

Research Report 9913/A

Determinants of firm size

A survey of literature

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Contents

1	Introduction	.5
1.1	Motivation and objective	.5
1.2	Research approach	.6
1.3	Structure of the study	.8
2	Developments in firm size in the Netherlands	.9
2.1	Dimensions of scale	.9
2.2	Size in Dutch industries	.10
3	Determinants of scale at the firm level	.17
3.1	Economies of scale and scope	.17
3.1.1	Economies of scale	.17
3.1.2	Diseconomies of scale	.21
3.1.3	Economies of scope	.26
3.1.4	Diseconomies of scope	.27
3.1.5	Economies of scale and scope and firm size	.29
3.2	Transaction-costs theory	.31
3.2.1	Transaction costs and firm size	.33
3.3	Agency-costs theory; motivation of individuals	.35
3.3.1	Agency costs and firm size	.37
3.4	Demand factors and life cycles of firms	.39
3.5	Concluding remarks	.41
4	Determinants of scale at the sectoral level	.43
4.1	External economies of scale	.43
4.2	Network externalities	.45
4.3	Standard setting and lock-in effects	.48
4.4	Concluding remarks	.51
5	Trends and structural changes in firm size	.53
5.1	Strategic trends and basic mechanisms	.53
5.1.1	Globalization	.54
5.1.2	Technological development	.56
5.1.3	Deregulation and liberalization	.59
5.1.4	Other trends	.61
5.2	Concluding remarks	.64
	Literature	.67

1 Introduction

The subject of this study is the rationale behind two, at first sight conflicting trends: on the one hand we see a strong growth in the number of mergers and acquisitions, and on the other there is much attention for the (perceived) growing importance of small and medium-sized enterprises (SMEs) for the economy. While many firms grow larger and larger, government policy is focusing on the small firm, entrepreneurship and start-ups of new firms, since they are supposed to stimulate economic growth through a more dynamic economy.

1.1 Motivation and objective

This study primarily serves the objective of an update and increase of knowledge about scale and determinants of scale (see also previous EIM studies; among others Carree and Thurik, 1997, and Peters and Lever, 1996). This study will be useful for other EIM research where better understanding of scale effects is needed, for instance in model updates or studies looking at differences between SMEs and large firms. The study is further aimed at researchers and policy makers interested in the backgrounds of differences in firm size within sectors and countries.

This study intends to give an overview of the most important ‘basic mechanisms’ that are relevant to explain firm size and size distribution, with the objective of improving our understanding of changes in scale and scale distribution. Since we want to find explanations for actual scale and not the optimal (‘technical’) scale, we take into account cultural and institutional factors and the dynamic situation of the environment of firms as well. Hence, the objective is:

- To give a literature overview of the determinants of firm size and size distribution (‘basic mechanisms’), and to assess how structural trends can influence the relative importance of basic mechanisms for firm or sector size and how they can change firm or sector size.

The following questions are taken as a starting point:

1. How can the development of firm size in the Dutch economy be described?
2. From which analytical viewpoint(s) should we deal with scale and scale distribution?

3. Which determinants of scale (basic mechanisms) can be found in economic theory, and how do they interact?
4. Can we illustrate the basic mechanisms using examples of recent developments in firm size?
5. How do structural trends affect the relative importance of basic mechanisms in general, and in the actual Dutch situation?

The emphasis in the study is on question 3, the determinants of scale. Clearly, this question should be followed by the question which weights can be attached to every determinant of scale, for different sectors. This (ambitious) question goes beyond the scope of the present study, but an empirical elaboration of the determinants of scale would certainly be an interesting subject for further research.

1.2 Research approach

In this paper we shall try to unravel all different factors that determine the size of a firm and the differences in size between at first sight comparable firms. To satisfy the objective of this study, the research approach follows five steps (see the research questions in section 1.1), of which step two is elaborated more extensively below.

- Step 1: Describe the statistical development of firm size in the Netherlands
- Step 2: Analytical viewpoint for looking at determinants of scale
- Step 3: Describe determinants of scale at three levels of analysis
- Step 4: Find practical examples of theoretical issues
- Step 5: Syntheses of scale trends and basic determinants of scale.

Step 2: Analytical viewpoint

'Basic Mechanisms'

To structure the description of theories about why firms are large or small and why sectors can have skew size distributions, we deal with scale from two different viewpoints. The viewpoint of the individual firm, and that of the sector (or cluster, or sometimes the relevant market) in which firms are incorporated.

