of the cost structure are important, although they are not always interpreted in terms of operating leverage, but more in cost levels in general;
(2) the measurement problem is not very important since nobody actually calculates *dol*-values or something along that line;
(3) it is not useful as a control measure, since other variables (of which it is a result) are more important;
(4) because of this, there is not much interest in technology choices in structuring the operations;
(5) it seems to be covered mostly by the concept of fixed costs.

[27] this was, of course, in the days of yore for Baan.

The overall impression from the interviews was that fixed costs are important, and so is the total level of costs, but the operating leverage as such is not really suited for practical use. When talking about outsourcing, for example, the issues are quality, manageability, cost efficiency – not lowering the operating leverage. When talking about fixed costs, and measures to reduce them, attention is directed to the absolute level of fixed costs, and not to the operating leverage. When talking about technology choices, it is the possibility of different specifications that is attractive, not different cost structures. When talking about flexible employment, it is not flexibility in the cost of employees, but in their work, so that they can be used in different positions. All this leads to one conclusion: the concepts of operating leverage and cost structure are too general, too aggregate to be used in day-to-day management. The decisions that finally result in a certain cost structure are not made because of the resulting operating leverage.

3.5.3 so what about our model?

The model presented in section 3.4 is just a first step in describing the role of the cost structure for firm performance. The question is, then, whether we have found a good representation of this role. There is one aspect of the model that seems to capture the empirical situation quite well: the position of the cost structure as 'nothing more' than a mechanism that translates several key characteristics into the performance of the firm, as measured by its earnings. Again, what is important in this view is that the cost structure is more a result of other decisions than a decision variable. This may seem obvious from other points of view, but in our discussions of the operating leverage within the framework of financial economics it was difficult to see it otherwise. However, leaving the viewpoint of financial economics also robs us of the clear, well defined and well behaved analytical framework used in sections 2.4 and 2.5. What's more, we do not seem to get anything back for it, in terms of a simple new framework, because the model does not offer new hypotheses or theories. The determinants that are thought to influence the cost structure do come back in our practical discussions. For example, demand proved essential, although the interviewees cast it in terms of market structure, and technology and strategy are also important. But we do not have any clear relationships or hypotheses that we can formulate, precisely because we let go of the cost structure as a number and took it as a more general firm characteristic.

In the interviews, as well as in our presentation of the model, it proved difficult to talk about optimal cost structures. In fact, this is what we would expect given our discussion that led to discarding *dol* and viewing the cost structure more as a concept than as a number. If anything, the interviews strengthen our ideas on the lack of practical usefulness of the operating leverage, coupled with the importance of the cost structure.

In the end, the model does not seem to fully capture what is going on. While the model assigns less importance to the cost structure than we did to the operating leverage in our first approach reported in chapter 2, it still seems too much. In order to explain this, we look at the interpretation of the determinants of the model given in section 3.4. If we look at sales, we asked how a firm reacts when it is confronted with the effects of the cost structure. This is not what our interviewees had in mind when discussing sales. The influence of the market, as it is reflected in the sales pattern, does set the stage for the

role of the cost structure. However, it does not become important because of unexpected changes in revenues, or because of the way the cost structure translates sales fluctuations into earnings variability. Much more than being the source of variability, the market conditions form an overall contingency that continually underlines the importance of costs, and of the cost structure. Or to put it differently, it is not so much a *change* in market conditions (or sales), but the market conditions as such that determine the influence of the cost structure.

With respect to strategy, we are confronted with largely the same problem: the strategy is, at any point in time, a contingency of the cost structure. If all is well, the cost structure is the result of strategic choices made in the past. Strategy still governs the cost structure in that a firm has ideas about its competitive position, influencing for example its pricing policies. However, we did not encounter any decisions that override financial logic in favor of 'strategic benefits' or something along those lines, as we indicated when introducing strategy as a determinant.

And even technology as a determinant does not work quite the way we expected it to do. Whereas we thought firms would be interested in having a choice in a range of cost structures, actually offering a *choice* in the level of operating leverage, firms tend to be much more concerned with technology as an influence on the performance of the processes. For example, the media company is not interested in the different levels of fixed costs that printing lines offer, but in specifications like the quality of the color printing of the lines. Furthermore, there is more to the cost structure than just the technology. In general, support processes in a firm, such as catering, administration, logistics, and maintenance, can be made variable relatively independently of the process technology.[28]

What is the difference with the application of the model to the literature on franchising, in section 3.4.1, where it seemed to capture the important issues? First of all, with that example, we took some general observations available in the literature instead of analyzing single franchising decisions. But even more, from a cost structure perspective, franchising is still much too 'clean', too close to theory. If franchising is interpreted as a choice for variable instead of fixed costs, there are no further classification problems, and once it is possible to franchise, the technology has no further limits in that any range between 0% and 100% franchising is possible.

3.6 conclusions

We started this chapter by picking up what was left over from the subject of the operating leverage. We concluded that the operating leverage, as measured with *dol,* is important, but treating it as a number will not result in useful applications. This meant that we needed to take a different approach to look into the subject. To do this, we stepped out of our previous framework, that looked at the firm from a business economics or even financial economics point of view, and tried to extend the analysis by incorporating other fields of research. This implied basically that we viewed the firm as consisting of more than just fixed and variable costs. We have drawn up a conceptual

[28] we will return to this extensively in chapter 4.

model that positions the cost structure with respect to its determinants and its consequences. This helps in identifying important characteristics of the firm and its environment that influence the cost structure. As such, we can ask ourselves if we have come any closer to reaching our research goal, which was formulated as follows in section 1.2.3:

> **to contribute to the understanding of the importance of the cost structure for firm performance.**

If anything, we have found support for our reformulation of the research goal, away from the operating leverage. The operating leverage concept, though intellectually appealing, is not useful for firms as a management tool. Its neglect in management practice is the result of a lack of applications. It is simply not feasible to identify an optimal operating leverage for a certain process, project or firm. That is not to say it is not important. As the literature on systematic risk has shown, the concept is very useful in explaining risk. It also helps in explaining empirically observed phenomena, e.g. the difference in cyclicality between firms and industries, and maybe it is underexposed in that respect. It is somewhat surprising when no reference at all is made to cost structure or operating leverage in an economics article entitled: 'Why are some industries more cyclical than others?' (Petersen and Strongin, 1996)[29] However, the value of the concept in explaining aggregate phenomena does not necessarily imply that it is useful in the actual management of firms.

Do we, however, know more about the importance of the cost structure for firm performance? This is difficult to say. A first answer would be that it is not considered important outside of financial economics, when we look at the lack of theory in the literature that is specifically directed at the cost structure: note that we had to scrape together bits and pieces from financial management, strategic management, productions and operations management, and management accounting. But that is not completely what seems to be going on. Fixed commitments – meaning anything that commits the firm to certain courses of action, e.g. through fixing costs, reducing the choices available, and thus lowering flexibility – are an important issue in theory and in practice. It would seem that interest in the cost structure finds its outlet in discussing other, directly related issues like flexibility.

Can this lack of attention be rectified? After all, we found in the interviews that there was not much attention for the cost structure as some ratio incorporating fixed and variable costs, let alone a *dol*. This was not because of lack of effects, or of effort: two firms were very actively making their cost structure more flexible through outsourcing, and two firms had a very low profitably, and thus were at a point where the cost structure becomes very important. It seems that the typical operating leverage applications that are presented in the literature do not capture what is really going on. To underline our point, consider these quotes:

> Given the substitutability among production factors, the degree of operating leverage can be substantially changed by managerial decisions. Thus, for example, an increase in the capital intensiveness of the production process (e.g., a switch from steam generating to nuclear

[29] their view, also presented in section 3.1, takes an exactly opposite stance: the greater the part of the variable costs in total costs, the more cyclical the firm. This is because it can react more quickly to external demand or price 'shocks'.

> production of electricity) will result in an increase in the relative share of fixed costs (e.g., depreciation, maintenance, etc.) to variable costs (e.g., coal, wages, etc.) (Lev, 1974, p. 627)
>
> It is typically assumed that production functions are exogenously determined by technological conditions such as the extent of economies of scale and mass-production techniques, as well as opportunities for division of labor. It is not unreasonable, however, that a firm's choice of production technology is affected by the inherent cyclicality of its industry ... For example, firms in highly cyclical industries may choose more flexible, labor-intensive technologies. (Petersen and Strongin, 1996, p. 191 and 196)
>
> For example, a choice between using robots and using humans in manufacturing typically represents a choice between two levels of operating leverage. Robotic manufacturing has higher fixed costs to install, but lower variable costs to operate, than human manufacturing. (Emery and Finnerty, 1997, p. 411)
>
> Operating and financial leverage can be combined in a number of different ways to obtain a desirable degree of overall leverage and risk for the firm. High operating risk can be offset with low financial risk and vice versa. (Van Horne, 1977, p. 731)
>
> The degree of operating leverage is an important factor to be considered in the firm's asset structure decisions. By changing from a labor-intensive manufacturing process to a capital-intensive one, a significant change would occur in the cost structure. A rise in fixed costs and a simultaneous decline in variable cost per unit increase the degree of operating leverage... (Mandelker and Rhee, 1984, p. 54)

This does not seem to be the way it works. For one, the idea of labor costs being variable was not shared by any interviewee (which, by the way, sheds a different light on the test assignments we have composed). Next to this, it is very unlikely that a firm will change the way it produces based solely on the operating leverage. Operational considerations, quality, delivery time, product-mix variability (as opposed to volume flexibility), these seem to be the important points in deciding about the cost structure.[30] The ultimate example of this comes from the information company. Originally a newspaper publisher and printer, it has deliberately diversified into other media (music, radio, television) to lessen the cyclicality of the newspaper business. It did not try to do so through lowering the operating leverage of its original business because there is only so much that you can do while maintaining the quality of your product.

So there we are. After having discarded the operating leverage and *dol* as a useful concepts in discussing the importance of the cost structure, it now seems that we also have to give up the cost structure, as some ratio that takes into account the share of fixed costs in total costs, as a topic of interest. Is it important? Yes, because it has a big impact on earnings variability and overall flexibility. What is its role? Well, that seems to be a very passive one: once it's there, it's there, and we see the effects in the earnings development. This is at once satisfactory and very unsatisfactory. We know how the cost structure influences firm performance, we know that it is not possible to derive

[30] this is best illustrated from an informal case (because it is not yet published), borrowed from a fellow Ph.D.-student: he supervised the reorganization of the packaging line in a production site of a consumer electronics company. The new line was *less* automated and required more manual labor, which was if anything more expensive than the automated option. The choice was justified because of the greater operational flexibility of humans.

optimal cost structures from theory, nor to find them through empirical analyses, and we get the strong impression from interviews that in practice it is not found a very interesting firm characteristic. Not only do we have an answer to our original research problem based on theory and facts, from the field of business administration in general this answer is quite encouraging: it would be rather disappointing for business and management scholars to learn that a firm, process or project can be managed on one number. What does make it unsatisfactory, however, is the fact that we do not succeed in providing some positive guidelines on what to do with a firm's cost structure under which circumstances. Even if this would not result in suggestions for ideal cost structures, perhaps we could give some hints on when to take which measures. And this is exactly what we have to do: analyze and categorize management actions on their possible impact on the cost structure. This leaves us in almost the same position. All we have to do is redirect our attention a little, towards fixed costs. It is more logical for firms to talk about lowering their fixed costs than striving for an optimal operating leverage. It also offers the possibility to ask what kind of costs a firm wants to have and has to have. All firms consider labor a fixed cost, and although one might think that using temporary workers or flexible labor contracts is the easiest way to make your costs more variable, this option is not chosen. Controllability and manageability are the key words with respect to labor, and they require dedicated and motivated employees. Furthermore, fixed costs in the form of people are not passive: e.g. sales and service personnel can influence the level of sales.

In all, we are now at a point where we have taken the operating leverage and the cost structure to be interesting concepts that can explain observations made in practice, but we have still not succeeded in making them more useable in a practical firm setting. Given their importance, it is a pity to leave it at this. Therefore, we will take an important part of the cost structure, and the cause of the operating leverage effect, and try to develop some more ideas on it.

4 fixed costs

After discussing the operating leverage and the cost structure, and discarding them in spite of their theoretical importance, as practical concepts, we dive into the topic of fixed costs as the practical handle to do something with the subject of this thesis. First, we will discuss how we got to where we are now. Next, we will discuss fixed costs in general. This is solely to get a better grip on the subject, not to come to a new and improved definition of it. After that, we are going to discuss flexibility. While until now we could say that the operating leverage and the cost structure were a measure of financial flexibility, this is no longer the case with fixed costs (and no, it is not a measure of financial *in*flexibility). Because of the tension between fixed commitments and flexibility, the literature on flexibility management may provide some interesting notions on how to deal with fixed costs. We then arrive at the heart of this chapter: a categorization of management actions that can influence fixed costs, and some suggestions on how these actions can be placed in a 'theory' of fixed cost management. Finally, we will present some interview results that deepen and enlighten the ideas presented.

4.1 from operating leverage to fixed costs

The previous chapter ended with a clear conclusion with respect to the operating leverage concept and the cost structure: though intellectually appealing, they are not useful for firms as a management tool. Their neglect in management practice is the result of a lack of applications. It is simply not feasible to identify an optimal operating leverage for a certain process, project or firm. That is not to say it is not important. As the literature on systematic risk has shown, the concept is very useful in explaining risk. It also helps in explaining empirically observed phenomena, e.g. the difference in cyclicality between firms and industries, and perhaps it is underexposed in that respect. However, the value of the concept in explaining aggregate phenomena does not necessarily imply that it is useful in management or business administration. In my opinion there are three main reasons why its conceptual appeal does not translate into managerial applicability.

First, the operating leverage at firm level is too aggregate. A firm is a constellation of different processes and projects, each of which has its own operating leverage. This means that no conclusions can be drawn from a *dol*-value calculated for a whole firm, which is what you would do if you were an investor or analyst. Also, management cannot use the *dol* as an indicator of overall firm performance for the same reason.

Next to this aggregation problem, there is the question of the optimal cost structure. How do you determine the optimal cost structure, and thus the optimal operating leverage for a firm, or even one single project with a clearly identifiable cost structure? There is no reason to assume that a certain cost structure leads to a certain profitability.

There is also no reason why a given set of market conditions requires a specific cost structure.
Finally, the cost structure is the result of other decisions. Firms undertake a project because of its future cash flows, and the operational choices are largely dependent on the perceived market conditions. All sorts of considerations play a role in this: strategic, technical, operational, organizational, etc. It is hard to imagine that these considerations are subordinate to the level of fixed costs resulting from it. Chase, Aquilano, and Jacobs (1998) provide a list of the decision variables in choosing among alternative processes and equipment. Table 4-1 reproduces this list in full, to emphasize our point.

decision variable	factors to consider
initial investment	price; manufacturer; availability of used models; space requirements; need for feeder/support equipment
output rate	actual versus rated capacity
output quality	consistency in meeting specs; scrap rate
operating requirements	ease of use; safety; human factors impact
labor requirements	direct to indirect ratio; skills and training
flexibility	general-purpose versus special-purpose equipment; special tooling
setup requirements	complexity; changeover speed
maintenance	complexity; frequency; availability of parts
obsolescence	state of the art; modification for use in other situations
in-process inventory	timing and need for supporting buffer stocks
systemwide impacts	tie-in with existing or planned systems; control activities; fit with manufacturing strategy

table 4-1 major decision variables in equipment selection, reproduced from Chase, Aquilano, and Jacobs (1998, p. 101).

For manufacturing firms, the general considerations with respect to investing in the production process have been studied under the heading of 'manufacturing strategy'. Although manufacturing strategy sometimes is interpreted as something like choosing between JIT, MRP, TQM or some other three letter word, it is more useful in this respect to see it as the link between the market place and the production process (see Voss (1995) for an overview of manufacturing strategy paradigms). One approach in this respect is to identify those criteria that win orders against the competition: price, delivery, quality, product design, variety (cited in Voss, 1995). This approach has been worked out by Miller and Roth (1994) who have undertaken a survey to identify different manufacturing strategies from empirical data. Their results are not important here, but their list of criteria (taxons) to classify a firm's strategy is:
(1) low price: the capability to compete on price;
(2) design flexibility: the capability to make rapid design changes and/or introduce new products quickly;
(3) volume flexibility: the capability to respond to swings in volume;
(4) conformance: the capability to offer consistent quality;
(5) performance: the capability to provide high performance products;

(6) speed: the capability to deliver products quickly;
(7) dependability: the capability to deliver on time (as promised).

All of these criteria will be more or less important depending on the specific situation of the firm. It is clear, however, that at least some of these criteria will be more important in choosing a specific production process than the cost structure that is the result of it. This does not make the cost structure unimportant as a characteristic of a process or firm; it does mean that it is difficult to imagine the cost structure as a variable for which a specific target will be set.

Having said this, we should not discard the concept as being unpractical. It remains important in sensitivity analyses that are carried out in most investment decision processes. When used in this respect, it seems that the current state of knowledge is sufficient. The literature review shows that it is not very useful to construct more sophisticated models. This has been done for the break-even analysis, the basis for deriving the *dol*-formulas. It is possible to incorporate certain flexibility issues such as setup costs and keep the analysis simple (Hanna, Newman, and Sridharan, 1993; Newman and Hanna, 1994). However, the introduction of multiple products and stochastic variables may lead to models that are more realistic, but they result in unmanageable equations that lose the attractive simplicity of the 'traditional' model, next to the fact that they rely heavily on assumed distributions of variables (see e.g. Miller and Morris, 1985; Chung, 1993).

At this point, it is useful to return to the previous problem definition of the research:

> **to contribute to the understanding of the importance of the cost structure for firm performance as measured with earnings development.**

Now we can see what the real problem with this problem is: it is already completely clear what the importance is. In fact, the development of a management tool that incorporates the operating leverage effect is not necessary, since the effect is well understood, and there is already a number for it – the degree of operating leverage *dol*. The problem lies in finding a guideline: what should we look for in our cost structure? We discovered that (1) there exist no clear answers to this question, but even more, (2) that the problem lies in how to obtain a certain cost structure. The determinants of the cost structure that we were looking for in chapter 3 were partly 'real' determinants, but for at least one variable we can say that we are talking about a constraint: technology doesn't tell us what the 'optimal' cost structure is, but limits us in our possibilities to set that cost structure, given the 'real' determinants.

The theoretical importance of the cost structure was established within the CAPM-framework. Upon leaving this framework, we looked at earnings variability as the firm characteristic that showed the impact, and even the importance, of the cost structure. This is where we can find the limitation of the cost structure as a concept in managing a firm, a limitation which presented itself in full during the interviews: firms want to generate earnings first, and only secondly are interested in the variability of these earnings. Whether we call it maximization of firm or shareholder value, or striving for profitable growth, aimed at continuity, firms are in business to make money. As we have established in section 3.3, starting on page 74, earnings variability is very important for firms, but they are primarily interested in the *level* of earnings. They are not striving to minimize the variations in earnings, but want to maximize their returns. This, of course,

is the same argument as made above, that there are other issues that are more important when making a decision that influences the cost structure than the cost structure itself. And while it is safe to say that firms are *secondarily* interested in earnings variability, we need another approach to the subject to come to some meaningful conclusions. One could wonder if it isn't possible to look at firms in the same 'earnings class', or perhaps more general 'profitability class', similar to the risk class concept introduced by everybody's favorite friends Modigliani and Miller (1958). However, the cost structure is directly related to the *operational* characteristics of the firm. And from the Dupont relations we know that return is the product of asset turnover and operating margin, which means that firms can have very different cost structures and show the same profitability level. So besides being very difficult, such an exercise would also be pointless.

Nonetheless, we do not want to leave it at this. There has to be a way to tackle the cost structure: it must be possible to say something more about it than merely observe its influence on earnings variability. To see if this is possible, we direct our questions at the decisions that a firm can take that influence the cost structure. To structure these decisions, we are going to look at a very basic firm characteristic: fixed costs. Fixed costs are the origin of the leverage effect. As such, all work done on the (theoretical) importance of the operating leverage can be applied to fixed costs *sec* as well. What is more, the interviewees generally indicated that the level of fixed costs is of prime importance. It seemed as if every controller felt that he had too many fixed costs, even in the cases where virtually all production was outsourced. Note that this is different from the operating leverage in that it is not some ratio of fixed to total costs, but the absolute level of fixed costs that receives attention. It seems that fixed costs, from a managerial point of view, are an important issue, but that the operating leverage is not the right concept to manage them (although it helps in analyzing them). Rather than looking at some formula including v and F, we are now going to look at what a firm does with F. This can be done e.g. through splitting off a part of F, and turning it into v, or by filling up capacity, generating more contribution margin to cover F.

Fixed costs have been the subject of some research. The specific type of overhead costs has been studied at least since the 1923 classic of J.M. Clark. More in general, the question of allocating indirect costs has led to the rise of management accounting. Indeed, just like the operating leverage, fixed cost is a management accounting concept. However, the questions addressed in this field are not the kind that we are interested in. Management accounting tries to assign the costs correctly to where they are caused. What we want to know is not the correct cost price of a product, but what a firm does with its fixed costs.

The close link between fixed costs and operating leverage should serve as some reassurance that there has not been a substantial amount of research into the subject. A quick scan of the literature through indexes of popular textbooks (Drury, 1995; Horngren, Foster, and Datar, 2000; Kaplan and Atkinson, 1998; Brealey and Myers, 2000) shows little attention for the topic as such. This is not surprising: management accounting is concerned with providing information on the current costs in the firm, and one could say that the 'new' approaches even try to help management identify problems in the structuring of the operations as is the objective of activity-based costing

and activity-based management. In general, however, management accounting is concerned with recording, not altering. This is incidentally also the problem with the operating leverage. What we are aiming at is to generate knowledge about what to do with the recorded situation, or maybe only what *firms* do with the recorded situation. Apparently, firms are not always comfortable with the level of fixed costs that is recorded by their management accounting system. It is at this point that the ideas for new lines of research start, prompting the following research goal:

to contribute to the understanding the importance of fixed costs to firm performance.

The general question that can now be asked is: when should management influence which fixed costs and how should they do this? And consequently, what do they consider to be fixed costs? And why? What strategies does management use in dealing with fixed costs, and when and why does it use them? Why is it that some firms pay very much attention to their fixed costs, and others do not care so much – even when they are active in the same type of market? This is a tempting line of research, but after some thought, this almost comes down to a 'cost theory of the firm': what is the optimal level of fixed costs for a firm? As has been pointed out repeatedly, there is no such thing as the optimal cost structure, certainly not when we look at costs in general.[1] What is more, we are not at all in a position to answer these questions. Research on the managerial perception of fixed costs is hardly abundant,[2] and overall agreement on what fixed costs are is absent (and probably fundamentally impossible). Linking firm and market characteristics to optimal decisions with respect to fixed costs, i.e. empirically deriving the strategies firms use to deal with their fixed costs, is therefore several steps too far.