At both levels, there are relevant attributes of the firm or the sector, that correspond with different theoretical determinants of scale. For instance, at the firm level the costs structure of a firm determines whether economies of scale are relevant for that firm or not. At the sectoral level, these relationships are less direct, but for instance the observation of a positive attitude towards co-operation in a sector, may correspond with the existence of 'external economies of scale'. Figure 1.1 shows which 'basic mechanisms' or determinants of scale

we shall discuss per level of analysis. The two levels of analysis cannot be strictly separated in practice; they are separated only for the clarity of the description.

Figure 1.1 'Basic mechanisms' determining scale at the firm and the sectoral level

Level 1: The firm; micro

- ⇒ (internal) economies of scale and scope; indivisibilities, organization effects, etc.
- ⇒ transaction-costs theory
- ⇒ agency-costs theory
- ⇒ life cycle of the firm, demand characteristics

Level 2: Sectors and clusters; meso

- ⇒ external economies of scale and scope
 - ⇒ network effects
 - ⇒ standard setting and lock-in strategies
-

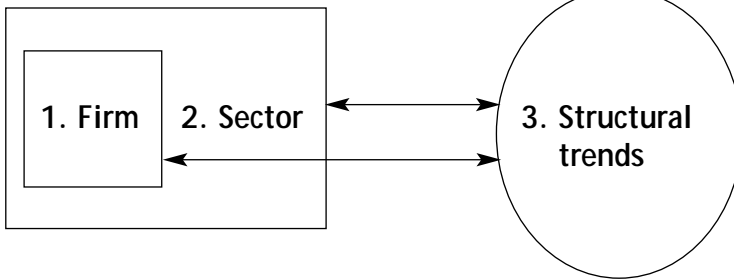
To describe the basic mechanisms, we extensively searched the relevant literature. There are some important articles and books on which parts of this report are based. The article of You (1995) was very important in our description of the economies of scale and scope and transaction-costs theory. Williamson (1998) was also important for describing transaction-costs theory. Another important article for the description of agency-costs theory, but also for transaction costs, was that of Holmstrom and Roberts (1998). To describe the external economies of scale the article of Oughton and Whittam (1997) was relevant and the articles of Liebowitz and Margolis (1994) and Arthur (1989, 1997) were used to describe the network externalities and standard setting mechanisms. Furthermore, very important literature was the book of Pratten (1991), and the industrial organization literature in Schmalensee and Willig (1989) and Scherer and Ross (1990).

Strategic trends and basic mechanisms

The basic mechanisms from figure 1.1 are helpful in explaining why firms and sectors have different optimal sizes. However, we are also looking for explanations for the changes in firm size and size distribution. Therefore, we combine the basic mechanisms with relevant structural trends that influence these mechanisms (see figure 1.2).

Figure 1.2 Basic mechanisms and structural change

Basic Mechanisms



The present study deals with structural trends that are relevant for firm size. The trends are described only briefly. The emphasis is on the relation between trends and the determinants of scale at the firm and the sectoral level. How do trends affect the basic mechanisms and how does (could) that work out on firm size and size distribution? It should be noted that these questions will certainly turn out to be too ambitious to answer them in a scientifically sound manner. Still, we find them too interesting to leave them totally unanswered.

1.3 Structure of the study

The report starts in Chapter 2 with a brief description of the size distribution and recent developments in size and size distribution of the Dutch economy. Chapters 3 and 4 give an extensive literature overview of the relevant theoretical determinants of scale, at the firm level in Chapter 3 and at the sectoral level in Chapter 4. The theoretical issues are illustrated with examples from firms or sectors where interesting developments in scale can be seen. In Chapter 5 we deal with structural trends that are relevant for firm size and these trends are described in short. The effects of strategic trends on the basic mechanisms of Chapters 3 and 4 are elaborated.

2 Developments in firm size in the Netherlands

To illustrate the relevance of the questions in the introduction, this section looks at firm-size distribution, developments in average firm size and the number of mergers and acquisitions in the Netherlands. The following aspects are elaborated:

1. The skewness of the firm-size distribution in the Netherlands per sector
2. Development of average firm size and size distribution per sector
3. Development of mergers and acquisitions per sector.