However, we can make a first step in this direction: by trying to identify the actions and decisions a firm can take with respect to its fixed costs. If we can produce an overview, or a taxonomy of the possibilities a firm has in managing its fixed costs, we can establish a base on which to develop a 'theory of fixed cost management'. The overlap with the original idea behind the research is larger than it may appear at first glance. We wanted to know to what extent the operating leverage concept could be used in managing a firm. The very first formulation of the research goal was: the design of a management tool for investment decisions that incorporates the cost structure (operating leverage) of a project. From this, it evolved into the formulation reproduced above – to contribute to the understanding of the importance of the cost structure for firm performance as measured with earnings development – but that one already hinted at the difficulties in using the operating leverage as a tool. We first had to understand the role of the cost structure before being able to develop anything, and that understanding led to the conclusion that applying the cost structure as a tool was not possible. This is very unsatisfying, since the concept of the cost structure seems to offer so much, at least in understanding firm performance. What it teaches us first and foremost is the importance

[1] whenever it is possible to determine an optimal cost structure, this will be the result of capital budgeting analyses. This is not what we are interested in.

[2] Wouters (1992, 1993) examines how managers deal with relevant costs and full costs, which can be related to fixed costs.

of fixed costs. Therefore, we are going to take this firm characteristic and look at what management thinks of it and does with it.
The central research question would then simply be:

how can a firm manage fixed costs?

The basics for this question in terms of past research and importance are covered in our review of the literature on operating leverage, which can be interpreted in this respect as a dynamic (or relative) measure of fixed costs. As such, we do not feel that the adjustments that have been made during the research are a major departure from our starting point. In fact, it is our firm opinion that anything with fixed costs follows logically from the previous stages. An extra stimulus for formulating this research question is the empirical observation from the interviews that firms are generally very much interested in fixed costs. Therefore, there is little chance that the answer to this question will be found uninteresting in practice.
The subject of the research has now become very generalistic. The concept of fixed costs is applicable in every firm and every situation. The problems that this causes can lead to legitimate questions regarding the research methodology: is it at all possible to expect useful outcomes when looking at 'the importance of fixed costs to firm performance'? After all, in the end everything is influenced by something, if not everything. Wouldn't it be wiser to take the knowledge gathered from the literature review, the empirical research on financial statements, and the first interview round to draw up some hypotheses on the role fixed costs can play and test them through either a series of structured interviews or perhaps even a written questionnaire? For example, we could ask about typical flexibility measures, such as temporary workers or outsourcing, about the importance of volume and the sensitivity to fluctuations in sales, perhaps about the use of hedging instruments to ensure a certain level of sales, or whether mergers are a tool in covering fixed costs.
Such a course of action would be advisable if we knew about all possible ways to deal with fixed costs. But (1) we probably do not know them all, and (2) most of these measures can also be applied because of other reasons. Since we are specifically interested in their application because of their influence on the level of fixed costs, we need to go somewhat deeper. In the end, the research remains largely exploratory. Again, rather than producing a set of optimal measures to deal with fixed costs in certain circumstances, we first want to know what relationships we could find. This means that a basic goal of this part of the research is a taxonomy of fixed costs measures. Also, we want to understand what the influence of these measures is on fixed cost levels, in relation to something else. What that something else has to be is also part of this chapter. This is different from generating hypotheses (it is certainly different from *testing* hypotheses): we do *not* want to predict when firms use which measure. We do hope to find out whether it is at all possible to arrive at these kinds of predictions.
What then is the use of the findings? Who will be interested in the results? First and foremost, it will give some insight into the practical usefulness of the operating leverage concept. If firms do not manage their fixed costs, there is no use in measuring it through the *dol* other than incorporating it as an explanatory variable in theories on risk and return. In that case, fixed costs are a parameter, a result of other decisions rather than something that is to be considered on a regular basis – a contingency influencing firm

performance rather than a variable that can be manipulated. Taking this to a level that is even more basic, the question becomes whether fixed costs are a management accounting concept that has no value for management as such, or whether they are something more than that. When fixed costs are merely a result of decisions based on other considerations, like production specifications, quality, marketing issues etc., the concept is important in analyzing cost behavior, and in understanding firm performance, but not in managing. This would also reduce the operating leverage to a parameter, or even a contingency that will not be assigned a target value; it would also mean that the oft-mentioned operating leverage-financial leverage trade-off (section 2.6, page 55) is not applied in practice because of its unfeasibility.
Besides this, it is hoped that the taxonomy of fixed cost management will be interesting for firms. This would include not only firms that manage their fixed costs, but also the firms that can help in managing them. Basically, this comprises all firms that offer outsourcing services. We can think about agencies for temporary workers, suppliers of administrative and support services, and more generally firms that take over parts of the production process of their buyers. If we should arrive at producing taxonomies or insights that are practically useful, we would have achieved our primary research goal: a thorough understanding of the role of the cost structure in firm performance.

4.2 on the nature of fixed costs

Fixed costs are commonly defined as those costs that do not vary with a change in output (units produced, services provided) within a certain period of time. This definition is simple, clear, and can be interpreted in any way you want. In the long run, everything is variable, and in the short run, everything is fixed. The issue can become more complex when we look at different levels within a firm. An operations manager will have less choice to change certain costs than the business unit manager two or three levels higher. This is the issue of controllability. In the current research project, we will consider fixed costs at the level of the individual business entity. We assume that such an autonomous part of an organization will have control over the structuring of its operations to such an extent that the level of fixed costs can be adjusted. For smaller organizations, comprising only one business entity, this is clear. For business units in a larger organization, it seems reasonable to suppose that such units can change their operations to any extent, although maybe only with permission from top management. This means that we are interested in the 'real' fixed costs: costs that cannot be controlled because of their fixed nature, and not because the manager responsible is not allowed to change them.
But when are costs 'really' fixed? If we take the definition of Horngren, Foster, and Datar (2000), costs are fixed when they do not change in total despite changes in a cost driver. As they note, this is true only within a certain time span, and within the 'relevant range'. The relevant range concept was discussed in the section on break-even analysis. Atkinson *et al.* (1997) talk about the variability of support activity costs. Next to the 'standard' categorization of direct fixed and variable costs, they distinguish flexible, discretionary and committed support activity costs. Flexible costs include indirect materials and electricity. Discretionary costs like advertising, publicity and

research and development are not directly related to the production volume and are therefore considered fixed. Committed resources are made available before the actual production level is known:

> These resources cannot be reduced in case the demand is actually less than the capacity made available. Commitment for some resources may be for the short run, such as for materials handling and supervision. For some other resources, like plant equipment and facilities, the commitment may extend over a longer term. The usage of committed resources varies with the actual volume and mix of products. As the volume and complexity of production increase, the capacity of committed resources made available may be inadequate to support actual production. (Atkinson *et al.*, 1997, p. 172–173)

Most textbooks discuss the difference between fixed and variable costs with volume as the cost driver. Shank and Govindarajan (1993) claim that this is based on micro-economics, whereas industrial organization models suggest other, more richer cost drivers. They mention scale (size of the investment), scope (degree of vertical integration), experience, technology, and complexity as 'structural' cost drivers, drivers that have an optimum. Too much economy of scale is not good. Next to these structural cost drivers, they identify executional drivers where more is always better: participation, total quality management, capacity utilization, plant layout efficiency, product configuration, and linkages in the supply chain. It would seem, however, that particularly their structural cost drivers play a role in capital budgeting decisions and indeed structural choices. This is not directly where the difference between fixed and variable costs is important. Of course, a sound investment decision includes a sensitivity analysis, but there we still look at fluctuations in the volume. Furthermore, even if cost drivers other than volume would be more correct in evaluating and controlling the performance, we would still be able to distinguish between costs that vary with changes in the drivers and costs that don't.

More important in the identification of fixed costs is the issue of manageability. One of the few categorizations of real cost types that can be found in the literature views the manageability of costs as an important characteristic. The main categories of Ames and Hlavacek (1990) – two practitioners, not scholars – are:

(1) fixed: these are the 'real' fixed costs, costs that are the result of substantial investments. They include plant and equipment costs, such as depreciation, taxes, and facility maintenance;
(2) managed fixed: costs that are 'related to people and structure – the so-called 'overhead' of management, accounting, finance – and even activities like advertising, sales, R&D, or market development. All tend to build up as a business grows. Once in place, managers often treat them as integral and bedrock fixed costs. They are not' (Ames and Hlavacek, 1990, p. 144). Costs in this category include maintenance, insurance, auditing expenses, office expenses, labor costs, advertising, small tools, and spoilage;
(3) direct variable costs: the costs that vary with business volume, such as materials, royalties, overtime premium and commissions;
(4) shared costs: the overhead of the business unit, including selling, general, and administrative expenses. Shared costs are manageable.

Regarding the managed fixed costs, they issue the following warning:

> Make no mistake, costs in the managed category are not fixed, even though they are commonly bundled under this label. Generally, as a business expands, costs tend to be far more variable than they should be, and when it contracts, they are far more fixed than they should be. (Ames and Hlavacek, 1990, p. 145)

The view of Ames and Hlavacek (1990) is one from business practice. As such, their ideas can serve as one starting point in thinking about fixed cost management. In particular, they maintain that costs are really fixed, and therefore unmanageable, only when they are incurred before the current period. The 'substantial investments' lead to depreciation charges that must be expensed in the operating income. But this also means that 'really' fixed costs are non-cash or book costs. They represent a cost, but not a cash expense. This, of course, is why they are fixed. The cash costs are manageable precisely because they need to be paid in cash, indicating that there is at least the possibility to alter them. This may come at an extra cost, as in the case of the termination of employee contracts.

A recent article (Guilding, Lamminmaki and Drury, 1998) on budgeting and standard costing practices in New Zealand and the United Kingdom gives some current information about fixed cost classification. Table 4-2 shows that costs are classified as fixed or variable in some 85% of the sample.

	New Zealand	United Kingdom
statistical regression techniques	0	2
subjective basis, based on managerial experience	40	58
all overhead fixed, all direct costs variable	44	28
fixed and variable not separated	16	10
other	0	2

table 4-2 cost classification techniques in New Zealand and the United Kingdom (adapted from Guilding, Lamminmaki, and Drury, 1998, p. 577).

Noticeable in the table is the absence of use of advanced techniques in estimating fixed and variable costs. Even more striking is the practice of classifying all direct costs as variable. Although strategic cost management proponents would find this a step in the right direction, this does not seem realistic. Drury and Tayles (1995), in an overview of surveys on management accounting practices, report that overhead costs on average comprise some 25% of total costs. Of the remaining 75%, a substantial part will be fixed.

The 'manageable fixed costs' are addressed by the godfathers of activity-based costing, Cooper and Kaplan (1988). They are very concerned about the time span that academics use to define fixed costs, and consequently the part of total costs that they view as variable and relevant. They claim this time span is about a month, leading to an overestimation of the fixed part of total costs. These costs are not very well, or not at all controlled. Furthermore, they tend to expand with upward trends in volume – since they are to an extent variable – but not contract with downward trends – since they are perceived as belonging in the fixed cost category:

> The volume-unrelated support-department costs, unlike traditional variable costs, do not vary with short-term changes in activity levels. Traditional variable costs vary in the short run with production fluctuations because they represent cost elements that require no managerial actions to change the level of expenditure. In contrast, any amount of decrease in overhead costs associated with reducing diversity and complexity in the factory will take

> many months to realize and will require specific managerial actions. (Cooper and Kaplan, 1988, p. 25)

The ideas about manageable costs point us to a clear working definition of fixed costs. Although defining fixed costs is not difficult conceptually – it is quite simple, really – the choice of a relevant range, and especially the time span considered, seems arbitrary to a large extent. Since we want to know how a firm deals with these costs, it would seem logical to define fixed costs in terms of managerial actions. This would lead us to something like 'fixed costs are those costs that cannot be changed unless management takes specific actions to do so'. To be sure, we do not want to take fixed costs to some higher, ethereal level by giving it a fancy definition. Rather, we want to make clear what the main issue is: fixed costs do not change unless they are altered deliberately. It should be noted that the time span problem is no longer present in this approach to fixed costs. One could argue that once the depreciation of a machine is completed, the costs associated with this (fixed) investment disappear without managerial actions. However, at any point in time until the machine is fully expensed, the costs are still there. The main problem that arises is with costs that are fixed only in the very short run. For example, should the labor costs of an employee that has a contract for one month be considered fixed or variable?

Our emphasis is somewhat different from the commonly mentioned reasons for distinguishing fixed and variable costs. Horngren *et al.* (2000) mention several surveys that ask for the purpose of identifying fixed costs. A survey of U.S. companies produced the following ranking of purposes: pricing, budgeting, profitability analysis of existing products, profitability analysis of new products, cost-volume-profit analysis, and variance analysis, with pricing and budgeting equally ranked first. Another survey of Australian, Japanese, and United Kingdom companies is reported in table 4-3.

purpose	Australia	Japan	United Kingdom
pricing decisions	1	5	1
budgeting	2	2	3
making profit plans	3	1	2
cost reduction	6	3	5
CVP analysis	4	4	4
cost-benefit analysis	4	6	5

table 4-3 purposes of cost classifications, where 1 is the most important, compiled from several surveys (Horngren, Foster, and Datar, 2000, p. 34).

In general, these purposes are very much oriented towards traditional management control and management accounting. They are concerned with the existing cost configuration. As such, they show what proponents of activity-based costing claim to be the main problem of the 'traditional' cost accounting methods: they treat fixed costs as fixed, and do not look at ways to change them. This is not how fixed costs are viewed in the current research project. Of course, it is not necessarily so that the fixed costs *should* be managed: it may very well be that the current cost configuration in a firm is the best one, and that there is no need to modify them.

Our definition of fixed costs carries the risk of including everything as fixed. Is a long-term contract with a supplier really fixed? Or, given that it is allowed to vary within a

certain bandwidth, can it be viewed as variable? And coming back to the issue of 'controllability' as opposed to manageability, does the organizational level really matter? If a manager is not allowed to do something about certain cost items without approval from a higher management level, this obviously means that specific managerial actions are required to change them. This also means that they are fixed within our definition. But a manager will also need approval to hire temporary workers above his budget limits – typically variable costs. In general, these issues will involve increases in costs, whether fixed or variable, and therefore concern upward adjustments in the total cost level. This can imply that the issue of controllability is not a problem in our fixed cost definition (but it plays an important role in fixed cost *management*, as will be discussed later). Nevertheless, it seems that we should take care in applying our definition. Again, it should be noted that this is not a 'better' definition; it merely serves to create a clear picture for our discussions.

4.2.1 cash versus non-cash fixed costs

The only 'real' fixed costs are those costs that have been made in the past, according to Ames and Hlavacek (1990). Modern financial management (you know, as advocated by the 'cash is king'-types) will claim that past investments are irrelevant. How do we deal with non-cash expenditures – are they the ultimate fixed costs, or are they not interesting?

Investment decisions are distinct problems, with identifiable cash flows. As such, we analyze them in terms of cash in- and outflows; we do not look at depreciation. To evaluate the performance of a business entity in a period shorter than the economic life of its operations, we need to allocate the costs of the investment to that period. That is all that there is to depreciation. This also means that for a going concern (or going project), depreciation is a good indicator of fixed costs – fixed costs being costs that do not change. Although the 'ideal complex' will not generally be realized in practice, the basic idea that a firm must continually invest to grow and prosper seems uncontested. The problem with depreciation as fixed costs is that they are not very interesting from a managerial point of view. They need not be 'really' fixed in that it can be possible to sell machines, or buildings, but mostly this will only be possible at a substantial book loss. And this book loss is real, since it represents unrecovered expenses. This is a capital budgeting problem, and it will result in structural changes in the production process of the firm. Interesting as that may be, in general it will be an emergency measure to prevent the company from incurring even greater losses.

What is more interesting, of course, is the situation where a firm has decided in its capital budgeting process to invest in such a way that the total cost of the investment is variable to a large extent. This is an awkward way of describing decisions like outsourcing. When a firm chooses to outsource part of its production process, it will not necessarily lower its total costs (although this proves to be an important reason for outsourcing in practice). However, it does make these costs more variable, since it can choose to buy less from its suppliers without being stuck with the same amount of fixed costs. At the same time, it exchanges non-cash for cash costs. Again it shows that cash costs are more easily managed than non-cash costs.

Fixed costs in the form of depreciation are 'real' fixed costs. They represent large expenditures that cannot be changed, or only at a substantial extra cost – meaning that selling the investments will not lead to a full recovery of the costs made. Therefore, in looking at fixed costs, depreciation charges are very much a point of interest. Their relative unmanageability makes them more important in structural (capital budgeting) decisions, and less in reacting to changes in the environment from an existing configuration.[3]
However, the relative manageability of cash costs should be viewed with caution. The well-known example of labor costs shows that these costs can be as fixed as depreciation charges. In general, the 'fixedness' of cash costs is determined by the contract that governs it, so by the deal that is closed. During the length of the contract, the cash flows are fixed, and can only be changed at substantial cost (see figure 4-1). Several respondents in both interview rounds noted that rental and lease agreements can be more fixed than owning equipment or buildings, since there you at least have the possibility to sell the asset.

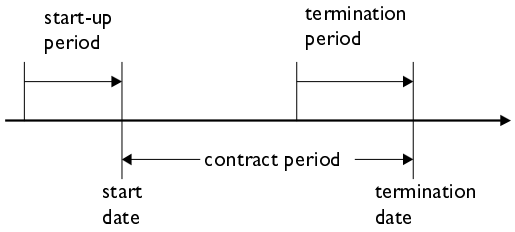

figure 4-1 contracts: fixed cash flows during the contract period, terminating is costly and can also take time (source: Theeuwes and Adriaansen, 1994, p. 95).

4.2.2 configuring versus managing fixed costs

Given the difference between making an investment decision and altering existing cost configurations, how should they be handled in the research? Should we treat them as separate discussion points, or are they part of a continuum of decisions, differing only in their time horizon? Are the decisions and possibilities in setting a production configuration the same as those involved in changing the level of existing fixed costs? It would seem logical to say that they are not. A very simple reason is that the options in the second case are much more limited, precisely because the firm has committed itself to the existing configuration. On the other hand, if a firm chooses its investment in such a way that a large flexibility results, there is no need for adjusting the fixed costs. In general, building flexibility into the firm's real processes will be costly, so there is a trade-off between increased flexibility and lower costs. This trade off will be evaluated *ex ante*, and the criteria used in this evaluation should correspond with the reasons for adjusting existing fixed costs.

[3] Wouters (1993) indicates that including fixed costs in short-term decisions (i.e. using full costs instead of relevant costs) is a way of dealing with uncertainty and commitment of production factors. This point is also made by Ball, Keating, and Zimmerman (1998).

While the decisions regarding fixed cost configuration can help in understanding why and how firms deal with fixed costs, it will not provide a full insight into the issue of managing fixed costs. This is partly because not all fixed costs in our definition are the result of intentional decisions, as has been pointed out by the likes of Cooper and Kaplan (1988). Furthermore, changing the level of fixed costs through selling of assets in most cases implies drastic, unforeseen changes in the firm's environment. If the changing conditions were anticipated, this would have been incorporated in the capital budgeting decision.
All this forces us to once again rethink our current research position. Is the nature of the research predominately strategic, or do we pursue a course that borders on operations management? The answer is, unfortunately, both. 'Unfortunately' because this implies an inherent broadness in the research that keeps on popping up as its weak spot. There are many angles to look from, and many interesting books and articles that can be found within each angle. More troublesome is the lack of coherent theory coming with our view on the research subject. However, this can also be the added value of the research: is it useful to look at fixed costs as a generic characteristic of the firm? If so, how does a firm do that? Can we find suggestions on how it *should* be done? It is this generalistic interpretation that hopefully will produce useful results.

4.2.3 fixed costs and strategy – the importance of fixed costs

In order to underline the importance of fixed costs, we can point to several *strategic* issues and events that are directly related to fixed costs. We offer the following examples:

(1) overcapacity: a typical situation in capital intensive industries is the existence of overcapacity. The automobile market in Europe at the end of the 1990s experienced record sales levels, but still the European car manufacturers had an overcapacity of some 15 to 20% (*NRC Handelsblad,* 9 August 1999);
(2) entry barriers: large fixed costs form a very real entry barrier. In a market where fixed costs are very high, it is not easy to start up new plants and increase the production capacity. This allows a specific strategy to deal with the overcapacity mentioned under (1). A firm can buy (plants of) competitors active in the same market and next close them down, to relieve the volume pressure on the market. This strategy was followed by Dutch oil drum and packaging producer Van Leer (*Het Financieele Dagblad,* 1 March 1995);
(3) project finance and special purpose companies: organizing operations within a special purpose company, for example for building a bridge or a railway line, can be seen as 'nothing more' than transferring fixed costs to that company. The risk that is inherent in taking on fixed costs can thus be (partly) transferred. This implies that these fixed costs are a very real problem for the firms that want to take on the projects (see Klompjan and Kroon, 1999);
(4) mergers: the merger boom within the financing industry in the late 1990s, continuing into the year 2000, is partly driven by the costs of new technologies. For banks, a substantial customer base is needed to be able to bear the costs of investing in information technology and e-commerce applications (*Het Financieele Dagblad,* 31

August 1999). The mergers within the accounting sector also are driven partly by the increasing investments, and thus fixed costs, in new technology (*Het Financieele Dagblad,* 10 October 1997);

(5) strategic alliances: some aspects of a market are so expensive to develop and maintain that it is only possible to do so through sharing the costs with direct competitors. This can be seen in the oil industry, where firms compete at the level of individual gas stations while jointly investing in exploration and production. In the Netherlands, the payment system of the Dutch banks is developed and maintained by Interpay, in which all major banks participate.

These examples stress the importance of fixed costs, and its implications at a strategic level. While interesting and important, they are difficult to discuss at a practical level, for the same reason (but then even more) as the capital budgeting decisions that configure the cost structure.

4.3 flexibility management

There is a close link between fixed costs and flexibility: at first sight, one is inclined to say that more fixed costs lead to less flexibility. Of course, there is much more to flexibility than just the level of fixed costs, but it is wise to look into the literature on flexibility management to see if we can find any suggestions on dealing with fixed costs in such a way that the overall flexibility improves.

Flexibility can be defined from a number of angles. Basically, it corresponds to the presence of choice: a flexible manufacturing system (FMS) gives the company the possibility to change its product mix in order to respond to changes in demand, whereas a dedicated production line does not allow a choice in the product mix. However, it is not the case that flexibility is one of the design variables of a production process. Rather, it is a result, of choices in the technology used, the capacity, and the organization. In viewing it as a result, we need to link the process characteristics, as well as the possible managerial actions, to their impact on flexibility. It is not enough to look for something like 'the level of flexibility', nor can a firm increase this level without undertaking some concrete steps – it cannot 'buy' flexibility as such.

Given the nature of this research, we are first and foremost interested in a specific kind of flexibility: financial flexibility, or perhaps more precisely earnings flexibility. Flexibility from a financial point of view was defined for the first time by George Stigler in the 1930s. A business entity is more flexible when its short-term average cost curve is relatively flat. This means that a large variation in production results in a smaller variation in the unit cost price. The ultimate measure of financial flexibility is earnings variability: a firm is more flexible when changes in costs, prices or demand can be dealt with without a large variation in earnings. This view of flexibility is too aggregate to use in practice, but it can help us in identifying and evaluating flexibility types and measures.

4.3.1 manufacturing flexibility

Since we are dealing with the cost structure of firms, it is useful to see how flexibility is treated in the productions and operations management literature. In this area, it is defined in relation to the actual (configuration of the) production process. Chase, Aquilano, and Jacobs (1998, p. 365–366) discuss the issue of manufacturing flexibility at a very general level. They define capacity flexibility as 'having the capability to deliver what the customer wants within a lead time shorter than competitors'.' A company can achieve this through:

(1) flexible plants: the ideal is the 'zero-changeover-time' plant, that can adapt to changes in demand instantly through movable equipment, knockdown walls, and easily reroutable utilities;
(2) flexible processes: fast low-cost switching from one product to another, either with a flexible manufacturing system, or with simple equipment that can be easily set-up;
(3) flexible workers: workers with multiple skills that can perform a variety of tasks in different settings;
(4) using external capacity: subcontracting or outsourcing.

The flexibilities are very aggregate, and in the literature more specific flexibility types in manufacturing settings have been proposed. There have been many attempts to identify and categorize these flexibility types, recently for example by Shewchuk and Moodie (1998). Since we are interested in flexibility to help us understand other phenomena, we will not look for the best categorization. Instead, we take a look at a much-cited survey of manufacturing flexibility literature by Sethi and Sethi (1990). Based on their literature review, they identify 11 main categories of manufacturing flexibility:

(1) machine flexibility: the various types of operations that the machine can perform without requiring a prohibitive effort in switching from one operation to another;
(2) material handling flexibility: the ability to move different part types efficiently for proper positioning and processing through the manufacturing facility it serves;
(3) operation flexibility: the ability of a part to be produced in different ways;
(4) process flexibility: the set of part types that the system can produce without major setups;
(5) product flexibility: the ease with which new parts can be added or substituted for existing parts;
(6) routing flexibility: the ability to produce a part by alternate routes through the system;
(7) volume flexibility: the ability to be operated profitably at different overall output levels. Only feasible output levels are under consideration;
(8) expansion flexibility: the ease with which its capacity (output rate) and capability (quality, specifications) can be increased when needed;
(9) program flexibility: the ability of the system to run virtually untended for a long enough period;
(10) production flexibility: the universe of part types that the manufacturing system can produce without adding major capital equipment;
(11) market flexibility: the ease with which the manufacturing system can adapt to a changing market environment.

The flexibility types can be linked as shown in figure 4-2.

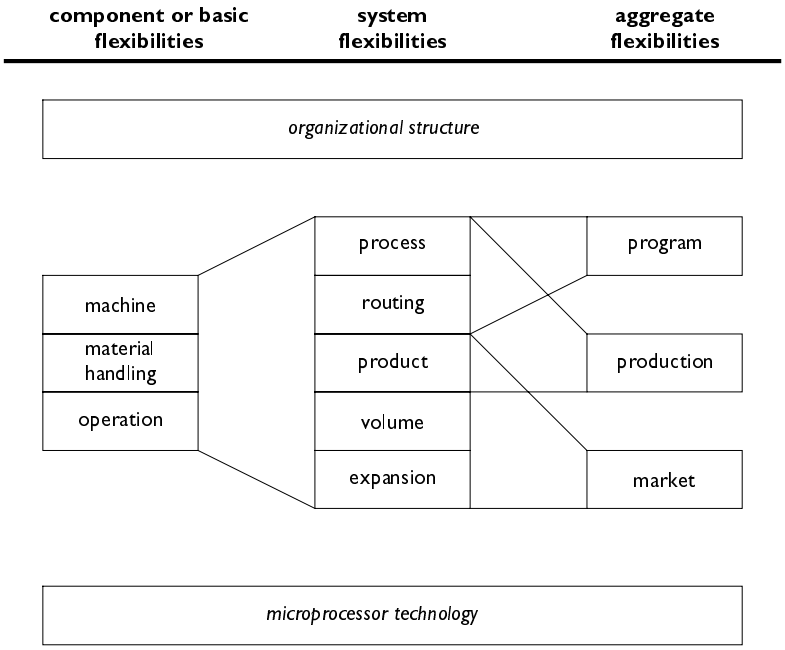

figure 4-2 how the various types of flexibility link according to Sethi and Sethi (1990, p. 297).

As we see, the basic flexibilities contribute to the flexibility at the system level. In turn, these determine flexibility at an aggregate level. Underlying the manufacturing flexibilities are the organizational structure and the available technology. From the figure it is apparent that manufacturing flexibility is largely related to the production process in place, i.e. the existing configuration. As such, it is important mainly because of the trade-offs that have to be made between increasing flexibility of a kind, and increasing the level of fixed costs, thus decreasing the financial flexibility.
Because of this trade-off, care should be taken in equating the flexibility types with earnings variability. If we look at product mix flexibility (production flexibility in the framework of Sethi and Sethi (1990)), we see that an FMS can produce various product types without substantial set-up times. However, since these systems are generally very expensive, they need to have a capacity utilization rate of 85 to 90% or even more. This results in a volume flexibility that is very low. In general, volume flexibility works identically to earnings variability. This implies that it is only desirable in an upward trend, while the downward flexibility should be used as little as possible. All other flexibility types are appealing precisely because they can reduce volume fluctuations: because the firm can respond to demand changes, volume will not decrease.
Identifying the available types of flexibility is useful, but we also want to know when we should look for which type. An interesting view on this management of manufacturing flexibility is provided by Upton (1994). Besides using a charmingly simple definition of

flexibility – the ability to change or react with little penalty in time, effort, cost or performance – he identifies three key aspects to flexibility:

(1) dimension: what changes? Volume, product specifications, number of products, inputs, the production process itself;
(2) time horizon: over what period do the changes occur? Days, weeks, months, years? The well-known terms can be used here: *operational* flexibility is the ability to change day-to-day, and it can be found in firms capable of changing their product mix easily. *Tactical* flexibility is the ability to change occasionally, for example being able to cope with seasonal fluctuations in demand or input. *Strategic* flexibility is the ability to make one-way, long-term changes. A chemical plant that has to operate for years must still be able to meet changing environmental demands;
(3) elements of flexibility: what is the nature of the flexibility required? There are three elements to flexibility: first, the *range* of change within the dimensions, e.g. the number of different types, the volume range, the number of specifications in size or quality. Second, the *mobility* within the dimensions, i.e. the ease in changing the product mix due to low set-up times. Third, the *uniformity* of performance, e.g. in yield, quality, or cost, with the classic example of Stigler's flat average cost curve.

The analysis of Upton (1994) emphasizes the importance of identifying the nature of the choices that flexibility implies. Is a firm flexible because it can choose its volume, or the number of types it makes? Can these choices be made every day, or over a number of years? Are we interested in having a large range of choices, or the speed with which we can implement them, or both? Or is it important that we offer consistent quality, no matter what the quality of the inputs?

Discussions on flexibility in the production and operations management literature often focus on the flexibility that is incorporated in 'actual' production processes (whether realized or proposed): given the configuration of the production process, what is the level of flexibility it offers? If we look back at the flexibility types of Sethi and Sethi (1990), we see that they identify only one type that seems to influence the existing level of fixed costs: the expansion flexibility. All other types refer to the flexibility incorporated in the current lay-out of the system. This amounts to the problem of configuring fixed costs. The issue of managing existing fixed costs can be found under the heading 'production planning'. Anderson (1994, p. 164) talks about the measures that can be taken to match capacity with demand. He notes that they can be divided into two groups: capacity management and demand management. Options for capacity management include (1) changing the number of employees, (2) working overtime or short-time working, (3) subcontracting some work, (4) coordinating holiday arrangements when demand is seasonal, (5) investment in new machinery. Demand management can take the form of (1) introduction of new products with complementary demand profiles, (2) sales and promotional activity, (3) variations in pricing. The options for capacity management are expensive: hiring or firing of employees, as well as new investments involve substantial costs. Therefore, it can be sensible to take on the matching problem from the demand side, e.g. through increased marketing activities or a revised product portfolio. In the end, there is always inventory to use as a buffer.

Chase, Aquilano, and Jacobs (1998, p. 557–558) identify three strategies to cope with fluctuating demand:

(1) chase strategy: hire and fire employees with demand variations. This requires a pool of 'easily trained applicants', and it has 'obvious motivational implications';
(2) stable work force – variable work hours: vary the number of hours worked through flexible work schedules and overtime;
(3) level strategy: maintain a stable work force at normal production levels, and absorb shortages and surpluses by fluctuating inventory levels, order backlogs, and lost sales.

Besides these strategies, Chase, Aquilano, and Jacobs (1998) mention subcontracting. They see this as similar to the chase strategy: the hiring and firing is translated into subcontracting, and not subcontracting. Note that these strategies take the existing configuration as given: adjustments in costs related to the production equipment are not considered.

The manufacturing flexibility literature focuses on the flexibility incorporated in the existing configuration – which is perfectly logical, since it is what a firm will be looking for. However, we are interested in costs, and more specifically in changing the cost configuration. This will almost certainly mean changing the physical configuration (including the stable work force). This point is made by Anderson (1994): it is wise to make sure your manufacturing possibilities are well tuned to the demand patterns. Changing your physical configuration should not be the first option. Since this theme seems pervasive throughout the manufacturing flexibility literature (see the strategies of Chase, Jacobs, and Aquilano (1998) mentioned above), it means that the nature of our research goes beyond the operations and manufacturing management discipline.

4.3.2 flexibility in services

The focus on flexibility in manufacturing firms is dominant throughout the literature. There are very few articles on flexibility in service organizations. Harvey, Lefebvre, and Lefebvre (1997) start their analysis with the main characteristics of service processes. They list the following:

(1) services generally involve customer contact, making the location or outlet part of the product offered;
(2) customers increasingly demand the bundling of services to accommodate the customer instead of the other way round (one stop shopping);
(3) services are consumed as they are produced, so no inventory can be kept;
(4) because of the non-tangible nature of many services, electronic delivery is often possible. The impact of information technology developments is considerable, and it seems that service processes are more easily changed or made obsolete;
(5) self-service is a realistic alternative in many service industries, whereas producing your own goods is mostly not feasible.

Like Upton (1994), Harvey *et al.* (1997) see a firm as flexible if it can handle variability with minimal penalty. The source of this variability can be either external or internal. External variability comes from the market, whereas internal variability stems from organizational aspects such as product or process design, organizational structure or administrative procedures. Note that the internal variability is almost totally absent in the discussions on manufacturing flexibility. This is because it means that the processes

within the organization are not well controlled: a high scrap and rework percentage, or producing products that are not up to specifications is not seen as useful flexibility. The main source of internal variability that can be deliberately incorporated within manufacturing processes is the quality of the inputs. This is the case in the food processing industry, where the natural ingredients can have large fluctuations in quality, or even only be available on a seasonal basis. Because of the personal nature of services, other sources of variability are more important in service organizations compared to manufacturing firms. Employees that are not well trained, not well motivated, or simply are having a bad day are a problem in a production organization, but this does not necessarily have a direct impact on the quality and quantity of the output. In a service organization, these employees face the customer directly, making it a big problem. Harvey *et al.* (1997) call the ability to handle internal variations robustness, leaving the valuable ability to deal with external variation to flexibility. It should be noted that the variability stemming from changes in product mixes or the use of advanced manufacturing technology allowing diverse production schedules is a goal, not a source of variability. Offering multiple services at the same counter does create variability, but that will normally be a solution to the problem that customers are not happy with having to go to multiple counters. If the firm cannot cope with its own solutions or operations, the problem lies in the organizational structure.

In dealing with variability, a firm can choose to tackle the source of variability, or increase the ability to handle the variability. Reducing internal variability amounts to a better structuring of the organization, like the process improvements in a manufacturing setting. Reducing external variability amounts to revenue management. The possibilities here are, if anything, greater than in production organizations. One can think of the actions undertaken by the Dutch banks to force customers into using those services that are cheaper to the banks. This can be thought of as 'training customers' (Harvey *et al*, 1997, p. 35). Furthermore, volume variability can be met through e.g. expanding office hours and offering discounts at certain times or in certain periods (also known as yield management, see Kimes, 1989). This reduces the problem of matching capacity to peak demand without leaving too much capacity unused outside peak hours, caused by the fact that service cannot be made to stock. In fact, managing demand is so important in many service industries that occupancy rates are a key indicator. We see this, for example, with hotels and holidayparks, airline industries and public transportation. Also, in consultancy firms the number of billable hours per month is a very important indicator. The main reason why demand management is so important is precisely the large share of fixed costs in total costs.

Whenever demand or yield management is an important issue, it probably means that the possibilities for increasing the ability to handle variability are few. Hotels and airlines cannot easily expand their capacity, nor cut it back. Of course, there are some possibilities in stretching the capacity upward. They are identical to those in manufacturing firms: just as a brewery will do most of its large maintenance jobs in the winter, a service organization can schedule maintenance of a computer system outside office hours, and send its employees on training courses during low-demand periods. Also, hiring extra employees, renting capacity, and training employees to be able to perform multiple tasks are measures that can be applied in both manufacturing and

service organizations (Lovelock, 1992, p. 157). It seems as if changes in the product mix are more easily implemented in a service organization, because of the intangible nature of many services. However, training employees will cost money and time, and the technologies needed for offering the new services may also require large investments. This is apparent from the merger waves in the financial sector and in the consultancy sector, where the costs of the new information technologies are cited as one of the important reasons for merging.
Is it necessary, or even useful, to distinguish between service firms and manufacturing firms when looking at fixed costs and fixed cost management? Do the two categories require a different approach? Given the previous discussion, it would seem that there are no fundamental distinctions. This is of course to be expected, given the generalistic nature of the research topic recognized earlier. Fixed costs are fixed costs, whether they come in the shape of machines, computer systems, or trained personnel. The literature suggests that the importance of fixed costs is – if anything – greater in the service industry.[4]

4.3.3 linking flexibility to costs

At what level do we need to look at flexibility within our research project? Since we focus on costs, let us start by taking a look at the earnings equation for a multi-product firm:

$$\pi = \mathbf{q}'(\mathbf{p} - \mathbf{v}) - F$$

with π = profit
$\mathbf{q}'$ = $(q_1, q_2, ..., q_n)$ = vector of n quantities (units sold)
$\mathbf{p}'$ = $(p_1, p_2, ..., p_n)$ = vector of n prices
$\mathbf{v}'$ = $(v_1, v_2, ..., v_n)$ = vector of n variable costs per unit
F = fixed costs

The revenue $\mathbf{q}'\mathbf{p}$ is determined by the product portfolio, and the demand for the products. A firm has to offer the right products at the right time and at the right price. To be able to do this, the firm has to make a trade off between the ability to meet customer demand and the level of fixed costs that meeting this ability requires. The ability to meet customer demand can depend on many flexibility types. If we take these to be technological characteristics of the production process, we can take them all under one heading. This is reasonable within our framework, because we are interested in what happens to F, the level of fixed costs, and why this happens. As long as the flexibility resulting from technological characteristics is sufficient to keep on meeting customer demands without changing the existing physical configuration, the situation is not interesting, nor is the way in which the flexibility is achieved. The question of interest in this case is why the firm has chosen to build in specifically that amount of flexibility into

[4] note that the issue of fixed costs in services actually should be discussed in the previous section on the nature of fixed costs. However, literature on fixed costs in services as such is almost non-existent. Discussing it in the context of flexibility allows us to find support for our contention that fixed costs are just as real and important in services as they are in manufacturing.

the production process. The dimension (as defined by Upton, 1994) is important: does it concern flexibility in volume, in time, in mix?
It becomes different when we encounter flexibility types that are directed specifically at reducing *F*, as can be the case in outsourcing parts of the production process. In general, all measures that make costs more flexible are of interest. Here, we are interested in what changes have been made at the level of the production process. This is again the question of technology and technology choice.

4.4 classifications of fixed cost management

4.4.1 about classifications

Classification is defined as the ordering of entities into groups or classes on the basis of their similarity. Statistically, this means we are trying to minimize within-group variance while maximizing between-group variance. This maximizing of the homogeneity within a group and of the heterogeneity between groups allows us to understand phenomena more easily. The basic rule in classification processes is that the classes formed should be both exhaustive and mutually exclusive. There must be an appropriate class for each case to be classified, and no case should be a member of two classes (Bailey, 1994).
The main classification types are typologies and taxonomies. Generally, typologies are classifications that are conceptual. This means that each class (or cell when the typology is presented as a matrix) represents a concept rather than empirical cases. A taxonomy is a classification of empirical entities, often drawn up with statistical procedures like factor analysis or multiple discriminant analysis. It should be noted that the distinction is not always made, and that the two terms are sometimes used interchangeably (Baily, 1994, p. 6). They represent the two basic ways to classify: either start from a theoretical point of view, and assign empirical cases where they conform most to the values of the grouping characteristics, or start from empirical values, and try to find characteristics on which to group the cases. Of course, the two approaches can be used simultaneously to come to a useful classification.
When talking about a taxonomy of fixed cost management, what do we have in mind? It is important to note that we are not looking to test a set of hypotheses: a firm operating under those market conditions, using that technology and having this strategy, will undertake the following actions in order to deal with its level of fixed costs. Rather, we want to be able to draw up such hypotheses, showing more what *matters* in managing fixed costs than what actually *happens*. We want to identify the important contingencies and firm characteristics that influence the way in which firms think about and deal with fixed costs, going further than merely establishing that everything has to do with everything else, but not coming to a fully fledged theory on the subject. If anything, the research should answer the question whether it is (a) useful and (b) possible to come to such a theory. The conclusions on the usefulness are of more interest than the theory itself.
At this point in our research, we have on the one hand ideas from theory on the operating leverage, fixed costs, and flexibility. On the other hand, we have the empirical

analyses as reported in section 2.5.6 (page 46), and the interview results reported in section 3.5.2 (page 94). Using the theoretical and empirical observations, we are able to make a start with a classification of 'management actions regarding fixed costs'. Whether we want to call this a taxonomy or a typology is of secondary importance, as is the question whether the classification meets the requirement of being both exhaustive and mutually exclusive.

4.4.2 management actions regarding fixed costs

Since we are talking about fixed cost management, any classification must include the possible courses of action that management can undertake with respect to its fixed costs. In identifying these actions, it could be useful to distinguish between actions applied to an existing configuration of fixed costs, or to starting from scratch. Constructing a new production process amounts to one or more capital budgeting decisions. Flexibility issues will be incorporated in the financial evaluations. Although the trade-offs between fixed costs and capacity, revenue, product (mix) flexibility, and perhaps other issues are also present in this situation, it is probably more useful to start from an existing configuration and analyze from there what the consequences of possible managerial actions are. These actions can include:

(1) capacity measures: expanding, investing in extra machines (economies of scale), hiring more employees (on fixed contracts), firing employees, selling machines;
(2) revenue measures: long-term contracts, third-party products, insourcing (using *part* of the production process for third parties, e.g. a filling line in a brewery), price measures, one-time only orders;
(3) process related measures: learning curve, process improvements, wear & tear of machines, quality of inputs, replacing or upgrading equipment, cutting overhead;
(4) production (process technology) flexibility measures: making costs more variable (e.g. replacing employees with temporary workers, new technology), outsourcing, buy instead of make;
(5) product (mix) flexibility measures: using flexible manufacturing systems/advanced manufacturing technologies (FMS/AMT), revising the product portfolio (offering new products, or reduce the number of types), reducing complexity.

Basically, all actions that influence the total level of fixed costs are of influence. In general, the main focus will be on those actions that seem more drastic, like decisions to outsource part of the production process. However, it may very well be possible that large gains are to be found in the reduction of overhead, either through efficiency measures or through reducing complexity – the realm of ABC. The classification above satisfies the property of assigning a case to only one cell. This is only possible if we let one aspect of the decision to undertake one of the actions prevail: the decision to install a flexible manufacturing system, for example, will also be guided by capacity considerations. In this case, we assume that the main reason lies in the flexibility it offers.

In order to structure our ideas on fixed costs and how management can deal with them, we will begin with some general classifications involving important characteristics. For starters, we refer back to the fact that fixed costs and operating leverage are basically the

same. In analyzing operating leverage, we start with the cost-volume-profit relationship. A CVP-graph has three important characteristics: the revenue line, the composition of costs, and the relevant range. Revenue is a clear characteristic, and needs no further discussion. The ratio of fixed and variable costs is not easily analyzed, but fortunately we have a very clear indicator that also takes into account the contribution margin: the break-even point. From our analyses, we already know that operating leverage and break-even point are very closely linked. The *dol* can be interpreted as the standardized distance from the break-even point: a firm with a lower *dol* is operating further away from its break-even point. Rather than using fixed costs, or the ratio of fixed to variable costs, we will look at the break-even point as the fixed cost indicator. Finally, the relevant range is limited upwards by the capacity. Since capacity is a relatively clear concept, this is used in the analysis. The three characteristics – revenue, break-even point, and capacity – have an attractive quality: they are all at least ordinal, and not nominal. This means that a preliminary analysis can be done by plotting out the characteristics on a low-high axis. Given that we are interested in fixed costs, we will draw up matrices with the break-even point as the basic characteristic of interest.