2.1 Dimensions of scale

Before discussing determinants of scale, scale itself should be defined. Pratten (1991) mentions the following dimensions of scale:

Dimensions of scale

Dimensions affecting efficiency of production

- Total output of the product
- Duration of product runs
- The rate of production per unit of time
- The extent of standardization
- The capacity of the plant unit & equipment
- The total plant capacity
- The overall size of a complex of plants at one site
- The extent of vertical integration
- Location (proximity to consumers and transport costs)

Dimensions affecting selling/distribution costs

- Sales per customer
- The number of customers
- The geographic concentration of customers

Overall dimensions of scale:

- The size of outlets
 - The size of firms
 - The size of an industry (average size & size distribution)
 - The scale of a national economy
-

The dimension of scale is often related to number of employees or sales, but it can also be related to the average size of the industry, so that a company with (far) more than 100 employees can still be small. In the Netherlands the following definition is generally used. This definition is related to the number of employees:

- Small firms: 0-10 employees
- Medium sized firms: 10-100 employees
- Large firms: ≥ 100 employees.

In the figures of the next section the above division of size will be used.

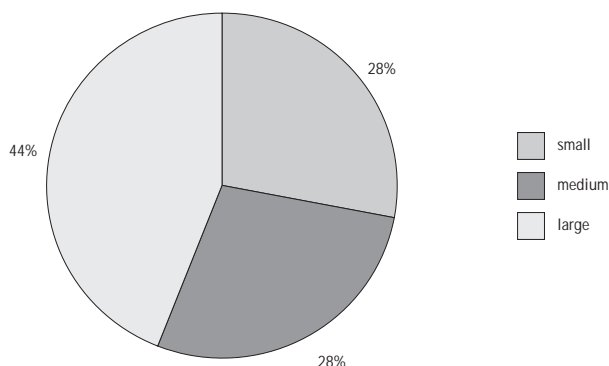
2.2 Size in Dutch industries

In this section we give an impression of the (changes in) size distribution of firms in the Netherlands. It is often expected that the strong increase in mergers we see over the last decade, should have to increase average firm size. However, besides many mergers, the number of new start-ups has also grown very fast. Entrepreneurship is often seen as the key to economic growth and innovation. This latter development, together with the many split-ups that follow from mergers, could cause a decrease in average firm size. Looking at the statistics, we see that average firm size decreases only slightly over the last 10 years. The dynamics within sectors, however, are extremely high.

Size distribution

Figure 2.1 shows the size distribution of firms, measured by the number of employees (in labour years) in 1998. Ten years earlier, in 1988, the division in firm size was not very much different. Large firms had a slightly smaller share (42% instead of 44%) and medium-sized firms had a slightly larger share (30% instead of 28%). When we investigate the size distribution of the number of firms, the figure looks quite different. Most firms are small (90%), while less than 1% of all firms is large. In the number of firms, the strongest growth over the last 10 years was in medium-sized firms. While the total number of firms increased by 30% between 1988 and 1998, the number of medium-sized firms increased by 44%. The number of small and large firms increased by 29% and 30%, respectively. Taken together with the employment figures, we can conclude that while medium-sized firms increased strongly in number, their employment share decreased. This can be explained by the fact that the (for the largest part) positive economic situation in this decade, caused the small firms to grow strongly and thus become medium-sized, while the strong medium-sized firms grew to more than 100 employees and became large.

Figure 2.1 Distribution of employment among small, medium-sized and large firms in the Netherlands, 1998



Source: Bakker, van Noort and Verhoeven, 1999.

From Bakker, van Noort and Verhoeven (1999) it follows that on average, labour volume per company decreased only slightly in the period 1988 to 1998, from 8.5 labour years per company to 8.0 labour years. In most sectors, average firm size decreased, particularly in manufacturing, construction and in the financial services sector. Only in the sectors retail trade, hotel & catering, transport and employment agencies firm size on average increased in the ten years between 1988 and 1998. Table 2.1 shows the average firm size per sector in 1988 and 1998.

The total average firm size is also shown excluding the employment agencies. In that case average firm size decreases stronger, from 8.2 to 7.4 employees per enterprise between 1988 and 1998. The employment agencies are left out because when they are included, the importance of the large firms is overestimated. Employment agencies themselves are large firms, but they hire personnel to predominantly small and medium-sized firms. Bakker, van Noort and Verhoeven (1999) show that the change in firm size was largest in the last years of this 10-year period. Between 1988 and 1993 average firm size did hardly decrease.

After the employment agencies, the largest average firm size is found in manufacturing, transport and communication and the financial services sector. The sectors with the smallest average size are 'other services' (which exists predominantly of personal services) and hotel and catering services.