4.4.2.1 capacity

We classify the measures on their influence on the capacity and the break-even point. In the matrix, the bottom left cell is the position with the least flexibility: with less capacity, there is less choice in volume, and the higher the break-even point, the higher the volume has to be to operate profitably.

capacity up	* expansion	* buy * hire temps	* process improvements * outsourcing (* learning curve)
capacity equal	* replace machines * flexible manufacturing systems/advanced manufacturing technology (FMS/AMT)		* make costs variable (e.g. through outsourcing) * replacing employees with temps * cut overhead ('manageable fixed costs')
capacity down	* flexible manufacturing systems/advanced manufacturing technology (FMS/AMT)	* wear & tear * process control * unqualified operators/quality of inputs	* divestments * sell off machines * fire employees
	break-even point up	break-even point equal	break-even point down

table 4-4 classifying management actions on their impact on capacity and break-even point.

As we see, not all measures can be put into one cell. This suggests a somewhat different representation, where we can incorporate the range of flexibility a measure offers (quite like the range idea of Upton, 1994).

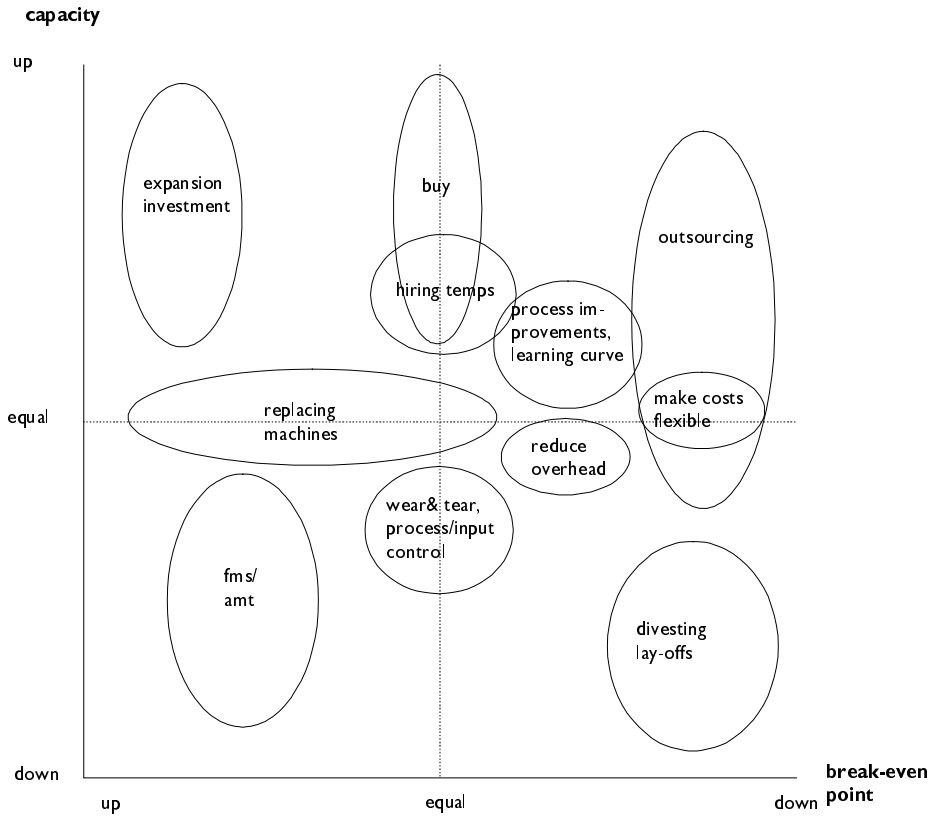

figure 4-3 classifying management actions on their impact on capacity and break-even point. From an overall flexibility standpoint, the bottom left is least desirable: a decrease in capacity accompanies a higher break-even point.

As can we see, it is not necessarily the case that capacity has to change. Indeed, one could say that the most desirable region in the graph is at the center right: while capacity is not changed, the firm does become more flexible. This is the region of measures like replacing employees on a fixed contract with temporary workers, and it can also include outsourcing. Let us now again go through the management actions that can influence fixed costs.

* expansion/investment: when a firm invests to expand capacity, its break-even point will rise. The volume range will increase, but the output level at which operations are profitable also rises;
* replacing machines: new production equipment will generally lead to higher costs, if we assume that the equipment is more expensive. As such, it will raise the break-even point. It is possible that the new equipment allows the firm to either produce cheaper or raise the product prices due to better quality of production. This could offset the increase in costs. Note that within our analysis, a total reconstruction of the production process is not considered;

* flexible manufacturing systems/advanced manufacturing technology (FMS/AMT): the benefits of FMS and AMT are generally not found in flexibility regarding costs or volume (cf. Boer, 1991);
* buy: letting other companies make your products is the ultimate flexibility. The downside is in controllability and costs, of course;
* hiring temps: by keeping the current staff at a level that suffices to keep operations going, capacity can be expanded through hiring temporary workers when demand rises. This is especially convenient for seasonal producers, like breweries, and in the service sector;
* wear & tear/process control: although not really a managerial action (more the lack of it), capacity can decline because of wear in the equipment. Also, the quality of the inputs can influence the capacity, as well as the quality of the employees. Using less skilled or less trained employees will result in less optimal production;
* process improvements/learning curve: the opposite of wear & tear can also happen. Through better understanding of the production process, production performance can increase – resulting in more efficient production and thus in a lower break-even point;
* reduce overhead: the actions advocated in the activity-based costing and management literature regarding the 'manageable fixed costs'.;
* outsourcing: contracting out parts of the production process or of the support departments. In general, it will offer increasing volume flexibility and possible increases in capacity. This is of course dependent on the capacity of the production process of the firm. It can also be a cost efficiency decision, in which case the capacity probably will not change very much;
* make costs flexible: the aforementioned substituting of employees with temporary workers. We can also think of new production processes that have a more flexible cost structure, but this again is more like a new investment rather than adjusting the current lay-out. Where to draw the line is not really clear;
* divesting/lay-offs: the most drastic way of reducing fixed costs is of course selling machines, firing employees, or divesting complete processes.

It should be noted that not all measures are single, identifiable managerial actions. This goes especially for the reduction of overhead, and making costs flexible. At the moment, however, we are not able to formulate them better.

4.4.2.2 product and mix flexibility

The remarks regarding FMS/AMT show that comparing the measures on their influence on the capacity alone is not sufficient. The product mix flexibility needs separate attention. Again, we can draw a figure including all the measure that can possibly change the mix flexibility. Only a few measures are new, and it is not always clear if they can be seen as specific actions or more a combination of different actions. Especially the reduction of mix flexibility will be the result of decisions involving capacity and technology, much like the reduction of overhead and making costs flexible in the previous section.

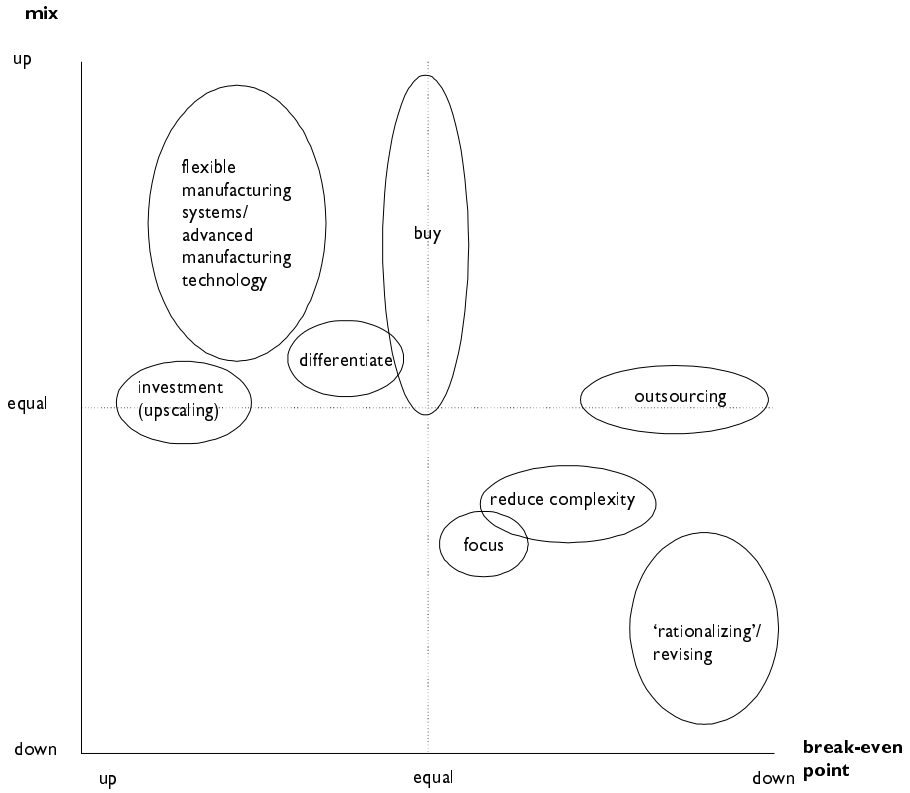

figure 4-4 classifying management actions on their impact on product mix (number of product types) and break-even point. From an overall flexibility standpoint, the bottom left is least desirable: a decrease in number of types accompanies a higher break-even point.

* flexible manufacturing systems/advanced manufacturing technology: the flexibility in production types is what makes these systems attractive;
* investment (upscaling): expanding the production while maintaining the same product portfolio and with no (major) changes in the production technology;
* buy: this allows not only flexibility in volume, but also in the product mix;
* outsourcing: in general, this will not lead to a large increase in mix flexibility, since it regards only part of the production process. When support departments are outsourced, mix flexibility does not apply;
* differentiate: based on the existing production lay-out, new products (or product types) are made. This will increase the complexity;
* reduce complexity: through offering fewer options per basic product type, the number of parts and the number of operations can be reduced. Savings are found in parts, labor, logistics and supervision;
* focus: largely related, and perhaps the same as, the reduction of complexity, focusing on certain types reduces the mix flexibility. Since there has to be a plus side, it should probably result in cost reduction, and thus in a lower break-even point;

* 'rationalizing'/revising: a complete revision of the product portfolio, taking out the less profitable types, where possible reducing the fixed costs – reminiscent of the reengineering trends.

Examples regarding complexity measures, focusing and rationalizing abound in the literature. See, e.g. Kaplan and Atkinson (1998, esp. chapter 5), Gingrich and Metz (1990), and Swenson (1998).

4.4.2.3 revenue

As indicated by Anderson (1994) (see page 119), managing fixed costs is most easily done by increasing revenues. The ultimate example is the current mergers and acquisitions boom: through 'buying' demand, companies can increase their revenue relative to their fixed costs. We will mention some less drastic measures that can be taken, and incorporate them into a figure as with the previous classifications. Since it is reasonable to assume that measures regarding revenues will be aimed at increasing revenues, most actions are located in the top half of the figure.

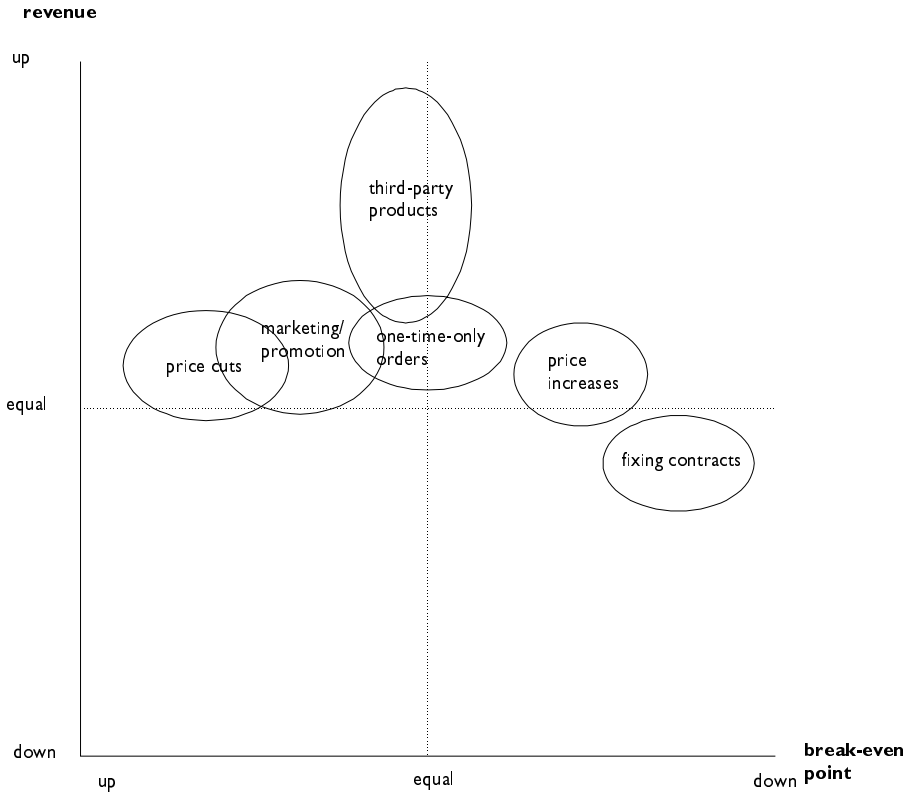

figure 4-5 classifying management actions on their impact on revenues and break-even point. From an overall flexibility standpoint, the bottom left is least desirable: a decrease in revenues accompanies a higher break-even point.

Of course, measures that influence the product mix will also have an impact on the revenues. In most cases however, it will be a reaction to shifts in demand. The measures discussed here are aimed at increasing revenues (with one exception):

* price cuts: cutting prices raises the break-even point, since the contribution margins are lower. This should be compensated by an increase in units sold;
* marketing/promotion: it is questionable if we can see these costs as being fixed. Atkinson *et al.* (1997, p. 173) call them 'discretionary resources', being fixed with respect to production levels in the short run;
* third-party products: making products for other companies will fill up excess capacity, possibly with incurring some extra fixed costs. The major downside is in the strategic position versus the buyer, with a smaller risk of opportunity losses;
* insourcing: this refers to using *part of* the production process for external parties. A typical example is the filling line in a brewery. Provided that the capacity used by the insourcing is truly excess capacity, there seems to be little risk involved;
* one-time-only orders: the realm of marginal costing, and subject to a great deal of discussion lately (cf. Shank and Govindarajan, 1993);
* price increases: the increase in revenues should exceed the drop in units sold;
* fixing contracts: a customer that commits itself to buying a fixed number of units over a period of time will do so only because of the discount offered. The company will offer this discount because of the reduced uncertainty in the level of sales, effectively reducing its break-even point.

But note again that increasing the mix flexibility to be able to better cope with changes in demand can also be seen as a revenue measure. This goes even more if the mix flexibility allows for new and better products. In all, the revenue measures are supposed to be somewhat less of a trade-off: because price is something that the firm can set regardless of its operations, it is to be expected that the firm will only take price cutting measures when this benefits overall revenues. It is very well possible, of course, that unwise price measures lead to a decline in revenue, e.g. because it brings about price competition in a stable or declining market. Also note that the figure follows the simple logic that a price increase is more attractive than a price decrease.

4.5 issues in fixed cost management

The figures we produced in section 4.4.2 serve as a basis for discussing the possibilities management has to do something about the level of fixed costs. Of course, there is more to this than just the influence on the break-even point. However, it is very difficult to identify issues that are important when deciding on the level of fixed costs, but are not interesting when looking at costs in general. It seems incorrect to talk about 'fixed cost management' as being different from other managerial actions (viewed from a cost perspective): every such action should be evaluated on its financial results. The only aspect where fixed costs require specific attention is flexibility. This is of course a major aspect, but it is important to note that the other issues that are being discussed are present in all business decisions – not just those specifically or at least partly aimed at changing the level of fixed costs.

From the literature and interviews, we can make a list of important issues in managing fixed costs.

(1) technology: the basic question is whether there is any possibility at all to do something about the level of fixed costs a firm incurs. The limited availability of choices in the chemical and process industry is important for our research, not so much because of the way fixed costs are handled there, but because of the problems these industries have due to the lack of opportunities to handle fixed costs. This results in cyclical industries, large fluctuations in sales and earnings levels, and low market-to-book values because of low price-earnings multiples. Technology comprises the physical and capital lay-out of the firms' processes. It also includes flexibility issues, in volume/capacity and in type and mix. Basically, technology is the necessary condition to be able to manage fixed costs within a production process. Once a choice is present, we can focus on decisions regarding outsourcing or trading-in fixed for variable costs;

(2) financial evaluation: in choosing for a certain production process with its cost structure, whether to outsource, whether to make or to buy, whether to lower product prices, a firm looks at the financial results – as it does in all its decisions, of course. This includes both price and quality: a firm can outsource because the supplier can make it cheaper, or better (or both);[5]

(3) flexibility: flexibility as such is an attribute of the process, resulting from the possibilities the technology offers. The financial evaluation should show whether investments that increase flexibility are justified (see also Kaplan, 1986a). Therefore, flexibility should not be an issue in its own right. It is possible, however, that there is so much uncertainty about volume and/or composition of demand, that flexibility – meaning the number of options or choices available – comes into play;

(4) control:[6] a major problem in outsourcing part of the production process (or buying parts) is the control over quality and timing. This control aspect is also important in using temporary employees, who generally are less well trained and less motivated. Outsourcing means handing over at least some control over quality and production schedules. Chase, Aquilano, and Jacob (1998, p. 558) note that extensive use of outsourcing in the production process may be seen as a high-risk strategy. This applies to buying as well, and also to the use of temporary workers. A company has less control over the levels of skill and training of temporary workers;[7]

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[5] it is not clear whether it is useful to untangle price and quality decisions in the case of outsourcing, as suggested by e.g. De Wit and Mol (1999), and Benson and Ieronimo (1996). Quality is an integral part of the service or product, whether it is outsourced or provided in-house. Again, it is much easier to view it within an overall financial evaluation, where the quality aspects are included.

[6] as with so many keywords in business administration, there is no standard definition of control. In the words of Anthony and Govindarajan (1995, p. 3), control means that the organization goes where its leaders want it to go.

[7] Tijdens (1999) reviews the use of flexible labor in the Netherlands. She remarks that 'internal flexibility', the flexible employment of fixed contract workers through variable working hours, overtime, employability in several departments, is more important than 'external flexibility', meaning variability in the number of employees through temporary contracts. She argues that this is partly because the qualifications of temporary workers are less well known.

(5) supplier relations: the nature of buyer-supplier relations is 'specific' enough to have given rise to transaction cost economics. It seems that the various characteristics of the relationship with suppliers will lead the firm to consider issues other than the previous three, that can largely be thought of as operational. Through transaction specific investments, a dependency can be forced onto the parties that may or may not be desirable. In outsourcing key parts of the production process, the firm has to be able to rely on its suppliers. In general, supplier relations will come into play with cost measures, i.e. measures that influence the cost composition;
(6) buyer relations: the competitive position of the firm in the market is an issue that comes into play with revenue measures. Management accounting textbooks pay a lot of attention to it in the case of the 'special one time only order': you have to be absolutely sure that the order is unique, otherwise the customer will always demand the 'special' price he got for his special order. This mechanism also works with the third party products: when a customer can order a generic brand, or have its own private label manufactured at a lower price than it has to pay for the original products of the firm, it will start asking questions about those prices;
(7) strategy: the strategy of the firm is important because it determines the business that it's in, and as such, a lot of the technological choices it has, as well as the competitiveness of the markets in which it operates. Besides this, strategy can overrule certain choices that may be advisable when evaluated within a capital budgeting decision.[8] For example, a firm can choose to keep its know-how within the firm, thus reducing the possibilities to outsource, or to offer new products based on that know-how. Also, it is possible that the firm wants to be active with certain technologies, resulting in investments in advanced manufacturing technologies.

From the discussion of these issues, it becomes clear that they are not all of the same kind. The first, technology, is a prerequisite or a constraint: without any choices, there is not much to manage. The financial issue *always* plays a role, in any decision a firm makes. Therefore, we cannot use these issues to discriminate between the various management actions. Furthermore, the nature of flexibility makes it difficult to use it as a distinguishing characteristic. As noted repeatedly, it is a result of the technological and physical capabilities of a process. We can, however, evaluate the actions on the issues of control, relations, and strategy. These issues make decisions regarding fixed cost levels more than just a financial exercise. The control aspect, or strategic considerations can dominate the financial outcome.

[8] but even then, the underlying argument must be that the strategic choices will ultimately turn out to be more profitable.

	control	relation	strategy
capacity			
expansion/investment			
replacing machines			
FMS/AMT			x
buy	x	x	x
hiring temps	x		
wear & tear/process control	x		
process improvements/learning curve	x		
reduce overhead	x		
outsourcing	x	x	x
make costs flexible	x		
divesting/lay-offs			x
type/mix			
FMS/AMT			x
investment (upscaling)			
buy	x	x	x
outsourcing	x	x	x
differentiate			x
reduce complexity	x		
focus			
'rationalizing'/revising			
revenue			
price cuts			
marketing/promotion			
third-party products		x	
insourcing		x	
one-time-only orders		x	
price increases			
fixing contracts		x	

table 4-5 identifying which issues play a role with fixed cost measures.

Table 4-5 helps us in distinguishing between 'normal' investment-like decision – should we expand, replace our machines, or revise our product portfolio – and decisions that are not so much purely investment related. The problems encountered in this respect explain why they are not so easily applied. For example, Quinn (1999) claims that the question management must ask is 'why *not* outsource?'; 60 to 90% of the activities of most companies 'are services that are neither being performed at best-in-world levels nor contributing significantly to competitive edge – and are not very risky to outsource' (Quinn, 1999, p. 13). The current trend seems to be that the whole often is *less* than the sum of its parts. However, the literature on transaction costs, as well as the management control literature, suggests otherwise.[9] Control issues cannot be eliminated solely with the pricing mechanism. The existence of a control problem need not result in not

[9] Chase, Aquilano, and Jacobs (1998, p. 471) mention several risks of outsourcing, such as loss of control, higher exit barriers, supplier relations, difficulties in obtaining economies of scale, and management attention. Nevertheless, the view on outsourcing has changed in recent years. It is much more common these days to consider outsourcing, as Quinn (1999) indicates. In fact, the previous edition of the standard text book of Chase and Aquilano, published in 1995, does not have the item 'outsourcing' in the index.

undertaking an action such as outsourcing, but it does force the firm to recognize it, and deal with it.