Table 2.1 Number of employees (in FTE) per company, per sector and size class, in 1998

	1988				1998			
	small	medium	large	total	small	medium	large	total
	employees per company							
manufacturing	4	35	411	24	3	29	317	19
building	4	30	262	10	3	24	273	8
reparation + trade in cars	3	20	104	5	3	19	285	5
wholesale trade	3	29	270	8	2	23	235	7
retail trade	2	21	822	4	3	22	684	5
hotel and catering	2	26	272	3	3	14	387	4
transport + communic.	3	29	560	12	3	26	546	13
financial services	2	17	869	18	2	15	872	12
business services	2	29	373	6	2	22	371	5
employment agencies	3	36	904	118	4	38	1,512	156
other services	3	39	260	4	2	23	317	3
total	2.6	29	434	8.5	2.5	24	424	8.0
total excluding employment agencies	2.6	29	417	8.2	2.5	24	374	7.4

Source: Bakker, van Noort and Verhoeven, 1999.

Dynamics in firm size

From the information described above, we can conclude that average firm size in all size classes decreased slightly between 1988 and 1998, and particularly in the last 5 years of this period. The aggregate division over size classes, however, did not structurally change over this period. Underlying sectoral changes were relatively large, which is shown below.

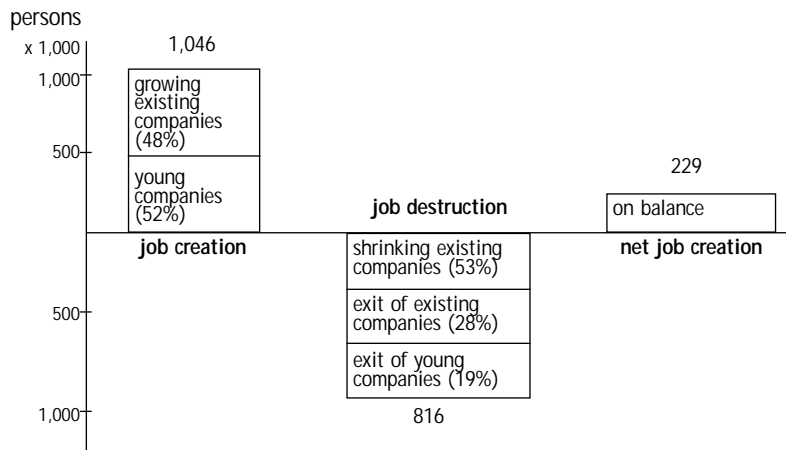
Bangma and Verhoeven (2000) describe the dynamics in the number of firms and employment. They distinguish new firms (starters plus new subsidiaries), existing firms and exit of firms. From their study it follows that the number of new firms per year increased from about 33,000 in 1987 to around 60,000 per year in 1998, of which around 42,000 are new start-ups. The number of affiliate firms increased even stronger than the number of new start-ups. The increase in exits of firms did not keep up with the growth of new start-ups and affiliate firms. There were 34,000 firm exits in 1998.

The new firms are relatively small, about 1.5 persons per firm for starters and 2.7 persons for new affiliates. Starters did not increase or decrease in size, while affiliates slightly decreased in size. The firms

that left the market are also small, around 2.4 employees per firm in 1997. This study also shows that on average, firm size decreased slightly over the last years.

Figure 2.2 shows how the balance of employment change in the period 1993-1998 was built up. New firms are important for job creation; they create more than half of all new jobs. Of the incumbent firms, that existed both in 1993 and at the end of 1997, only one out of three is growing in employment. Many firms stay the same size, particularly small firms.

Figure 2.2 Changes in employment, 1993 till 1998, divided in gross job creation and gross job destruction