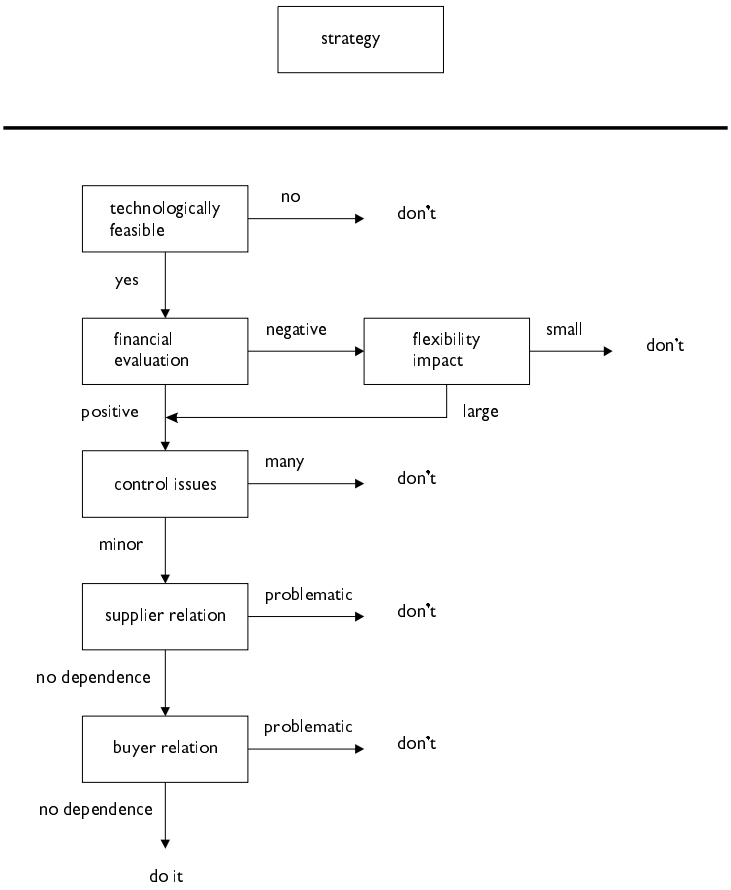


figure 4-6 one way to present the issues that play a role in fixed cost management. The arrows are merely for interpretational ease, they do not suggest a necessary flow (except for the flexibility impact).

To see how the various aspects can link together, we can think of them as shown in figure 4-6. The technological feasibility is generally only important in the production processes, and not so much with respect to the support departments. Of course, the decisions do not have to follow precisely this line, but it does serve to distinguish between 'normal' capital budgeting decisions and other issues that are important in fixed cost management, as well as the relatively modest role of flexibility. This figure makes clear once again why looking at the cost structure solely from a flexibility perspective does not produce many useful results: it is only one in a number of issues when making a decision influencing the cost structure.

The first issue is whether it is at all possible to do something about the level of fixed costs. If the technology requires a minimum scale to be feasible, as in the process

industry, there is not much choice. The technology issue is not limited to the process industry, however: once a production process is installed, it is generally not easy to adjust the level of fixed costs. We can say that technology is a constraint, or necessary condition, to be able to manage fixed costs. Given the ability to do so, the next question is whether it is interesting financially to manage them. Any (every) business decision should have some kind of financial justification. The textbook example is the make-or-buy decision: should we make this product, or is it better to let someone else make it?

It may be the case that the management action is not interesting financially, but that the impact on flexibility is such that the firm still wants to take it. This is somewhat discomforting from a financial point of view, but we can imagine that the firm is not really sure about future prospects (large deviation of expected sales), or maybe it wants to limit the downside loss. In these cases, it is possible that the perceived benefits from flexibility offset the negative outcome of the financial evaluation.

When the financial evaluation is positive, or if the flexibility impact is large enough, we can look at the next issue: control. The issue of control centers on the performance of a process: does it do what it is specified to do? Are the inputs of the right quality, are the workers trained and experienced, does everything run on time, do the products meet the quality standards? This is an issue in internal processes as well as with the performance of suppliers. In general, we assume that a firm is able to control its own processes well. When the firm makes use of outside suppliers, however, the control over quality, quantity and time of parts of the process is given out of hand. When this concerns more-or-less generic supplies, this is not a great problem. When the firm chooses to outsource part of its production processes (or support activities, for that matter), it becomes more important that the supplier performs in accordance with the agreed specifications.

The buyer-supplier relationship as such has other characteristics: even if the supplier can perform in accordance with time and quality specifications, he can still show opportunistic behavior. Basically, the supplier *chooses* to perform less, whereas internal control problems imply a less than complete grip on the operations. More generally the supplier changes the price/quality ratio, without the buyer having the possibility to easily switch to another supplier. These relationship-specific issues are different from control issues; they certainly require different solutions. It is a question of insufficient control versus no control at all – apart from market forces. The supplier-buyer relationship, meaning the relationship where the firm is the supplier, can also cause problems, which are partly mirrored by the buyer-supplier relationship. The most important problem is that of unilateral dependency, where the firm has to give in (excessively) to the buyer's demands.

Finally, we are left with that elusive issue, strategy. Again, strategy determines what business the firm is in, and what position it wants to have in that business. There can be certain decisions that are to be labeled 'strategic' because their financial evaluation is difficult or impossible. For example, a firm commits itself to a specific technology, and does not want to share it with others. Or it can be the case that the firm believes in that technology, and goes on with it despite the apparent lack of available opportunities. The bottom line, however, is that strategic decisions, like all other business decisions, are aimed at making money.

4.5.1 a 'theory' of fixed cost management

Firms strive for maximum flexibility, or minimal fixed commitments. If a firm chooses a higher level of fixed costs than is technologically necessary, other constraints or reasons prevail. The basic example in this respect is economies of scale. Whenever firms set their level of fixed costs – either from scratch, or when changing an existing situation – they will set it at such a level that the other conditions are met. Of course, the cost condition will generally be dominant to such an extent that other issues are pushed to the back. However, the general pattern at work will be the minimization of fixed commitments, and thus the maximization of financial flexibility: take your fixed costs down until another constraint kicks in.

If we look back to the firms that participated in the first interview round (section 3.5), we can see the following. The extreme cases of minimizing the fixed costs levels are the producer of power supply installations and the measurement instruments producer, though not for the same reasons. With the producer of power supply installations, the main issue is controllability: they feel that managing fixed costs is not something they are very good at. Therefore, they have outsourced the complete production process. The resulting flexibility is important, but was not the main reason for outsourcing. With the measurement instruments producer, the goal was to make everything flexible that can be controlled even when outsourced. Costs also play a role: subcontractors often have a better price/quality performance. Even so, the nature of the work that is outsourced is such that it cannot be contracted in again, because it is too specific. Note that in the first situation, the flexibility is larger, since the producer of power supply installations can take back part of the outsourced operations when business is slow, whereas this is not technologically possible with the second firm. This tells something about the limitations that come with every choice: even if you want to be as flexible as possible, you have to accept that other choices, such as reclaiming part of the outsourced production, have to be ruled out.

A different approach is taken by the industrial services company. Here we see that it is not possible to make the costs flexible: the main part goes to wages and salaries. Not only are these fixed within the Dutch social institutional arrangements, because of the required training and experience it is also undesirable from an operational point of view to use temporary workers. So the course of action is to make the employees available to more parts within the organization by setting up an internal employment agency. This is an important aspect of people: they can be deployed in different ways and in different locations – unlike much equipment, machinery etc.

Two firms are active in a process industry, involving large investments in plants that have a useful life of well over 10 years. Both firms require high operating rates. In the case of the fiber producer, the policy is to maximize the uptime of the installations. The maximum use implies that the cost side of the operations is easily managed. The problem lies in getting a decent price for the products. Because of the importance of the up-time, there is a need for qualified staff: the production has to run smoothly, and the products have to be of a consistently high quality. This means that in this capital-intensive production process, labor quality is at least as important as in a more labor-oriented process. The food producer also strives for a high operating rate, but this is not

as absolute as with the fiber producer. Since its production has a seasonal pattern, its stable workforce is maintained at a level just above what's needed in the low period. The workforce is supplemented with temporary workers during the peaks. With this configuration, it is possible to control the processes, otherwise there will be too many inexperienced and untrained staff. The food producer also follows this procedure with its external logistics: recently, it lowered its transportation capacity to low period level. This decreased the level of fixed costs. Next to this, external transporters can operate at lower costs.
The machine producer is very cautious in taking on extra fixed costs. The existing machinery has been in place for years, and will be used to the maximum extent possible. Next to the fixed labor base, use is made of temporary workers. Finally, the media company takes its costs as almost totally fixed. The technology used does not offer much choice. To compensate for this, it looks for revenue sources that display different cycles, so as to increase the financial flexibility.
Again, this view of how firms deal with fixed costs will generally not be found directly in practice. However, it does give us a logical framework for placing decisions with respect to fixed costs. This is very much a cost view, and not so much a, let's say, managerial or even entrepreneurial view: outsourcing, one of the hot topics of the moment, is pushed as a means of 'leveraging' the firm's possibilities through using 'world class suppliers', not a means of lowering fixed costs. However, even so, we are left with a way to look at the cost structure as something more than the optimal level of *dol*.
Why is this view of fixed costs and fixed cost management useful? We started this project many years ago with the operating leverage as our main focus of attention. In the beginning, it was believed (or at least hoped) that it would be possible to find optimal levels for the cost structure, most ideally in terms of target numbers for the degree of operating leverage *dol*. What we came to realize more and more, however, was that a firm's operations are much too complex to be captured in one number. The new view we take brings it back to its rightful place: an important number in describing a firm and its operations, but more than, that the result of many other decisions, and so not (ideally) suited to run a firm on.
The basic idea we now have is that a firm always tries to bring its operating leverage to the lowest possible level, and thus to maximize financial flexibility, within the constraints of technology, costs, control, relations and strategy. This gives us a handle in analyzing decisions with respect to their impact on fixed costs levels. Most importantly, it can help in identifying specifically those actions that relate to fixed costs and operating leverage, and other actions that also influence the cost structure, but are undertaken because of other, more important reasons. Of course, we expect that only a limited (maybe even very limited) number of actions are aimed specifically at altering the cost structure. More often, we will see a simple cost-driven decision, occasionally a decision based on non-financial flexibility.

4.6 fixed costs in practice

Section 4.4 explored the consequences of undertaking managerial actions that influence the level of fixed costs. Perhaps we should say that they influence the impact or the

importance of fixed costs, since revenue measures try to increase revenue with respect to the fixed costs in place. They represent the ideas we have regarding the strategies firms can use in managing fixed costs. Ideally, we would now want to place these actions within a sort of framework for fixed cost management, but we have already established that striving for an optimal cost structure is not possible – that is, at an absolute level. Rather, we have suggested a number of issues which play a role in setting the level of fixed costs, and as such the cost structure of a firm.
Given the importance of the context for decisions regarding the cost structure and fixed costs, what possible approaches are there for gaining some insights into the practical issues? Due to the preliminary nature of our models, hypothesis testing is not the way to proceed. We are still in an exploratory phase. Therefore, we again carried out a small series of interviews, to find whether these issues indeed come into play. Just as we used the first round of interviews to generate ideas on the subject, and more generally get a feel for it – costs are important, yes, but more interesting is what you can earn with them; control over your processes is one of the most important things; the cost structure doesn't determine the profitability of a firm; a choice in technology is not that important – we now want to see whether our ideas, as summarized in figure 4-6, really do come back in practice.[10] Due to the nature of our taxonomies and concepts, there is no need for stratification aimed at theoretical or literal replication. All that we need to make sure of is that we find a diverse sample of firms, where we can find many of the actions and decisions with respect to fixed costs that we have identified previously.

4.6.1 firms

To find some empirical reflection on our ideas, we talked to managers at five firms. All managers were active at the board level or one level below. In meetings of one to two hours, the current cost situation of the firm was discussed, and the decisions that led to that situation. The main emphasis lies on the issues that play a role in 'fixed cost management'. The taxonomies of management actions (figures 4-3, 4-4, and 4-5) are not ideally suited for discussion. They are more of a basic conceptual analysis of the relationship between the cost structure (as measured with the break-even point) and managerial actions. As such, they represent the influence that undertaking a specific action has on the operating leverage. However, since we do not have any ideas on when to expect which actions, it is difficult to deduce any predictions that we could validate. Therefore, the discussions focused on the issues from figure 4-6.

the wholesaler

An independent firm (over 200 employees, revenues of several hundreds of million guilders) that operates a chain of small wholesale outlets providing everything that is needed in the construction industry. Customers are small installation companies, and also roofing companies, building contractors, and technical services of organizations. Ultimately, the goal is to take over the complete stock of supplies of the customer. This

[10] in-depth case study research is not the way to tackle the issue at this point in our idea development, since it would be impossible to seperate the cost structure aspects from all other issues that play a role in configuring the operations of a firm. See Ruffini (1999) for a laudable attempt to capture all these issues.

means that everything can be bought in small numbers, and also that many (small) outlets are needed to make sure that the customer can get his supplies at short notice.
* technology: being a wholesaler, the technology is not a main issue at the outlet level. Each outlet requires housing space, storage racks, and supply stocks. All outlets are linked to a computer network, thus enabling central ordering, logistics and administration. This means that the outlets can be very small, with often just one employee. Technology is important in that the computer network allows these very small outlets, but there is no special storage or retrieval equipment at the outlet level.
* costs: because of the nature of the market, cost control is essential. The firm succeeds in getting slightly bigger margins on the products because of the service it offers (effectively removing the need of customers for stocking supplies). On the other hand, there are no economies of scale on the outlet level. This means that the fixed costs at the outlets have to be brought down. To achieve this, the firm designs and builds its own outlets, and also constructs its own storage systems with high racks and small lanes. This is not a problem since all customers are professionals who do not come for fancy lay-outs or nice designs. In a further effort to reduce costs, a franchise formula was developed in which customers in remote areas open up their own inventories for other customers of the firm, thereby creating another outlet and increasing the presence of the firm throughout the country.
* control: the low-cost concept that the firm uses in its outlets means that employees have to have extensive knowledge of everything with respect to all products, including price levels, discounts and the capacity to negotiate on them. Next to this, they have to stock the supplies, and perform the administrative activities at the outlet. All this makes it impossible to use temporary workers at the outlets. Employees are required to work in a region, rather than at just one outlet, in order to fill up places that are vacant because of illness or holidays. Even more, the level of training and experience needed is so high that a new concept is being developed: employees no longer are allowed to negotiate prices, or accept special orders. If customers want more expertise, they can call service numbers where this expertise is available. All this reduces the need for training and experience, thus reducing the control problem, and simultaneously increasing the flexibility.
* relations: being a wholesaler, the firm is 'constantly on the brink of elimination'. Whenever customers make large orders, they can go directly to the supplier and buy it from him. The trick is attracting smaller customers through the added service of being present all over the country and supplying in any number or amount the customer wants. Ultimately, once a customer has decided to get all his supplies from the firm and gets rid of its own inventories, he is in there for the long run. With respect to its own suppliers, the firm is not really in a position to command special privileges. However, this also goes for its competitors.
* strategy: the concept of providing full service to small customers is the basic strategic choice that guides most of the decisions discussed. This implies that the firm will not compete on price.

the chemical firm

A listed firm, 20,000+ employees, several billion guilders revenue, active in a range of markets from base chemicals to pharmaceutical ingredients. Some 15 business units, grouped into three divisions. The cash generated with the base chemicals is used to invest in the higher margin products, which tend to be less cyclical than the base chemicals.

* technology: the chemical industry is the textbook example when talking about the cost structure.[11] In general, chemical processes require very large investments. Because of this, the fixed costs caused by depreciation charges are substantial. Furthermore, the processes run or do not run, but they do not operate at 50% of capacity. Developing new technologies that allow production at other scales is also very expensive. Economies of scale are everything, and as a consequence the fixed cost per unit of output is a key indicator. All this means that in the base chemicals, there is constant pressure on the prices because everybody has to fill up his capacity. Because of the high fixed costs in the production process, the firm constantly looks for ways to increase the variability of other costs. It has outsourced major parts of the maintenance, engineering, and purchasing departments, as well as smaller departments like the internal travel agency and the translation bureau.

* costs: since the process costs cannot be made more flexible, the firm tries to bring them down. For example, the operators work in pools, and as such are available for more than one business unit (although their labor costs remain fixed for the firm as a whole). Even more important for bringing down fixed costs per unit is the continual increase of plant capacity through process optimization: the ultimate capacity of a plant can be twice its initial capacity. Also, part of the rationale of outsourcing departments is in costs: since the chemical sector has a relatively high level of wages, the labor costs of outsourced departments are lower. Finally, since internal services tend to generate their own demand, outsourced services are used less, resulting in lower total costs. The goal is trading in fixed for variable costs, but with total variable costs amounting to less than the previous fixed costs.

* control: although the maintenance is largely outsourced, there is still considerable know-how within the firm. The essential maintenance expertise has been retained. Much attention is paid to the relationship with the suppliers of services: this needs to be well managed. Just as it was not possible for the firm itself to perform major maintenance jobs on many plants at the same time, it now requires intensive cooperation with the maintenance firms to plan these jobs. Certain support processes are essential to the firm's competitive position and are therefore kept in-house. For example, the 'technical service staff' that helps customers in optimizing the customer's processes, and functions as a link-pin between customer requirements and desires, and the firm's own production and development processes. Other than the few essential support activities, everything can be outsourced without many control problems. As an indication of how far the firm has come in this respect: it has not hired people below intermediate vocational education levels in the past ten years.

[11] and also the Ph.D.-thesis example, see section 1.1.

* relations: outsourcing services requires a well-developed market for these services. Ultimately, the firm would like to contract its operators on a temporary basis, but this is not possible since there is no market. As indicated under 'control', outsourcing requires good relationship management. However, due to the nature of the process industry, service suppliers work in support activities, not in core areas with respect to production. In general, there should be no problems in becoming too dependent on any suppliers. The relationship with the buyers varies per business unit. Where business units produce commodities, there is only price competition. When the products get more differentiated, it is possible to build up a relationship with the customers, especially through the activities of the aforementioned technical service staff. Furthermore, the firm is very active in supplying to the pharmaceutical industry. Pharmaceutical firms are increasingly tending to become R&D and marketing organizations, leaving the production to others.
* strategy: the chemical industry is one where strategy is something for the long term. As the interviewee noted: 'Strategy discussions in the service sector are simple because strategy is almost free. Making a strategic choice in the chemical sector has a price tag of hundreds of millions, if not billions.' These price tags lead to substantial fixed costs, making it necessary to actively look for possibilities to make other fixed costs in the organization more variable – and lower.

the optical machinery producer
A listed firm, 3000+ employees, revenues of approximately 2 billion guilders. Designs and builds optical machinery used in production processes in the computer and information technology industry. The production level is several hundred units per year. The firm is active in a technologically very advanced industry. It is actively involved in developing the technologies which will be needed in the computer industry in 10 years time, rather than getting the most out of the current production technologies.
* technology: over 90% of the direct costs of a machine comes from outside the firm. Basically, the firm designs, assembles, and tests, while the production of the components is done by suppliers. The customer is primarily interested in one thing: does the machine run smoothly, with a short lead-time? This means that quality in production and assembly is of the utmost importance (more than price), and full control of the operational processes is the way to achieve that. The firm uses several dozen preferred suppliers, and it actively monitors and supports their operations to make sure the components entering the assembly are perfect. However, the close cooperation between the firm and its suppliers means that the costs are not.
* costs: costs are 'totally unimportant'. Cost control is important, but the firm tries to achieve this through controlling the operations, total quality management, statistical process control and other operational measures, rather than calculating standard unit costs and efficiency results. This is only possible, however, because the customers recognize that the machines have to function up to specification and without downtime in order to make more money with them. Therefore, price is important, but performance even more. The implications for the cost control within the production process of the firm and its suppliers are that price, and thus costs, are of only secondary importance.

Note that the costs in the areas outside of the core competences are made as flexible as possible, since the customer does not pay for cleaners, caterers and the like.
* control: continuing the cost story, if costs are relatively unimportant, control is everything. This is why the relationship with the preferred suppliers is very intense: the firm actively supports, monitors, and sometimes even invests in the operations of its suppliers. On the other hand, the expertise to manufacture the components in-house has never been developed, so there is no choice with respect to whether or not to use outside suppliers.
* relations: once customers have chosen the technology of the firm, they are dependent on it. So the firm tries to ensure it is at the forefront of the technological developments, in part by working together with customers in developing new technologies, to be sure that customers are interested in the firm's technology. With respect to its suppliers, there is a strong interdependence with the manufacturers of core components. Therefore, these suppliers need to open up their books for the firm. Also, they need to apply the same operations philosophy as the firm. Efficiency gains have to be passed on to a large extent to the firm. In return, the suppliers are judged first on their quality and timeliness. With one supplier of a crucial component, the relationship is such that it is effectively a part of the firm. They are fully dependent upon one another, which is 'something that you really have to want, and really have to choose for'.
* strategy: the firm tries to achieve competitive advantage by using the best suppliers and by developing tomorrow's technology itself. This means that the relationship with the suppliers is more than just buying parts. Consequently, although most of the costs are made outside of the firm, this does not translate into a wholly variable cost structure. The firm needs the suppliers (almost) as much as they need it, so it cannot put all the volume risk with the suppliers.

the multi-product company
An independent firm, 3000+ employees, revenues of approximately 1 billion guilders. Active in processing animal slaughter by-products and residues (three divisions), in producing gelatin capsules for the pharmaceutical industry, and in generic drugs (each one division).
* technology: the divisions that process slaughter residues are very much process industries. As such, they deal with the typical issues: many fixed costs, economies of scale, filling up capacity, few possibilities for making costs variable. An extra complication is the need for overcapacity: since the supplies keep coming from the slaughterhouses, the processes should be able to overcome occasional bottlenecks. With the capsules production and especially the generic drugs division, there is still much room for process improvement: upgrading should lead to less operators, and thus less fixed costs.
* costs: in order to achieve economies of scale, the firm has concentrated the processing of residues in a few large plants. It has bought smaller plants, closed them, and brought over the production to the large plants. Within the plants, costs are fixed for some 90%. Variable costs are in maintenance, and in logistics, where a part of the costs has been outsourced. Temporary workers are used to a small extent in the production, but again the nature of the process means that there is little room for variabilisation of costs. This

leads to a focus on low overall costs. As noted under technology, the other divisions still have room for process improvements in order to cut fixed costs.
* control: the importance of keeping the plants running is so high, that the firm wants to keep control over its maintenance processes. Therefore, the part of the maintenance that is outsourced is only needed at peak levels. Again, the main issue is to keep the plants filled and use the capacity.
* relations: with the processing of animal residues, the relationship with the suppliers is of a unique nature. The slaughterhouses get nothing for their supplies, and if it is up to the firm, they are going to have to pay for it in the future. The products coming out of the processes are commodities whose main competitor is soya. The price of soya has fallen in recent years and no upturn is expected. Since the costs are still there, being largely fixed, the firm faces a tough period.
* strategy: the strategy of the firm is aimed at achieving strong positions in the market, either through having a dominant market share, or through offering unique products. It feels very strongly that being a non-listed firm gives it more leeway in reaching this goal, because 'outside shareholders do not appreciate that short-term profit suffers when investing in projects that are profitable in the long run'. This is important, since the traditional divisions that process the slaughter residues are limited in their growth (due to the government's plans for the agricultural sector). Expanding into related, but different sectors like the pharmaceutical industry costs time and money, but offers more growth prospects and higher margins. This is partly because they are closer to the consumer, whereas the traditional divisions are more business-to-business.

the enrichment company
An independent firm, 1500 employees, revenues of approximately 1 billion guilders. Processing of raw material for highly regulated industries, as well as producing the capital goods needed for the processing.
* technology: the enrichment process is a typical process industry. The processes do not produce products that are sold, but perform operations on raw materials supplied by the customers, that are subsequently returned to the customers. Therefore, the firm sees itself as providing a service, rather than being a production firm. A production line consists of dozens of identical main components, that have to run continuously. They are never stopped for maintenance; when they stop running, they are replaced. The components are designed and manufactured in-house. This means that the firm actually consists of two separate units: one for the processing of materials, and one for the production of the components. In the processing unit, costs are largely fixed. In the components production, there is more room for variability. The capacity has been expanded in previous years, and the extra operators have partly been hired on a three year contract via an employment agency. This is because the success of the latest family of components is not guaranteed, and with this arrangement, the firm has more flexibility when things don't turn out as expected. The production of several non-vital parts is outsourced.
* costs: because of its proprietary technology in production, the firm is able to compete with others on price. Since the service provided is essentially a commodity (producing according to specifications is a necessity, not something you can compete on), new

contracts can only be won on price. In order to fill up the capacity in the components production, the firm has expanded into producing power units for the aerospace industry. This is developing into a stable second product line, generating an increasing source of revenues.
* control: within the enrichment process, control is everything. The process is technologically fully developed. In order to ensure that everything runs smoothly, the raw materials input is tested on its specifications. Labor costs of the operators are completely fixed; in fact, the firm wants it that way precisely because of the control aspect. It needs a stable, experienced operator team. The temporary workers in the components production are all experienced and well-trained.
* relations: the enrichment industry is characterized by long-term contracts between processing firms and customers. As mentioned, these contracts can only be won on price. With respect to the aerospace industry, the story is somewhat different: the big gains come from supplying spare parts, whereas the original products produce hardly any profit. However, you have to deliver when the customer asks, and this has to be balanced with the primary production tasks of process components.
* strategy: the components are deemed essential for the competitive position of the firm. This is to such an extent that they are not sold to other parties, because the firm does not want to share its knowledge. Because of this, and because of the regulated nature of the industry it services, there is an added benefit to expanding into the aerospace market: it gives the firm some additional external influences. The aerospace market is very open and very competitive, whereas the culture of the firm is still very much oriented towards safety and reliability at all costs.