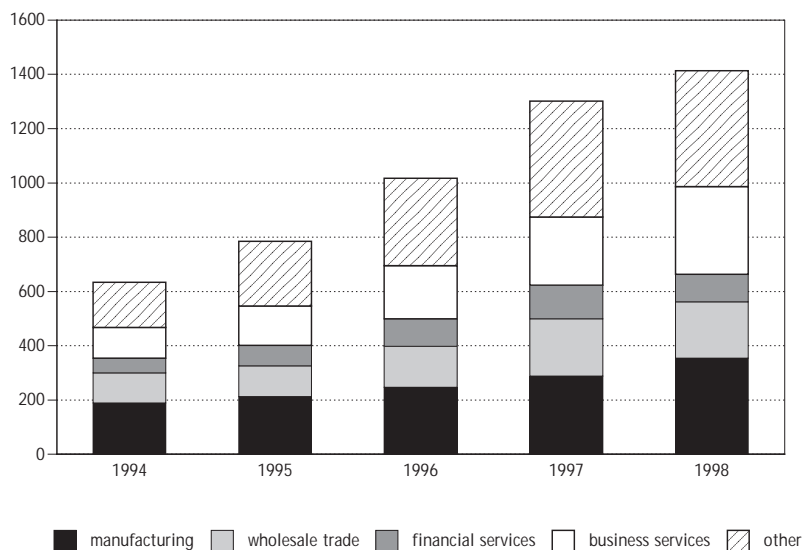


Source: Bangma and Verhoeven (2000).

Developments in mergers and acquisitions and co-operation

At the same time that average firm size decreased in many sectors, we see a very strong increase in the number of mergers and acquisitions. While in 1994 the number of concentrations was about 600, in 1998 it had grown to about 1.400. Figure 2.3 shows this increase.

Figure 2.3 Number of mergers and acquisitions of Dutch companies, total, in some large sectors, 1994-1998



Source: Delwel/EIM.

Although less strong than the number of mergers and acquisitions, the number of joint ventures and other types of co-operation between companies, and relationships such as management buy-ins and co-maker ships, increased as well.

Table 2.2 splits up the developments for the different sectors. The table refers to realized mergers, and mergers that are already agreed upon formally. Manufacturing, business services and wholesale trade are the sectors in which most mergers are seen. The business services sector has taken over the second position from wholesale trade between 1994 and 1998. The share of manufacturing in the total has decreased (but still in absolute terms there was a strong increase).¹

¹ It should be noted that the numbers in table 2.2 are based on information that was gathered by Delwel, from publicly available resources. Mergers of small firms that are not published in newspapers or firms without formal annual reports are not incorporated and thus small firms are under-represented.

Table 2.2 Number of mergers and acquisitions per sector, 1994, 1996 and 1998

	1994	1996	1998
	in % of total		
agriculture, etc.	4.3	1.8	2.6
manufacturing	29.8	24.3	25.1
electricity, gas, water production	0.6	0.4	0.8
building	4.9	6.2	5.0
reparation and trade in cars	2.4	1.8	1.6
retail trade	3.8	4.6	4.7
wholesale trade	17.5	14.8	14.7
hotel and catering	1.6	1.1	0.8
transport	4.7	6.7	4.7
postal services and communication	0.8	2.1	2.3
financial services	8.5	10.0	7.1
business services	16.9	18.1	19.9
employment agencies	1.1	1.1	3.0
other	3.1	7.0	7.7
total	100	100	100

Source: Delwel/EIM.

The figures about mergers and joint ventures and the figures about the developments for different firm types show a dynamic situation, which is not reflected by the static figures about average firm size (in table 2.1) and firm-size distribution. While many firms grow larger by mergers and acquisitions, there are at the same time firms that shrink in size, firms that quit the market, (merged) firms that split up, and many new (small) firms entering the market. There are some sectors that are more dynamic than others. This could reflect changes in the relevant technology used, changes in demand or other factors. In the next chapters we shall investigate the theoretical mechanisms that may cause all these differences in firm size between sectors and firms, and that cause the changes in size.

3 Determinants of scale at the firm level

The first level at which determinants of firm size are found, is that of the individual firm itself. At the firm level, isolated from all environmental factors, there are three important general explanations for scale from the viewpoint of costs structures of individual firms. Section 3.1 explains the role of (dis)economies of scale and scope (including learning and management effects). This is the most traditional and technical explanation for firm size. The second explanation for individual firm size is given by the transaction-costs theory; this theory is elaborated in Section 3.2. In addition to the transaction-costs theory, Section 3.3 elaborates the theory of agency costs. These three subjects are also important in explaining firm size at the next level (the sectoral level, see Chapter 4), but since they interfere at cost functions of firms, we deal with them in the current Chapter. Section 3.4 concludes. Throughout the text, boxes are presented with an elaboration of specific themes, or examples of some of the theoretical issues.

3.1 Economies of scale and scope

Economies of scale occur when an increase in production volume causes decreasing average costs of production. Economies of scale can cause increasing returns to scale if increasing all inputs by the same small proportion brings about an increase in output, which is greater in proportion. Economies of scope occur when an increase in the number of products produced decreases the average costs of production.