4.6.2 analysis/evaluation

We see several points coming back in the interviews that support our ideas surrounding the role of the cost structure. We have identified several issues that are important in making choices with respect to the cost structure. We will now compare the interviews on these issues and see whether they help in explaining the results. Besides the firms discussed in the previous section, we will also refer to the firms of the first interview round, presented from page 94 on in section 3.5.2.

technology

As with the first interview round, technology choice aimed at offering a broad range of possibilities in setting the cost structure, is considered relatively unimportant. For the chemical company, and for the multi-product company, large investments and high fixed costs come with the turf. At the same time, the chemical company is actively looking for possibilities to make fixed costs variable, specifically to increase the variability of costs. This is achieved mainly in the support departments. Also, the technology of the chemical processes is not static: through continual improvement of the process control, it achieves an increase in capacity, and thus a decrease of fixed costs per unit.
The technological possibilities and choices are a major factor in determining the room a firm has in managing its cost structure. The optical machinery producer, as well as the

measurement instruments producer and the producer of power supply installations from the first interview round, outsource major parts of their production process. The firms in process (-like) industries cannot do a lot with the level of fixed costs in their production process. The beverages producer and the fiber producer from the first interview round, and the chemical company and the multi-product company all face substantial investments in order to be in the business they are in. However, this goes mainly for the actual production processes. Within firms, there are a lot of support processes that are relatively independent of the technology. Activities like maintenance, logistics, and parts of the administrative processes can be made more variable, and this is done to a greater or lesser extent.

costs (financial evaluation)

We have argued that the financial evaluation is an integral part of every business decision, and as such there is 'nothing special' about the decisions that the firms take. Nevertheless, we can point at several examples where costs were the reason for making the cost structure more variable – because outside suppliers perform at lower costs, or because they provide more quality for the costs. This is the case for the chemical company, where the fixed costs of several support departments have been replaced by variable costs of suppliers, but at a lower total cost level. The beverages company from the first interview round has outsourced a large part of its logistics, partly because of the flexibility it offers given its seasonal products, but also because of the lower costs of outside firms. More generally, using suppliers frequently originates from the fact that they can perform a service or produce a product better, leading to a better price-quality ratio. This goes for the optical machinery producer, and also for the producer of power supply installations[12] and the measurement instruments producer from the first interview round. Next to these outsourcing decisions, we can point at the industrial services company from the first round. This company has set up an internal labor agency to make employees from one department available to others. In effect, this means that the fixed costs of these employees can be used to a fuller extent, generating more contribution margins and as such leading to a better cost structure.

Although we do succeed in identifying decisions that result in a cost advantage coupled with a change in the cost structure, the overall importance of the financial evaluation makes it difficult to use it in explaining differences in the cost structure, as we expected.

flexibility

Flexibility issues are difficult to identify, as we suggested in our model.[13] Several firms explicitly mentioned that they are actively seeking for ways to make the cost structure more variable, but we did not encounter examples where the flexibility impact overrides other (financial) considerations. To underline this point, we can point at the logistics of the beverages producer. Through outsourcing part of its logistics, it lowers its fixed costs

[12] as the interviewee from this firm said: 'If you outsource everything, it's possible that you have slightly higher costs, but you are assured of good quality.' As a reminder, this firm sees its main competences in design, marketing and service, rather than in producing.

[13] a justified comment here is that one only sees what one wants to see; see the remarks in section 5.1 (if you want to, of course).

and increases its flexibility. Because of the seasonal nature of its products, it is also directly financially justified: the firm does not have to maintain capacity beyond that needed in the slow months. Also, the labor pool introduced by the industrial services company can be interpreted as a flexibility measure, but the impetus is of course to increase the financial result. The chemical company and the measurement instruments producer did mention they were specifically looking to increase the variability of the costs, but always conditional on price and quality.[14]
Flexibility is important because it leads to better financial results. Therefore, flexibility issues can generally also be explained in financial terms. Because flexibility is the result of the characteristics of the firm's processes, it is not an issue that is easily identified.

control

One of the main points with respect to the cost structure is the issue of control. The optical machinery producer has outsourced almost everything. To control this, it performs tests during the operations of its suppliers, and it requires them to operate with same philosophy, and the same procedures and standards as the firm itself. Consequently, the control process is not much different from the one applied to its own departments. The chemical company has set up a system of firm management to deal with its suppliers. One of the aspects of this is that the essential knowledge is kept in-house, so the firm is not totally dependent on its suppliers. The wholesaler is adjusting its store concept to cope with control problems: employees are not allowed to negotiate prices anymore, which makes it possible to train them less, and use employees with less experience. In each firm, outsourcing, buying, using temporary workers is subject to the control issue.[15] This is not surprising, of course: control is an essential aspect of management.[16] What is somewhat surprising, perhaps, is the confidence that the interviewees showed in being able to contain the control problems. The chemical firm thinks that there is no limit to outsourcing, other than social issues like job security. The optical machinery producer seems to have the control problem completely covered in its processes, even with over 90% of the production outsourced. Looking back to the firms covered in the first interview round, we see there that another producer of technologically highly advanced machinery, the measurement instruments producer, is also very active in outsourcing its production. This almost seems to suggest that outsourcing becomes more attractive – both from a financial and from a control perspective – when the nature of the products and processes gets more advanced.
The issue of control is helpful in explaining differences in cost structures. For example, the media company from the first interview round does not outsource its maintenance

[14] Tijdens (1999) suggests some other problems in identifying flexibility measures as such: she notes that many temporary contracts are used as a test phase for a long-term contract, meaning that they are not primarily used to create flexibility. The labor pools provide flexibility at the department level, but not at the firm level.
[15] Anthony and Govindarajan (1995, p. 8) define management control as 'the process by which managers influence other members of the organization to implement the organization's strategies'. Obviously, by bringing a part of the organization outside of the hierarchical structure of the firm, the possibilities for influencing become less – although this by no means implies that keeping it within the firm would remove, or even necessarily reduce, all control problems.
[16] note that in Dutch, management and control can be translated to the same term: *beheersing*.

operations, because it feels that maintenance is too important. Other firms feel that it is possible to outsource maintenance, provided that adequate control mechanisms are in place. Control is also a major issue in using temporary workers. Nevertheless, since the control issues ultimately also must translate into financial results, they can be overruled by cost considerations. For example, while the beverage producer now has outsourced part of its logistics (see under 'flexibility' above), it used to keep it all in-house because it felt that it needed more control over the handling of the products.

supplier relations

The relationship issues are somewhat less pronounced, at least with respect to the consequences for the cost structure. Relationships on the supplier side are viewed with care. The enrichment company uses outside suppliers for some parts, but tries to have two suppliers for one part. The many demands that the optical machinery producer makes on its preferred suppliers are accepted because it 'pledges everlasting loyalty to them as long as they perform at the level expected of them'. However, the suppliers of commodities and standard parts are interchangeable: the firm does not feel any loyalty towards them, and if another supplier is cheaper or better, it will get the order.

In all, unilateral dependency on suppliers is avoided, for example through keeping essential know-how in-house. This can limit the outsourcing possibilities, and as such the possibilities to manage fixed costs. Furthermore, there has to be a market for the services a firm wants to outsource, or dependency on the supplier becomes inevitable. The technical services company from the first round has landed a large deal for providing maintenance services to a firm in the process industry because that firm wanted to enlarge the existing market of service providers.

buyer relations

On the buyer side, the wholesaler tries to capture its customers through taking over their inventories, but this does not complicate the situation of the wholesaler itself (on the contrary). However, it chooses consciously not to aim at big customers, because 'they have many demands and are lousy at paying their bills'. Taking on these big customers would result in lower margins, and in more receivables and thus higher finance costs. The wholesaler has decided that this does not compensate for the increase in revenues. The enrichment company works with long-term contracts, thus reducing uncertainty, but these contracts still have to be won on price.

In general, the firms interviewed are not dependent upon one or a few buyers. Specific buyer issues, as they are identified in the literature, do not arise.

strategy

Strategic issues play a role in the overall firm policies. If all is well, the strategy guides all decisions that are made. While this is especially clear for major decisions like acquiring another company, or shifting from business-to-business towards consumer products, simple operational decisions should also adhere to the firm's strategy. For example, the wholesaler's choice not to focus on big clients is a strategic decision. However, like flexibility issues, strategic decision should translate into financial results. This makes it difficult to identify them. Most notably, we have the enrichment company that does not

sell its main components to outsiders because it wants to keep its technology completely to itself. Also, the optical machinery producer has a large research staff that works on the technology for years to come, rather than optimizing current technology. This causes a very large amount of fixed costs, which can also be considered a strategic choice, although the firm itself sees it as a necessity rather than an option.

In all, we see that we can use the issues identified in section 4.5 to help identify reasons why the cost structure of a firm is set at any level. The main issue, the financial evaluation, really is not that interesting in analyzing the cost structure. The (capital budgeting) decision underlying any investment does not need further refinement or enhancement, given the estimates of the future cash flows. Any decision that prefers one cost structure over another should be the result of a discounted cash flow analysis.[17] However, the possibilities that need to be considered in the analysis are restricted by the other issues, those of technology, control, relations, and strategy.

4.7 conclusions

In our search for ways to apply the operating leverage concept in the management of firms, we have taken the most basic approach there is in this chapter. Rather than taking all aspects of the cost structure, and relating them to market circumstances, earnings levels, strategic positions, or a range of performance indicators, we asked ourselves: how can we relate the actions that management can take to the cost structure? Note that this is different from relating them to earnings levels, or earnings variability, and as such from relating them to (the absolute level of) firm performance. To get some idea on how to proceed, we started with a discussion on flexibility. With hindsight, this served mainly to get into the right frame of mind. The flexibility of a process is often treated as a characteristic in itself, yet it is the result of the real, or operational characteristics of the process. The same goes for the cost structure: while it is a concept that can be defined and measured better than flexibility, it also is the result of the operational characteristics. And just as we can classify the different types of flexibility measures, as done by e.g. Sethi and Sethi (1990, see section 4.3.1, page 117), we can classify operational measures on their impact on the cost structure. The step that we had to take to do this was to look for a general characteristic to which we could relate these measures. This was necessary because we did not want to use absolute performance measures, like whether the management actions increase earnings, or lead to increased earnings variability. The main problem with this is that it requires an *existing* performance level, and therefore makes it almost impossible to apply generally. Fortunately, there is a characteristic available that does not need performance levels, yet still conveys information on the cost structure: the break-even point. Classifying the measures on their impact on the break-even point gives us a starting point to think about *managing the cost structure* – which is what we were looking for.
The original idea behind this chapter came from the observation that managers in general feel that their firm has a fixed cost level that is high, or too high. In retrospect,

[17] if they are not based on such an analysis, or at least on the logic underlying it, using the operating leverage concept will not help very much in producing better decisions.

the main subject of this chapter is not so much fixed costs, as it is the cost structure as a whole. However, it is much easier to talk about 'measures that influence fixed costs', than about setting the cost structure at some target level. The management actions classified in section 4.4.2 sometimes regard only fixed costs, sometimes the substitution of variable for fixed costs, and sometimes the revenues (i.e. the contribution margins) generated to cover the fixed costs. If we look at something like, for example, insourcing, i.e. filling up part of the capacity by performing services or producing products for third parties, it is easier to discuss it as a method that provides additional contribution margins to cover fixed costs than as an adjustment of the cost structure. Yet it is exactly that, when we discuss it in the terms of chapters 2 and 3: through increasing *q,* while keeping *F* (more-or-less) constant, we achieve a decrease in *dol.*

The next step we made again involved some letting go: rather than trying to find when which firms undertake what actions, we identified some general issues that play a role in decisions that influence the cost structure. As such, we developed something of a theory: what are the aspects a firm has to deal with when doing something about its cost structure? The main problem with respect to the model developed lies in its *ad hoc* nature. However, due to the state of management theory, it is difficult to establish the important issues within a rigorous framework. There is some logic to it, of course: first, there is the question of what the possibilities are in making costs variable, leading to technology as an issue. Then, we look at the financial performance. Next, since the firm needs to manage its operations, we get internal and external control requirements. Internal control refers to the control of the processes – does everything run optimally – and external control to the position of the firm with respect to its buyers and suppliers. Somewhat reluctantly, we also include flexibility, noting that the benefits of flexibility really have to show up in the financial evaluation. Finally, we have to include strategy. Although the issues as such are probably all relevant, it is difficult to test this empirically. We did encounter them in the interviews, where they helped in explaining several choices of the firms.

As a further check on the issues, we look back at the example of franchising that we used to introduce our first conceptual model on page 83, figure 3-2. We noted in our analysis of the first interview round that analyzing franchising from a cost structure perspective with the model seemed to work better than with the firms that were involved in the interviews. We can now see an additional reason why this is so: it is probably one of the few situations where increasing variability or outsourcing *reduces* the control problems. In this case, the market mechanism is used to remedy the internal control problems as they are suggested in the agency literature. In the interviews, we repeatedly encountered the control issue playing a role in setting the cost structure – which led to its inclusion in the final model of figure 4-6.

There is one important assumption that we have to make in order to further develop the role of the cost structure: that is that firms strive for maximum flexibility, subject to maximizing firm value (or earnings, or income).[18] This is essentially the same as claiming that a firm strives for the lowest *dol* possible, something that has always hovered around

[18] although the section on the importance of earnings variability (3.3) does provide some comfort in making this assumption.

our ideas on the cost structure. However, this would also imply that there is an optimal *dol*-level. In chapter 2, we could not find any theory to support this notion. The way out of this is to realize that the optimal *dol*-level is subject to the issues we discussed, first and foremost the financial performance.[19] Again, we can point to the franchising example. There, we cited research that showed more use of franchising when the uncertainty is greater, especially when the franchisor expands into foreign markets. In case of increasing uncertainty, the firm wants more flexibility, and wants less fixed costs. If there is less uncertainty, the trade-off will be that of economies of scale and not having to share profits versus the control problem.

The main problems with our first conceptual model from figure 3-2 can now be seen as follows: it still focused on variability as a necessary condition for the cost structure to become important. In the final model, we can say that the cost structure becomes less important as the variability (or uncertainty) decreases. The difference is that we now say that the cost structure is always important, but that, for example, economies of scale become dominant over the need for flexibility if the market is stable. This can also be seen in our problems with the sales, strategy and technology variables in figure 3-2. We tried to talk our way out of this by naming them 'contingencies', but only now do we know what we meant by that: these 'determinants' are actually part of the financial evaluation, the capital budgeting decisions that set the cost structure. As such, they are very important, but they also cloud the issue of the cost structure. Strategy and sales are dealt with in the capital budgeting decisions, subject to the possibilities the technology offers. However, they do not have to take on any specific values, like a minimum amount of variability in sales, nor does strategy become important only at times where strategic choices are made. This way of thinking still looks at the operating leverage as something for which a target level has to be set and preferably met, which consequently suggests it is only an item of interest at those points in time that the processes are configured. This is reinforced by including the availability of funds as a determinant. We did not include the funds as a separate issue (or box) in our new model to underline this shift in emphasis, nor did they really come up in the interviews. Leaving them out probably reflects the fact that the roots of this project (as well as ours) can be found in financial theory, where every NPV-positive project can be financed because investors will always be willing to put up the money. On the other hand, given our starting point that firms strive for a low operating leverage, a lack of funds will not hinder in *not* committing fixed costs through large investments. This is why we did not miss it in our discussions.

[19] referring back to Brealey and Myers, who rightly state 'less risk can't always be better' (see page 56): the increase in *dol*, and thus in risk because of higher fixed costs, is offset by the increasing return because of economies of scale, more control, etc.

5 reflections

This research project started from a simple observation: while the concept of the operating leverage is clearly of importance to firm performance, it receives little attention in theory and, as far as was clear at the beginning, in practice. This observation prompted a first research objective, aimed at understanding the role of operating leverage in firm performance. Obviously, we started by looking into the nature of operating leverage, and how to measure it. This beginning already seemed a step too far: the number *dol* that we attach to the operating leverage is clear and simple when we discuss it in a theoretical setting, but its measurement from actual financial statement figures raised problems we could not solve. These problems had not only econometric causes, but also fundamental ones, the main being that a firm generally has no stable *dol* (and if so, then by accident). This makes it impossible to empirically determine if there is anything like an optimal *dol*-level. Furthermore, it is not possible to derive such a level theoretically. Next to the measurement issues, we gradually realized that the role of the operating leverage in firm performance already was quite clear. In fact, it has been known for years, and the definitive statement on it is our beloved Mandelker and Rhee (1983) formula (2-31).

Although the *dol*-approach seemed to head towards a dead end, it was clear that the operating leverage as such is an important concept, and one that plays a large role in actual firm performance. This encouraged us to take another route in order to develop some more ideas on the concept, ideas that would make it possible to apply it in practice beyond 'merely' explaining differences in earnings variability. As a first step, we took the concept underlying the operating leverage: the cost structure. We placed it in a wider context than the financial economics view employed until then. Nevertheless, we stuck with the idea of earnings variability as the main point of interest, the main indicator that governs a firm's interest in the cost structure. In a series of interviews, we discussed the determinants of the cost structure as we had identified them from the literature and some logical reasoning. This did not go quite the way we expected it to. In all, the interviews tended to focus on costs in general, and not so much on the cost structure (the composition of costs). In fact, we had to conclude that the concept of the cost structure, like the operating leverage, is not frequently used in practice – especially not when talking about managing a firm's operations, as opposed configuring those operations. At the same time, the interviewees underlined the importance of fixed costs.

Ultimately, by stripping the aggregate phenomenon of the cost structure down to basic fixed costs actions, we were able to do something with the operating leverage concept – by taking its parent concept, the break-even point, as an indicator of the cost structure. This helped us in analyzing managerial actions on their impact on the cost structure without going into numbers or assuming optimal *dol*-levels. It would seem that this is the most that we can do with the concept in terms of helping management implement the cost structure in its management of the firm.

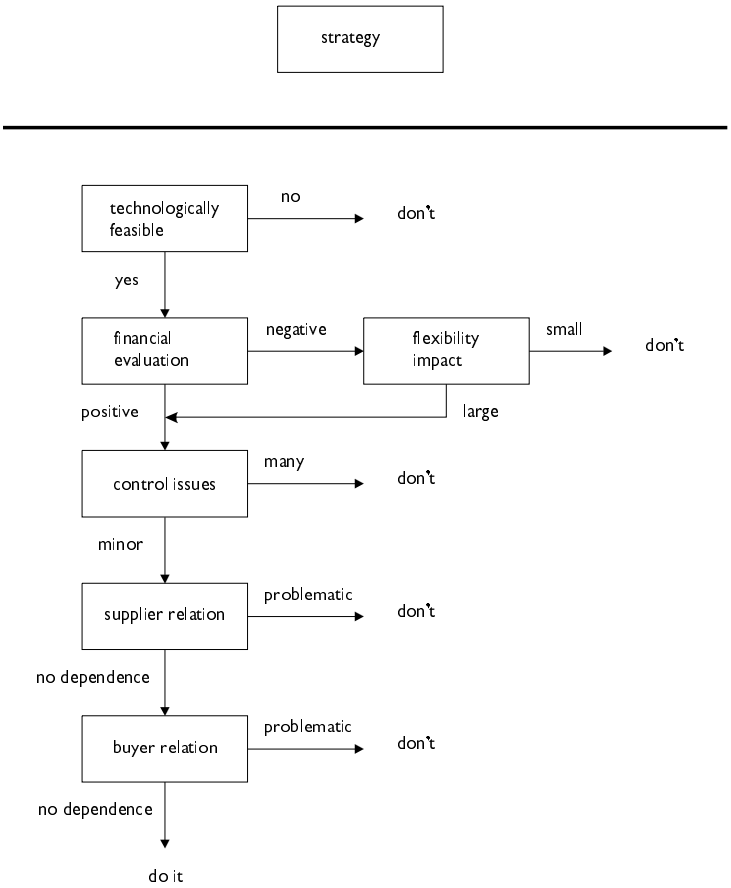


figure 5-1 (actually 4-6) the issues in fixed cost management, see page 134.