Economies of scale can be internal and external, which means that they are created within the firm or by co-operation with other firms, respectively. In this section we focus on internal economies of scale and scope.

3.1.1 Economies of scale

Economies of scale

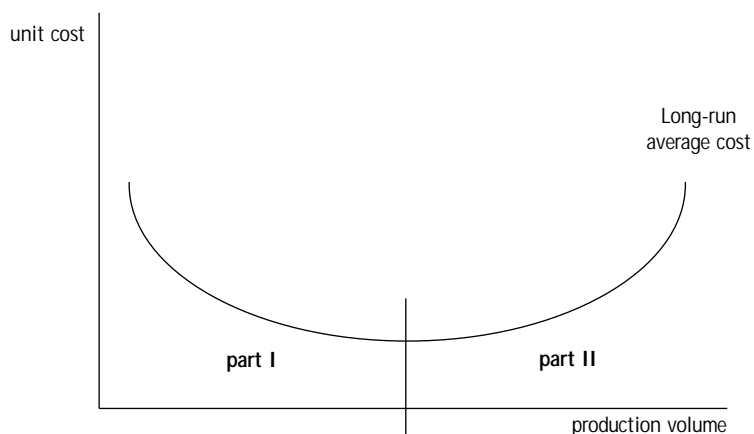
Economies of scale occur when an increase in production volume causes decreasing average costs of production.

Internal economies of scale refer to the cost function of an individual firm and depend on the internal organization and division of

resources within the firm. They can be product-, plant- or firm-specific, and are reflected in the shape of the costs curve and the level of production. Product-specific economies of scale relate to the production volume of a single product, while plant-specific economies of scale are related to the total output of a plant (possibly several products), and multi-plant (or -firm) economies of scale relate to operation of the multiple plants in one firm. The latter two types are found predominantly in secondary business functions such as R&D, HRM, purchasing, marketing and sales activities) (see Scherer & Ross, 1990, p. 97).

Economies of scale are found when the (long-run) average total costs curve (fixed plus variable costs) is sloping downwards. Below, we focus on the factors that cause the average cost curve to slope downwards (part I in figure 3.1 below) (see a.o. Pratten, 1991):

Figure 3.1 Decreasing and increasing long-run average costs curve



Factors causing the average costs curve to slope downwards

Indivisibilities

Indivisibilities are fixed costs that do not vary with the level of production, so that average total (fixed plus variable) costs are higher with low production volumes. In the short run there are many indivisibilities, like machines, buildings, costs of research and development or design, costs of information gathering, advertising, etc. A type of indivisible inputs are 'threshold costs'. These are for instance the costs of a manager or entrepreneur, the driver in a bus or service personnel at a checkout point in a shop. For example, to run a shop, at least one person should be available, even when there are almost

no customers (Nootboom, 1993). Pratten (1991) also mentions 'economies of increased dimensions' as a type of indivisibility, this is comparable to threshold costs. They apply when the costs of investing in a larger machine, building or other kind of capital equipment increases capacity more than proportionally. For instance when a new (similar) factory is built, output should at least double, to make the investment worthwhile. Indivisibilities are most important in capital-intensive industries, but in service industries or knowledge-intensive industries they do play a role as well. Threshold costs are the most important indivisibilities in those industries.

Economies of specialization and organization

The larger the output of a product, plant or firm, the larger the opportunities for and advantages of specialization will be, both in labour and capital inputs. The traditional example is the automobile assembly line that was first introduced by Ford. While these traditional assembly lines are less popular today because of the disadvantages for (labour satisfaction of) workers, specialization is a very important factor of efficiency increase in many work processes, for instance by using robots to further reduce the human factor, but specialization is also seen in special departments for R&D, personnel management, administration, etc. Maljers (1999) mentions the example of Nike. This firm is to a very large extent vertically disintegrated. Nike itself performs only design, marketing and quality control. All other business functions (production, distribution, etc.) are sourced out.

Economies due to risk spreading

Big firms face lower risks due to risk spreading. Note that this does not entail risk spreading over different products (source of economies of scope), but instead over several countries, regions or individual customers. For instance, large oil companies spread production over different countries, which is important because of political risk factors (see Maljers, 1999). Smaller firms have fewer clients or less diversification in their clients, so they face higher risks. The source of the higher risks for small firms is often found in sunk costs.

Sunk costs:

- Sunk costs are different from other costs in that they result in assets for which there is no market, so once they are bought, regaining the investment on the market is impossible.

These sunk costs don't have to be examples of indivisibilities, since they can be scale dependent but once these costs are made the money cannot be retrieved. The fact that small companies face high-

er risks gives them difficulties as regards access to capital. So the supply of capital will be better for large firms than for smaller firms.

Economies of massed resources

When a company uses more capital and labour, it can economize on spare parts, stockholding and the division of labour. Small firms should keep relatively higher stocks and more spare parts than large firms do, to avoid risks of discontinuity of the production process, selling out or quality loss.

Learning or experience effects

Where scale and scope are cross-sectional effects, that of experience is a time-serial effect (Thurik, 1996). An increase in production of a new product or the use of new technology leads to declining unit costs since the people working with the product or technology grow more experienced and the organization or firm also learns from earlier faults or inefficiencies. The longer a firm is in business, or the higher the firms' cumulative production is, the greater will normally be the experience and know-how, particularly experience and know-how that cannot be achieved by education (tacit knowledge¹). So not only individual people learn but also organizations.

Nooteboom (1993) distinguishes between learning effects and experience effects. The process of learning is divided in stages of perception, interpretation and evaluation. It depends strongly on the (firm or social) environment how and what people learn. Firms should acknowledge that people might fail to perceive, understand or appreciate developments that present threats or opportunities to the firm. Experience effects are not so strongly related to human learning and more to organizational learning. Experience effects follow from accumulated production since the start of the activity. An important example of economies of experience is the reputation of experience that a firm builds up after many years, that generates a lower perceived financial risk and facilitates access to credit.² A brand name can be used to communicate the comparative advantage of a product as the result of a 'rich history' of learning, and to strengthen the reputation of experience. The subscript 'since 1857' on a bottle of Heinz ketchup is used to tell the customer that this producer has made ketchup for almost 150 years and during that time made it an art.

1 Tacit knowledge is implicit knowledge. Tacit knowledge cannot be codified or otherwise transmitted to other people.

2 This example of access to credit can be a partial explanation for the fact that large firms are often more capital-intensive and small firms more labour-intensive (You, 1995, p. 453).

Economies of vertical integration/transaction costs

Vertical integration¹ can decrease different kinds of costs. For instance, transport costs and costs of stock holding can decrease when parts of the production process are moved from several sites to one site. When trying to explain the boundaries of the firm from the theory of economies of scale, the activities of a firm should be split in the relevant business functions or processes. As said before, every process or function can have a different optimal scale and there is always a trade-off between outsourcing and vertical integration of some business functions. For instance for a car factory, the optimal scale of stamping the body parts may be a lot larger than the optimal scale of assembling the cars from their different parts (see Scherer and Ross, 1990). To explain the outsourcing or integration decisions, not only scale economies (see also economies of specialization and organization above), but also transaction-costs economies are relevant. Transaction costs can be reduced after vertical integration. An integrated firm no longer has problems of control, uncertainty or quality with suppliers, and thus reduces the transaction costs. Integration of activities within one firm can also be necessary when there are no competitive supplier markets. For instance, a large factory that is strongly dependent on the quality and continuity of energy delivery may have a strong incentive to (partially) take care of its own energy provision. This is particularly the case when one firm dominates the energy market and that firm can give no guarantees for good service in case of problems (see also box 3.2). Transaction costs are further elaborated in section 3.2.

3.1.2 Diseconomies of scale

All the factors discussed above can cause the (long-run) average costs (curve) to decrease, but this may not go on indefinitely; in nearly all production and distribution operations, the realization of scale economies appears to be subject to diminishing returns (see Scherer & Ross, 1990, p. 102).

Diseconomies of scale

Diseconomies of scale are found when an increase in production volume causes increasing average costs of production.

For most causes of economies of scale mentioned, there are different 'countervailing powers' that offset the economies of scale and may even turn into diseconomies of scale. The following are the most important.

¹ Vertical integration is integration of firms at different levels of the production process, such as a producer who integrates with a distributor or a supplier.

Limiting factors for economies of scale

If production increases indefinitely, fixed costs and threshold costs become insignificant and after some point the average costs will no longer fall when production rises further. With threshold costs, production volume can rise so that new investments are needed (a new machine, an extra service desk in a shop). Fixed costs per product (or service) will tend to zero when production is large enough. The same holds for economies of increased dimensions and the advantages of massed resources. Also, the effects of specialization of capital and labour stop when everything is specialized to the maximum and no further business functions can be outsourced or otherwise performed more efficiently. Learning curves will also flatten out with production increases.