Through identifying the major issues in 'fixed cost management' (see figure 5-1), we were partly able to break the stranglehold of the capital budgeting decision on the cost structure. With this we mean that the cost structure of firms is first and foremost an investment decision, for which sufficient correct tools exist. Any well founded investment decision will undertake those actions that maximize the net present value. The operating leverage concept is not needed in that, nor is anything regarding fixed costs levels. However, once we have made a financial decision other issues can come into play. It is there that we find another possible contribution of this thesis. The issues discussed are important influences on decisions regarding fixed cost levels. They identify where and why actions that should be implemented based on capital budgeting decisions are not carried out that way. Or somewhat less ambitiously, they point at issues that help explain the limits of capital budgeting decisions. In general, we would expect that the management actions represented in the figures are decided upon in the financial evaluation box. Their resulting impact on the cost structure is to be accepted. That is to say, the actions are not evaluated merely, or even firstly, on this impact. On the other

hand, should a firm actively seek a reduction in operating leverage, it should look for those actions that lower the break-even point.
Did we succeed then, in developing some ideas that could improve its use in practice? We hope so. At the least, we have taken the abstract interpretation of the operating leverage that results in the typical financial management applications reproduced in section 3.6 on page 100, and evolved it into a more practical story, one which is better suited for a managerial perspective on the cost structure. And indeed, if the possibilities for applying the concept of the cost structure were restricted to choosing between steam generating or nuclear electricity plants (Lev, 1974), or between using robots or humans in manufacturing (Emery and Finnerty, 1997), the lack of attention for the operating leverage is not only understandable, but also justifiable. This view is basically the view with which we started the research project. To see where we have come from, compare figure 5-1 with the following figure, which represents our thoughts at the beginning.

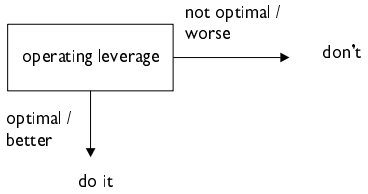


figure 5-2 representing our ideas at the start of this project: judging managerial decisions on their impact on operating leverage.

We now have some idea about the role of the cost structure in the firm. If we start from the basic premise that a firm wants to be as flexible as possible (since fixed commitments cause extra risk, above the intrinsic risk of being in the business), we can see the cost structure as a series of capital budgeting decisions that set the level of fixed costs based on simple discounted cash flow calculations. In order to explain why the fixed costs levels are higher than could be expected on the basis of DCF-analyses, we look at the issue of control of the operations of the firm, and at the position of the firm with respect to its buyers and suppliers. Finally, there can be some strategic issues that explain business decisions. In all, this sums up everything (and all) that we can see about the optimal cost structure, the use of the operating leverage in managing a firm, fixed cost management and whatever else you would like to call it. This is not a negative conclusion. It is only another restatement of the observation that every firm is unique, and that managing a firm amounts to more than simply filling in some numbers in some formulas. It also is a testimony to the relevance of business administration, foremost as an educational field, but also as a research field.
So what can we say about the operating leverage, the cost structure, and fixed costs? The mechanisms they cause or represent are very real. However, they are not characteristics that can be managed to optimal levels; if any, it would be the minimal level possible, but always within the limits of the standard financial evaluations.
So in the end we are torn between disappointment and enthusiasm. It is never a pretty sight to finish off the second chapter in a Ph.D.-thesis concluding that the main subject of the thesis is not interesting. On the other hand, it proved possible to discuss the phenomenon underlying the concept in different ways, ultimately leading to some level

of reconciliation of ideas from the financial view of the firm with real, operational issues within the firm. It is here that we find the true contribution.

5.1 reflection on the research process

Looking back, the idea with which we undertook the research project was somewhat naïve. That is to say, to look for reasons why the operating leverage concept is applied so little in practice, and especially theory, was and is a sensible thing to do. It turns out that the reasons for its low popularity are logical, and valid. This does not take away the amazement over the amount of effort put into researching financial leverage while it is of even less practical importance to firm value than the operating leverage, let alone in managing the firm as such. However, to think that such a basic concept as the operating leverage can be applied differently, or better, was perhaps the result of youthful (if not irrational) exuberance.

We have very consciously included the original ideas we had with respect to the cost structure, as presented in section 3.4 on page 82. These are ideas that continually come up when talking about the cost structure: the firm has to have a choice in technology, or there has to be a large variation in sales in order to make the cost structure interesting. Yet they are not the ones that will lead to meaningful conclusions. To keep us (and others) from going back to them, the reasoning behind the model presented in figure 3-2 is still included in this thesis.

The choice for the issues (or variables) influencing fixed costs decisions is not very rigorous, because they describe general mechanisms or influences. They are not so much derived from theory as they are chosen based on simple logic, as well as the ideas picked up during the first interview round. In all, it will not be possible to come to more precise definitions because of the general nature of decisions that influence fixed costs levels: as pointed out repeatedly, such decisions are based on many different choices (though all these choices are captured in a financial evaluation).

It is difficult to come to any rigorous deduction of what should be important, since this would require a 'cost theory of the firm'. However, it also seems that the empirical foundation of the ideas presented in chapter 4 is rather weak. One could ask, with the benefit of hindsight, if the deduction of these issues could better be done by some 'grounded theory' approach (Glaser and Strauss, 1967), or at least if a thorough analysis of the firms presented in the first interview round would provide some validation of our 'theory' from section 4.5.1. This feeling also lingers in our minds, as is demonstrated by our presenting it as a 'theory' (in quotes). A not so strong, but very real answer to this is that a research project like the current one seems to have a life of its own, which does not always take the turns you would have wanted it to in retrospect. But more than that, we feel that the unique nature of a firm, coupled with the fact that we are looking into a very aggregate phenomenon, makes it difficult to generalize the findings. Note that we are not so much looking for what a firm does in which situations, but for the issues that *always* play a significant role – whatever the situation is. Since it is very difficult to separate the cost structure aspects from the 'normal' aspects involved in management decisions, taking individual situations within firms and analyzing them in greater depth than we have done in section 4.6.1 would not lead to much insight with respect to the

issue of the cost structure. To illustrate this point, note that no firm mentioned problematic relations with firms that supplied outsourced products or services. At the most, they were careful in structuring these relations, but always with a successful result. However, the literature (e.g. De Wit and Mol, 1999; Chase, Aquilano, and Jacobs, 1998; and more generally, transaction cost economics: Coase, 1936; Williamson, 1983) as well as common sense suggests that problems arise in practice. Another point with respect to the generalistic nature of the research is that it is difficult to produce any sort of theoretical sampling (Yin, 1994), because we are looking for the same issues with all firms.

Although the two interview rounds served more as idea generators and reflection periods, their input into the research process was essential. Not so much because of the empirical confirmation or rejection of hypotheses (which we didn't have anyway), as because of the fact that we were pointed in directions other than those that we were initially looking. More than once, we have noted that it is difficult to talk about operating leverage and the cost structure in practice. This complicated the structured finding of empirical data, or even less ambitiously, just finding empirical opinions on the subject. At one point, we seriously considered how we could establish the familiarity of the concept with managers in practice: should we just give some hints on what we wanted to discuss and see whether they could come up with a *dol* formula, or at least some definition of the cost structure? However, with hindsight, it reinforces our ideas about the way in which the issue can be tackled: by placing it in a wider context, by breaking it up into a simple capital budgeting decision at the core, and other influences, determinants and issues that surround it and ultimately work together to come to the resulting cost structure of the firm. This showed especially in the second interview round. Here, it became apparent that talking about fixed costs was much easier than talking about the cost structure or the operating leverage: there were more examples, more actions that could be identified. Talking about the cost structure leads to discussing the configuration and the technology of the production processes. Indeed, it leads to talking about *costs*. However, once we discussed the level of fixed costs, the attention was directed towards discussing ways and means to make costs more variable, especially in the support departments, towards margins, revenues and cash flows to be generated by filling up the capacity, towards minimizing unit fixed costs: it lead to discussing how the operations of the firm can be run to employ the cost structure, and what matters when a firm does that.

Finally, a note on the overall methodology of the research process. We did not follow a standard path in pursuing our research goal, and more than once we had trouble in justifying beforehand the steps that we took. For example, focusing on earnings variability in chapter 3 is not easily explained coming from the theoretical foundations of financial economics that we used up to then. Also, taking on fixed costs as the topic of interest in the next chapter, largely based on the mere impression that firms are not (always) comfortable with their level of fixed costs, required several pages to explain. Nevertheless, blessed with the perfect clarity that hindsight provides, we can now say that the problems encountered in measuring *dol* provided the necessary turn to take on a true managerial perspective of the cost structure. Otherwise, we might have succeeded

in empirically observing some optimal *dol*-level, of which we would have no idea how firms could reach it.

5.2 reflection on the results

Now that we are at the end of this thesis, we can ask the following question: when a manager finds himself at the end of the year with his financial figures, and calculates his firm's *dol,* what can he do with it? Basically, the answer would be nothing. That is to say, either it is too high, probably implying that the firm is too close to the break-even point and thus not making enough money, or it is 'all right'. In the first case, the firm has to rethink its operations, to see whether its overall profitability can be increased. In the second case, things are going along nicely, and there is no need to take any action, just because some target level of *dol* is or isn't met. Of course, the firm should constantly strive to increase its productivity and profitability, and doing this will, by definition, change its *dol.* But this is different from actually doing something to your cost structure because of unsatisfactory *dol*-levels.

The point that we are trying to make in this thesis, is that firms are generally conscious about their fixed costs levels, and as a result are faced with a cost structure that originates from several well thought-out decisions. Firms do not want to be financially inflexible, just as they do not want to be unprofitable. However, they do not always have the choice to do something about it, certainly not in the short run. On the other hand, even if the firm's *dol* is reasonable, chances are that it is actively looking for ways to better it, probably through increasing the profitability, perhaps also through increasing the variable part of total costs. Even more, it will be on the lookout for new markets, new products, better production processes, perhaps even new strategic directions.

In all, the operating leverage concept is extremely static. This may seem strange in light of our presenting the *dol* as a dynamic concept (see section 2.1), but here 'dynamic' means that we can identify it only if things (ie. sales) change. It is static, however, in that it assumes that the firm sees the changes in sales come, and then go, without doing anything to the firm's cost structure in response to the changes. This is a fundamental problem underlying many (if not all) management accounting and financial management models (see Kaplan, 1986b, p. 112).

One of the interviewees explicitly said during the conversation: 'Your way of thinking is wrong'. With respect to the introductory example of the operating leverage, along the lines of figure 2-1 from page 17, he mentioned: 'You start from the premiss that you have fixed costs regardless of your production levels. This is only interesting if you are growing, once things go the wrong way you need to do something about these cost levels.' Kaplan (1986b, p. 108–109) also makes this point:

> The standard setup for [quantitative models in management accounting] is to contemplate a variety of possible outcomes and assign probabilities to each of these possible outcomes ... From this setup we compute actions that maximize the expected value ... My current problem with this formulation is that it assigns a much too passive role to the manager. In effect, if a bad state of nature occurs (such as low demand for sales, a high production cost or a late delivery from a supplier), the manager shrugs his shoulders and consoles himself with the thought that even though a bad outcome occurred, he made the correct decision given the information he had at the time. Managers I speak with are much less resigned to

> bad outcomes. If a 'bad' state of nature seems to be developing, resourceful managers take additional actions, attempting to correct the adverse trend.

So what can we say about the operating leverage, the cost structure, and fixed costs? That they are both very important, and unimportant. The mechanisms they cause or represent are very real. However, they are not characteristics that can be managed to optimal levels; if any, it would be the minimal level possible, but always within the limits of the standard financial evaluations.

A final reassuring word on the essence and the necessity of business administration. Being the young discipline it is, business administration, and management, is constantly reflecting upon its nature and its relevance. There really is no need for this. The task of business administration is not to produce a complete map of the firm, with a full understanding of all the relationships in it, and the optimal levels for all relevant characteristics. If running a firm or organization were as simple as running a machine, we could make do with numbers like the degree of operating leverage, configure the operations in such a way that the optimal levels of the characteristics are obtained, sit back, and enjoy the stream of earnings the firm produces. Consider, however, what that would mean. As Clark (1923/1962, p. 480) put it in his classic volume:

> The ideal of the maker of machines is well expressed in the phrase: "fool-proof." This phrase describes a great deal more than a quality of a mechanism: it expresses an attitude toward the average man who uses it. An endless process of learning and growth by the method of trial and error – this is no part of the conception of life the machine has for its attendants and beneficiaries. "So simple a child can operate it" is a most attractive motto, until one stops to think what it means to a mature mind to spend its working hours doing things a child could do.

Fortunately, running a firm cannot be reduced to a fool-proof process. The task of business administration and management is to help those who run the firm to come to better decisions and better choices than they would make without the knowledge generated in this field of research. As long as the students and scholars of business administration realize this, the field has a bright and promising future.

appendices

i reconciliation of worldscope and firm financial statement

In section 2.5.6, starting on page 46, we perform empirical analyses on financial statement figures provided by Worldscope. To see how Worldscope changes (Dutch) financial statements in order to make them fit the standard Worldscope format, we present the financial statement of 1996 for Neways Electronics International, a company active in developing, producing and marketing electronic components and products. This company is chosen because it shows some of the typical Dutch features of financial statements, most notably the use of reserves and extraordinary items.

Neways: financial statement figures for 1996 (in '000 guilders)		
net sales	236,414	
change in work-in-progress and finished goods	(1,825)	
other operating revenues	684	
net operating revenues		235,273
costs of raw materials and procurements	117,703	
staff costs	75,588	
depreciation	5,243	
other operating expenses	27,339	
total operating expenses		225,873
operating income (*ebit*)		9,400
net equity in interest	133	
interest income	49	
interest expenses	(1,696)	
result of financial activities		(1,514)
pre-tax income		7,886
taxes		(3,324)
after-tax income		4,562
extraordinary after-tax results		1,748
net income		6,310

Neways: Worldscope figures for 1996 (in '000 guilders)		
net sales		**236,414**
cost of goods sold	195,116	
depreciation	5,466	
selling, general and administrative expenses	n.a.	
other operating expenses	27,339	
total operating expenses		**227,921**
operating income		**8,493**
non-operating interest income		49
change in reserves		(223)
net equity in interest		133
other income		684
ebit		**9,582**
interest expense on debt		1,696
pre-tax income		**7,886**
taxes		(3,324)
net income bef. extra. items/pref div		**4,562**
extraordinary after-tax results		1,748
net income		**6,310**

How can we reconcile these statements? The first difference lies in the treatment of the mutation in work-in-progress and finished goods. This mutation refers to changes in the economic value of this item. Since Neways reports work-in-progress and finished goods at cost price, the mutation implies writing off part of the inventory. As such, it can be viewed as an extra cost, and added to the total operating expenses. This is what happens. Furthermore, we need to know that the depreciation charge is reduced by a withdrawal from the reserves.[1] The notes to the financial statement show that this amounts to 223. This allows us to reconcile the following items, with FS denoting the figure from Neway's financial statement, and WS the figure as reported by Worldscope:

deprecation FS	5.243
+ reserves decrease	223
depreciation WS	5.466

operating expenses FS	225.873
+ reserves decrease	223
+ change in w.i.p. and finished goods	1.825
operating expenses WS	227.921

[1] note the difference between U.S. and Dutch accounting customs: it is very difficult to find a good English term for applying reserves. In fact, whereas reserves and provisions play an important role in Dutch financial statements, there are basic U.S. financial accounting textbooks in which they are not even an item in the index; see e.g. Horngren, Sundem, and Elliot (1996).

The costs of goods sold are a typical U.S. item. Under U.S. accounting rules, these costs may only include costs that are directly related to the production process, whereas the overhead costs related to selling, general, and administrative activities form their own item. This is because these overhead costs may not be included in the inventory. There is no similar item in Dutch financial statements, so it is calculated from scratch. Costs of goods sold are generally calculated as costs of materials and procurements plus staff costs. For Neways, the change in work-in-progress is included:

+ costs of materials and procurements	117.703
+ staff costs	75.588
+ change in w.i.p. and finished goods	1.825
costs of goods sold WS	195.116

The operating income as reported in Worldscope is generally as basic as possible, meaning that all non-operating items, as well as any extraordinary results are excluded. To get from the operating income as reported in the financial statement to the operating income in Worldscope format, we need the following corrections:

operating income FS	9.400
– other operating income	684
– reserve decrease for depreciation	223
operating income WS	8493

Finally, we can look at the operating income as reported in the financial statement, and the Worldscope *ebit* (note that there is only one *ebit*-like number in the financial statement). Now we need to include everything that happens before paying interest on debt and taxes (except for the extraordinary after-tax items):

operating income FS	9.400
+ equity in earnings	133
+ interest income	49
ebit WS	9582

The conclusion is that in the Worldscope format, operating income is the item that best represents *ebit* as the result from the normal operations. It is corrected for accounting adjustments like reserves changes, and aims to include only *operating* items.

ii time interval of sample observations

The tables presented in section 2.5.6, from page 46 on, are repeated, but now only with those firms that have information over the full 10 years.

method	mean	median	std dev	min	max	*n*
OVDOL	1.199	1.075	1.161	−1.546	4.775	61
MRDOL	1.046	0.974	0.699	−0.814	2.858	61
MRABS	1.426	1.141	1.823	−3.735	7.378	79
DOLDIFF	0.079	0.057	0.080	−0.044	0.413	79
ABSOPSAL	0.078	0.065	0.079	−0.102	0.328	79
ABSOPDA	0.105	0.092	0.084	−0.106	0.327	79
NOM	0.056	0.052	0.032	0.006	0.168	79

table ii-1 statistics for several *dol* measures from a sample of 79 non-financial Dutch firms over 1987–1997. OVDOL denotes the O'Brien and Vanderheiden method (2-42), MRDOL the Mandelker and Rhee method (2-34), MRABS the Mandelker and Rhee method with absolute values (2-36), DOLDIFF the use of first differences (2-46), ABSOPSAL the regression of operating income to sales, ABSOPDA the regression of operating income before depreciation and amortization to sales, NOM the average net operating margin; *n* denotes the valid number of firms for each method.

The reproduction of table 2-3 from page 49 shows several important differences, especially for the advanced methods. We see much smaller deviations, and the extremes are also much smaller, suggesting that the *dol* values become less erratic over time. Given the fact that the cost structure is less likely to remain stable over longer periods of time, this is not necessarily a good sign: it can also be caused by statistical effects. With more data-points, the overall growth trend can dominate, which the method of O&V apparently also cannot eliminate. The lower deviations of the alternative methods need also be interpreted with care: since this is the deviation of the sample, it means that the values tend to converge, suggesting that margins of firms cluster over time.

	t-test		Wilcoxon signed rank	Pearson correlation	Spearman correlation
	difference	significance	significance		
OVDOL	0.22	0.32	0.33	0.16	0.30*
MRDOL	−0.07	0.76	0.11	0.38**	0.51**
MRABS	−0.52	0.29	0.25	0.60**	0.64**
DOLDIFF	0.00	0.94	0.70	0.75**	0.74**
ABSOPSAL	−0.00	0.87	0.32	0.72**	0.80**
ABSOPDA	−0.01	0.35	0.65	0.70**	0.81**
NOM	0.00	0.71	0.70	0.95**	0.94**

table ii-2 comparison of *dol* values measured over 6 (1992–1997) and over 10 (1988–1997) years from a sample of 79 non-financial Dutch firms. OVDOL denotes the O'Brien and Vanderheiden method (2-42), MRDOL the Mandelker and Rhee method (2-34), MRABS the Mandelker and Rhee method with absolute values (2-36), DOLDIFF the use of first differences (2-46), ABSOPSAL the regression of operating income to sales, ABSOPDA the regression of operating income before depreciation and amortization to sales, NOM the average net operating margin. Since the Wilcoxon test produces a *Z*-statistic without any absolute meaning, it is not reported, only its significance; significance denotes the two-tailed significance of the two samples being from the same population, with * at the 0.05 level, ** at the 0.01 level.

In order to test the stability of the *dol* values, we have performed a paired sample *t*-test, as well as its non-parametrical equivalent, the Wilcoxon signed rank test (see table ii-2). Both the *t*-test and the Wilcoxon signed rank test fail to reject the hypothesis of no difference between the two periods for all methods. Also, the Spearman correlations are significant and positive. However, given the fact that we hoped that the measures would perform identically, we are not really thrilled by the results, again especially for those of the O&V and M&R techniques.

	normal Pearson correlation						
(1) OVDOL	1.00						
(2) MRDOL	0.26*	1.00					
(3) MRABS	0.08	0.91**	1.00				
(4) DOLDIFF	0.64**	0.36**	0.28*	1.00			
(5) ABSOPSAL	0.06	0.67**	0.67**	0.48**	1.00		
(6) ABSOPDA	–0.02	0.47**	0.53**	0.40**	0.90**	1.00	
(7) NOM	0.06	0.18	–0.10	0.23*	0.45**	0.54**	1.00
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	non-parametric Spearman correlation						
(1) OVDOL	1.00						
(2) MRDOL	0.28*	1.00					
(3) MRABS	0.13	0.90**	1.00				
(4) DOLDIFF	0.66**	0.35**	0.30**	1.00			
(5) ABSOPSAL	0.13	0.75**	0.78**	0.48**	1.00		
(6) ABSOPDA	0.09	0.51**	0.58**	0.39**	0.88**	1.00	
(7) NOM	0.10	0.17	–0.10	0.35**	0.48**	0.57**	1.00
	(1)	(2)	(3)	(4)	(5)	(6)	(7)

table ii-3 correlations of the *dol* measures from a sample of 79 non-financial Dutch firms over 1988–1997. OVDOL denotes the O'Brien and Vanderheiden method (2-42), MRDOL the Mandelker and Rhee method (2-34), MRABS the Mandelker and Rhee method with absolute values (2-36), DOLDIFF the use of first differences (2-46), ABSOPSAL the regression of operating income to sales, ABSOPDA the regression of operating income before depreciation and amortization to sales, NOM the average net operating margin;* denotes a two-tailed significance at the 0.05 level, ** at the 0.01 level.

When we look at table ii-3, the reproduction of table 2-4 from page 50, we see a very erratic pattern. If we concentrate on the results of the non-parametric Spearman correlation analysis, we have lost several significant relations. Most troublesome of these is the absence of a negative correlation of the advanced techniques of O&V and M&R with the net operating margin, further suggesting that this can not be interpreted as an inverse indicator of operating leverage. The correlations of MRDOL with the other alternative measures on the other hand are remarkably stable.

The correlations between firm characteristics and *dol*-values, reported in table ii-4 below, show a moderate but consistent increase for the alternative measures when compared to table 2-5 from page 53, suggesting that they are relatively stable. As for the correlations with the O&V and M&R methods, we have lost the significant correlations that had the wrong sign for OVDOL, and have even gotten one back with the correct sign for MRDOL. However, the overall picture is still one of total absence of any relationship between these methods and the firm characteristics.

	sales / tot ass	sales / fix ass	fixed / tot ass	ppe / tot ass	depr / tot ass	depr / op exp	staff / op exp	depst / op exp
OVDOL	–0.11	0.07	–0.07	–0.04	–0.05	0.05	0.05	0.08
MRDOL	–0.17	–0.07	0.22°	0.00	–0.05	0.03	–0.10	–0.07
MRABS	–0.06	–0.07	0.07	–0.06	–0.15	–0.04	–0.12	–0.09
DOLDIFF	–0.34**	–0.27**	0.00	–0.01	–0.16	0.14	0.38**	0.39**
ABSOPSAL	–0.41**	–0.35**	0.23*	0.19°	0.05	0.30**	0.16	0.23°
ABSOPDA	–0.45**	–0.09	0.38**	0.38**	0.28*	0.46**	0.16	0.28**
NOM	–0.51**	–0.34**	0.29*	0.34**	0.14	0.42**	0.34**	0.41**

table ii-4 Spearman correlations between *dol*-values and firm characteristics for 79 non-financial Dutch firms over 1988–1997. OVDOL denotes the O'Brien and Vanderheiden method (2-42), MRDOL the Mandelker and Rhee method (2-34), MRABS the Mandelker and Rhee method with absolute values (2-36), DOLDIFF the use of first differences (2-46), ABSOPSAL the regression of operating income to sales, ABSOPDA the regression of operating income before depreciation and amortization to sales, NOM the average net operating margin; ppe is property, plant and equipment, depr is depreciation, op exp is operating expenses, staff is staff costs, depst is depreciation plus staff costs. ° denotes a two-tailed significance at the 0.10 level, * at the 0.05 level, and ** at the 0.01 level.

Finally, comparing the results of the 10-year sample in table ii-5 with those of table 2-6 on page 54, we see several major differences. Of these, the differences with respect to the accounting performance characteristics are the most troublesome. For example, the R^2 of the logarithm of the operating income, which can be interpreted as an inverse measure of the detrended variability, now shows large positive correlations for the M&R-methods. Also, individual correlations show large shifts, with the most extreme example being the correlation of net operating margin with the variation coefficient of operating income: from significantly negative (–0.31) to significantly positive (0.36). These changes make interpretation of the results difficult, and more than somewhat doubtful.

	roa	tsr	beta	vc oper income	R^2 ln op income	av sales	av sales growth
OVDOL	0.08	-0.15	0.03	-0.38**	-0.37**	-0.03	-0.13
MRDOL	0.09	0.37**	-0.01	0.48**	0.47**	0.14	-0.16
MRABS	-0.16	0.15	0.01	0.13	0.44**	0.02	-0.19°
DOLDIFF	0.14	-0.01	0.19°	-0.25*	-0.17	0.02	-0.15
ABSOPSAL	0.22°	0.27*	0.03	0.29**	0.50**	-0.04	0.00
ABSOPDA	0.30**	0.24*	-0.01	0.29**	0.39**	0.03	0.02
NOM	0.67**	0.24*	0.04	0.36**	0.29*	0.02	0.35**

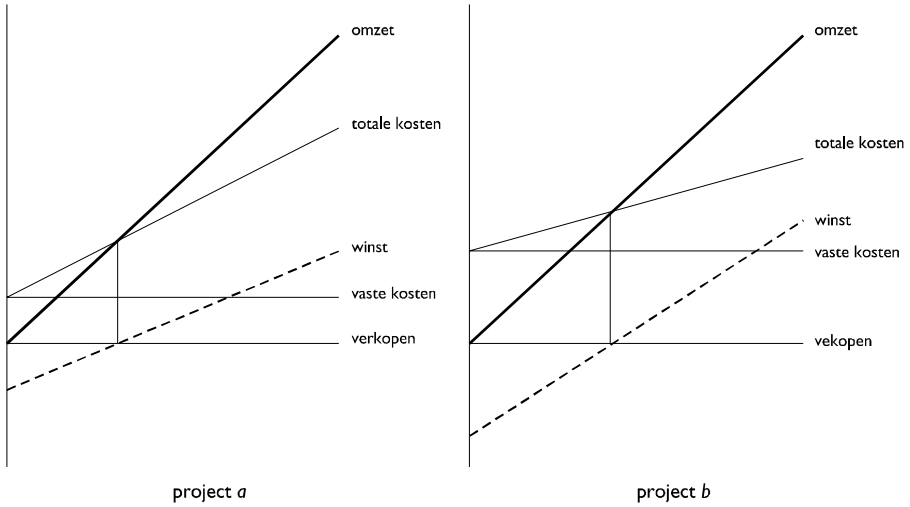
table ii-5 Spearman correlations between *dol* values and firm characteristics for 79 non-financial Dutch firms over 1987–1997. OVDOL denotes the O'Brien and Vanderheiden method (2-42), MRDOL the Mandelker and Rhee method (2-34), MRABS the Mandelker and Rhee method with absolute values (2-36), DOLDIFF the use of first differences (2-46), ABSOPSAL the regression of operating income to sales, ABSOPDA the regression of operating income before depreciation and amortization to sales, NOM the average net operating margin; roa is average return on assets, tsr is average total shareholder return (capital gains plus dividends), beta is the β as reported by Worldscope, vc oper income is the variation coefficient (standard deviation/average) of operating income, R^2 ln op income is the coefficient of determination for the regression of the logarithm of operating income to time. ° denotes a two-tailed significance at the 0.10 level, * at the 0.05 level, and ** at the 0.01 level.

samenvatting

De hefboomwerking van de kostenstructuur of *operating leverage* is een concept dat al geruime tijd bekend is in de financiële theorie en de bedrijfskunde. Maar terwijl het financiële equivalent hefboomwerking van de vermogensstructuur of *financial leverage* zich al jaren in grote belangstelling mag verheugen, is de aandacht voor de kostenstructuur op zijn minst beperkt te noemen. Deze constatering is de aanleiding geweest voor het onderzoek dat heeft geleid tot dit proefschrift. Het is namelijk eenvoudig duidelijk te maken dat het mechanisme van de hefboomwerking van de kostenstructuur in de praktijk een grote invloed kan hebben op de (financiële) resultaten van een onderneming, waarschijnlijk nog wel meer dan de financiële hefboomweking. Het doel van dit proefschrift is om de hefboomwerking van de kostenstructuur te doorgronden, de rol die hij speelt in het presteren van de onderneming te verklaren, en aan te geven of, en zo ja hoe, hij kan worden toegepast in de praktijk van het besturen van ondernemingen.

operationele hefboomwerking

De hefboomwerking van de kostenstructuur kan worden uitgelegd met behulp van het volgende voorbeeld. We beschouwen twee manieren (projecten) om eenzelfde product te fabriceren. Project *a* heeft lage vaste kosten, en hoge variabele kosten. We kunnen denken aan een productiemethode met veel mankracht en weinig machines, waarbij de arbeidskosten als variabel beschouwen. Project *b* is verregaand geautomatiseerd, en vergt substantiële investeringen in machines. Als we de kostenlijnen van deze twee projecten in een figuur uitzetten, krijgen we figuur s-1. We zien dat het break-even punt bij project *b* verder naar rechts ligt, en dus pas bereikt wordt bij hogere verkopen. Ook loopt dat de winstlijn van project *b* aanzienlijk steiler. Dit wordt van belang als de verkopen gaan fluctueren. Een schommeling in het aantal verkochte eenheden zal bij project a veel minder invloed hebben op de winst dan bij project *b*. Dat is de hefboomwerking van de kostenstructuur. In de praktijk zien we dat chemische bedrijven zoals DSM – met veel vaste kosten als gevolg van grote installaties – een veel grotere gevoeligheid hebben voor omzetschommelingen dan een handelsonderneming als Ahold, waarbij de kosten voor een belangrijk deel variabele inkoopkosten zijn.



figuur s-1 twee projecten, gelijke omzetlijn, verschillende winstlijnen: het basisprincipe van de hefboomwerking van de kostenstructuur.

Gezien de aard van het fenomeen ligt het voor de hand om de effecten van de hefboomwerking te meten met de gevoeligheid van de winst voor omzetschommelingen:

$$dol = \frac{\Delta\%bedrijfsresultaat}{\Delta\%omzet} \qquad \text{(s-1)}$$

Deze gevoeligheid wordt *degree of operating leverage (dol)* genoemd: de 'mate van hefboomwerking van de kostenstructuur'. We zullen het in deze samenvatting dan ook maar over *dol* hebben. Omdat we geïnteresseerd zijn in de kostenstructuur, gebruiken we als winstbegrip het bedrijfsresultaat. Dat is het resultaat voor belastingen, interest en bijzondere posten, dus het operationele resultaat. De interpretatie van *dol* is helder: een *dol* van 2 impliceert dat een omzetstijging van 10% leidt tot een winststijging van 20%. Andersom werkt hij ook: een omzetdaling van 10% leidt dan tot een winstdaling van 20%.
Als we de randvoorwaarden van de break-even analyse aanhouden, die er op neer komen dat alleen de prijs mag variëren, kunnen we *dol* ook als volgt schrijven:

$$dol = \frac{q(p-v)}{q(p-v)-F} \qquad \text{(s-2)}$$

Hierin staat q voor het aantal verkochte eenheden, p voor de prijs per eenheid, v voor de variabele kosten per eenheid, en F voor de vaste kosten. Deze formule laat duidelijk zien waar de hefboomwerking vandaan komt, namelijk de aanwezigheid van vaste kosten. Immers, als F nul is, is *dol* 1, en vindt er geen versterking van omzetschommelingen plaats. Als we formule (s-2) nader bekijken, zien we dat elk afzetniveau zijn eigen *dol*-waarde heeft. Dat betekent dat de *dol* geen uniek kenmerk van een onderneming is. Het gebruik van formule (s-2) om de *dol* te evalueren dient bovendien te gebeuren met het besef dat hij is afgeleid onder de weinig realistische

randvoorwaarden van de break-even analyse. Volgens de formule ligt de *dol* van een winstgevende onderneming altijd boven 1. Als we echter de elasticiteit (s-1) gebruiken op echte cijfers van ondernemingen kan deze ook voor ondernemingen die winst maken onder de 1 liggen, of zelfs negatief zijn.
Theorievorming rond de kostenstructuur heeft plaatsgevonden binnen het kader van het *capital asset pricing model* CAPM. Mandelker en Rhee (1984) hebben een heldere formulering gevonden voor het verband tussen het systematisch risico β uit dit model en de kostenstructuur. Hierbij maken ze gebruik van de *degree of financial leverage (dfl)* als maat voor de vermogensstructuur, gedefinieerd als de elasticiteit van de nettowinst naar het bedrijfsresultaat. Ze vinden het volgende

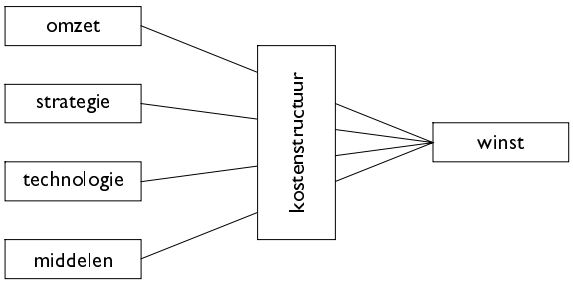
$$\beta = dol \cdot dfl \cdot \beta^0 \qquad \text{(s-3)}$$

Deze formule zegt dat het systematisch risico van een onderneming bestaat uit het intrinsieke ondernemingsrisico β^0, de hefboomwerking van de kostenstructuur, en de hefboomwerking van de vermogensstructuur. Het intrinsieke ondernemingsriciso ontstaat als gevolg van de concurrentiepositie die de onderneming in de markt heeft. Dit risico wordt versterkt door de aanwezigheid van vaste lasten, zowel financieel (rente) als operationeel (vaste kosten). De kostenstructuur beïnvloedt dus de risico-positie van de onderneming.
Omdat het niet mogelijk is om vaste en variabele kosten van een onderneming uit het jaarverslag te halen, moet de *dol* gemeten worden met de elasticiteit (s-1). Daarbij willen we over een aantal jaren kijken, om zo tot een stabiele waarde voor *dol* te komen. Er zijn verscheidene methodes gesuggereerd in de literatuur om de *dol* te meten, die allemaal nadelen hebben. Een nog groter probleem is dat de 'echte' *dol* van een onderneming niet beschikbaar is, waardoor ook niet is vast te stellen welke methode het dichtst in de buurt komt. Toepassing van de methodes op een bestand met jaarrekeningen van Nederlandse ondernemingen levert dan ook niet een duidelijke winnaar op. Dat is vervelend, want we hebben geen theoretisch optimale waarden voor *dol,* en we kunnen nu dus ook niet met behulp van empirische data eventuele 'advieswaarden' uit de praktijk afleiden.
De resultaten van de literatuurstudie, bespreking van theorie en emprische toetsen laten zien dat de hefboomwerking van de kostenstructuur een belangrijk fenomeen is, dat helpt in het verklaren van ondernemingsprestaties. Een kostenstructuur met veel vaste kosten zal in geval van omzetfluctuaties tot grotere schommelingen in de winst leiden. We kunnen echter geen conclusies trekken over optimale waardes voor *dol,* of een algemeen geldende relatie tussen kostenstructuur, ondernemingskenmerken en ondernemingsprestaties afleiden uit theorie of praktijk.

kostenstructuur

Het probleem met de benadering van de hefboomwerking van de kostenstructuur, gemeten met de *dol,* is gelegen in het feit dat we ons concentreren op één getal. Hoewel dat getal niet goed is te gebruiken om tot praktische bevindingen te komen, laat staan dat het is om te zetten in praktische aanbevelingen, is het mechanisme achter het getal wel degelijk van belang. Daarom verschuiven we onze aandacht naar de

kostenstructuur, dus naar de samenstelling van de kosten en naar de omzet die ermee gegenereerd wordt. We kijken niet meer naar het resultaat van de kostenstructuur, maar naar de invloeden en determinanten.
Als eerste gaan we daarbij in op het belang van winstvariabiliteit. Hoewel de Mandelker en Rhee formule (s-3) duidelijk maakt dat de kostenstructuur binnen het CAPM belangrijk is, laten we dit theoretische raamwerk nu los. De kostenstructuur uit zich in de variabiliteit van de winst; door het belang van een stabiele winstontwikkeling, en daarmee van beperkte winstvariabiliteit, te bespreken vinden we een verdere onderbouwing voor het belang van de kostenstructuur. In de financiële theorie, accounting (externe verslaggeving) en strategisch management wordt het belang van een stabiele winstontwikkeling onderkend.
We wijzen een aantal variabelen aan die een rol spelen in de mate waarin de winst varieert. Daartussen positioneren we kostenstructuur. Dit conceptuele model, weergegeven in figuur s-2, relativeert de rol van de kostenstructuur. Ze is niet langer de doelvariabele die een optimale waarde toegekend moet krijgen, maar ze beïnvloedt wel de mate waarin de variabelen doorwerken in de winstvariabiliteit. Het probleem met de variabelen is dat de aard van de beïnvloedingslijnen niet eenduidig is: een variatie in de omzet wordt via de kostenstructuur omgezet in een variatie in de winst, maar de aard van de markt (marktgroei, concurrentie) zal ook de keuze voor de kostenstructuur bepalen.



figuur s-2 een conceptueel model dat het belang van de kostenstructuur in perspectief plaats.

Om een beter idee te krijgen over de mate waarin het model bijdraagt aan begrip van de kostenstructuur zijn een aantal controllers geïnterviewd over het belang van de kostenstructuur en de variabelen die een rol spelen. Uit de gesprekken komt naar voren dat de kostenstructuur niet gezien wordt als iets wat de onderneming als zodanig bewust kiest: de kostenstructuur is een gevolg van een reeks beslissingen, die betrekking hebben op technologische mogelijkheden en marktomstandigheden, maar ook op beheersing *(control)*, flexibiliteit, en uiteraard de financiële aspecten. Het relativeren van het belang van de kostenstructuur door niet op zoek te gaan naar een optimale *dol* lijkt dus terecht.
Tegelijkertijd echter blijkt het moeilijk te zijn om de kostenstructuur en kostenbewustzijn in het algemeen uit elkaar te houden. De variabelen die we op basis van de literatuur en logisch nadenken hebben uitgekozen komen allemaal in meerdere of mindere mate terug in de gesprekken, maar een duidelijke invulling van de lijnen in figuur s-2 is niet mogelijkz. Dat komt juist omdat de kostenstructuur 'slechts' een

mechanisme is: er is geen reden waarom bepaalde marktomstandigheden, of een zekere strategie, zouden moeten leiden tot een specifieke kostenstructuur. En andersom is het niet zo dat een bepaalde combinatie van vaste en variabele kosten tot een bepaalde winstgevendheid leidt.
De benadering van de kostenstructuur met een model als figuur s-2 helpt in het verder begrijpen van de rol die de kostenstructuur speelt, maar brengt ons nog steeds niet bij goede beschrijving van de praktijk. Daartoe grijpen we naar de basis van de hefboomwerking: vaste kosten.

vaste kosten

De kostenstructuur lijkt nog steeds een te algemeen, te veelomvattend begrip. Door te concentreren op een onderdeel van de kostenstructuur, de vaste kosten, hopen we verder te komen. Die hoop is vooral ingegeven door de ervaringen opgedaan tijdens de gespreksronde: vrijwel alle gesprekspartners hadden het gevoel dat ze met veel, zo niet teveel vaste kosten zaten – ook in ondernemingen waar de kostenstructuur vooral veel variabele kosten kende. Dat doet vermoeden dat vaste kosten een begrip zijn waar managers 'iets mee kunnen'.
We beginnen met het bespreken van vaste kosten. Standaard worden die gedefinieerd als kosten die niet variëren met het volume van de productie. Hoewel een precieze definitie lastig is te geven, is een belangrijk kenmerk dat ze niet 'vanzelf' weggaan: afschrijvingen gaan altijd door, personeel in vaste dienst krijgt elk maand salaris, de huur van het kantorenpand moet elke maand overgemaakt worden.
Vervolgens gaan we in op flexibiliteitsmanagement. Vaste kosten en flexibiliteit lijken elkaar te bijten. Het is derhalve mogelijk dat de flexibiliteitsliteratuur manieren biedt om de invloed van vaste kosten op de algemene flexibiliteit te beperken – waarbij algemene flexibiliteit in ons geval zich moet uiten in een lage winstvariabiliteit. De literatuur richt zich echter vooral op *ingebouwde* flexibiliteit van processen: hoe de processen zo te structureren dat ze in de bestaande configuratie zoveel mogelijk flexibiliteit bieden. Dat is een zeer nuttige vorm van flexibiliteit, maar niet helemaal wat we zoeken. We willen immers weten hoe ondernemingen omgaan met vaste kosten, en hoe ze de invloed van die vaste kosten kunnen verminderen.
Daarom stellen we een overzicht op van 'vaste kosten-maatregelen': maatregelen die het management kan nemen die het belang van de vaste kosten beïnvloeden. We praten over belang, omdat vaste kosten ook relatief lager kunnen worden door meer omzet, en dus meer dekkingsbijdrage met hetzelfde vaste kostenniveau te genereren. We kijken naar de gevolgen van de maatregelen voor drie belangrijke ondernemingskenmerken: volume (capaciteit), de product mix, en de omzet. Deze gevolgen zetten we uit tegen de invloed die de maatregelen hebben op het break-evenpunt. Dit heeft als grote voordeel dat we niet hoeven uit te gaan van een bepaald prestatieniveau, terwijl we toch iets kunnen zeggen over de invloed van de maatregelen op de risicopositie van de onderneming.
De maatregelen dienen in de eerste plaats te worden beoordeeld op hun financiële resultaat. Er zijn echter nog andere aspecten die een rol spelen bij het uitvoeren van de maatregelen: technologie, beheersing *(control)*, relaties met leveranciers en afnemers, en

strategie. Ook flexibiliteitsoverwegingen kunnen een grote rol spelen, maar die zullen in het algemeen beter te kwantificeren zijn en dus in de financiële analyse meegenomen kunnen worden. Met behulp van deze aspecten kunnen we een aanzet geven tot een 'theorie' van het management van vaste kosten: er van uitgaande dat een onderneming zoveel mogelijk flexibiliteit wil hebben, zal ze de vaste kosten omlaag brengen tot het moment waarop bepaalde randvoorwaarden (aspecten) gaan overheersen. Na de technologie zal dat meestal de financiële randvoorwaarde zijn, die zich uit in bijvoorbeeld schaalvoordelen. Maar de beheersings- en relatie-aspecten kunnen er ook toe leiden dat het vaste kostenniveau hoger is.
In een tweede interviewronde blijkt inderdaad dat praten over vaste kosten makkelijker is dan praten over de kostenstructuur, en er is meer aandacht voor het variabel maken van kosten naast het algemene kostenbewustzijn dat ook weer ter sprake komt. We kunnen de aspecten gebruiken in het verklaren van de aanwezige kostenstructuren. Hiermee zijn we dan eindelijk aanbeland bij ons doel: een goed begrip van de (hefboomwerking van de) kostenstructuur. Dan gaat het niet alleen om het belang van de kostenstructuur in het presteren van de onderneming, maar ook om wat belangrijk is in het bepalen van die kostenstructuur, en dus waar een onderneming op moet letten bij beslissingen die de kostenstructuur beïnvloeden.

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It was just before the break of day and the three kings were tumbling along the road. The first one's nose had been mysteriously fixed, the second one's arm had healed and the third one was rich. All three of them were blowing horns. "I've never been so happy in all my life!" sang the one with all the money.

– bob dylan, liner notes to *john wesley harding*