Factors that cause average costs to increase when production rises (diseconomies of scale, see part II of figure 3.1) are looked at below. These factors have in common that they follow from intransparency of the organization (or the market) and of information asymmetry between actors.

Factors causing average cost curve to increase

Bottleneck production factors

Next to these factors that may cause unit costs to level out after expanding production beyond a certain scale, other limiting factors for further expansion can be a lack of skilled workers, raw materials, capital or other input factors (such as technical forces), so that with increasing production less efficient factors of production have to be used or factors even become unavailable.

Labour relations

Labour satisfaction in large companies is often found to be less than in small companies. Specialization of labour in large firms may make jobs less challenging and demanding, which may reduce the motivation and dedication of workers. Large companies also often have longer hierarchy chains, which reduces the communication between management and work floor, makes responsibilities less clear and makes the organization more bureaucratic than smaller organizations. Modern management techniques are often used to reduce these problems but at some point, the labour relations can still be sources of increasing unit costs (see You, 1995).

Managerial diseconomies

Closely related to the diseconomies of labour relations are managerial diseconomies. The span of control of managers is limited and the

marginal effectiveness of managers decreases with an ever-increasing firm size. Of course, management can be decentralized and specialized, and thus generate economies of scale. When a firm grows too large, however, it is often found that bureaucracy, limited control, inflexibility of the organization and co-ordination problems will prevail and turn into diseconomies of scale that increase unit costs (however, the point where a firm gets too large seems to have shifted in time, as a consequence of the application of modern management theories and the use of, for instance, communication technology). Inflexibility of the large firm has two major reasons:

- Lack of proximity: new opportunities and threats take more time to be spotted
- Organizational inflexibility: the organization of a big firm is by nature more complex and more difficult to change; it is an enormous web of interrelations.

Next to the span of control, another factor of managerial diseconomies of scale is found in the motives of managers that may diverge further from those of the owners (stockholders) when firms grow larger. While the best option for the stockholders may be to stop investing in a (mature) firm and to use the money to invest in more profitable products or firms, the manager in general tries to hold on to his status and (over-)invest in the firm (see section 3.4 about the life cycle theory and box 3.1).

Box 3.1 Small or big?

Nowadays, if companies decide to grow bigger or smaller it happens most of the time by mergers and take-overs or by splitting up business, respectively. While on the one side companies are more and more willing to join forces, on the other side there is a move towards splitting up businesses. Endogenous growth is considered uncertain and time-consuming. Here we investigate these developments more closely to find out what kind of companies split up and which ones join forces.

Recent examples show that most of the time mergers and acquisitions are seen between direct competitors in the same activities. NRC (Oct. 1, 1999): 'Back to basics is the motto of the main part of German companies. To be able to grow anyway most of these companies seek refuge in mergers and acquisitions.' The Economist (Jan. 9, 1999) states: 'Less than 10% of mergers now go beyond a core business.' These developments find their roots in the wish for scale economies and for an acquisition of specialist skills

and knowledge in niche or sub-markets (such as private banking, sports cars, etc.). The splitting up of businesses often takes place when a company is a collection of heterogeneous business units, sometimes after a merger. So the empirical reality of business trends seems to favour scale over scope.

Tamminga, in NRC (May 22, 1999), mentions three possible reasons behind the growing number of split-ups:

1. The bounded capabilities of managers: While few conglomerates flourish, most of the time there is a significant loss of capital and human talent involved when activities are strongly heterogeneous. Not everyone is a top-manager and particularly the board of directors more and more recognizes this.
2. Opportunism: The increasing drive for concentration in some markets puts pressure on the management of conglomerates to look for or accept the higher and higher bids for single business units.
3. Stock value: The stock value of a chain of business units does not represent the average profitability but that of the weakest link. So while working as a conglomerate may be positive for risk spreading, conglomerates are at a disadvantage when it comes to obtaining capital against optimal stock values.

These three points reflect the now popular 'back to basics' view. This view seems to be dominant nowadays among stockholders. De Waard, in NRC (Oct. 10, 1999) says that who gets back to basics is rewarded; already the announcement of such actions results in higher stock rates.

Box 3.2 Innovation diseconomies

According to The Economist (Dec. 4, 1999), innovation is the new key word in American management. Further re-engineering and outsourcing will no longer be effective. Innovation is often adopted by mergers; the big companies spent fortunes on licensing and buying others' intellectual property. But that creates a new problem, since innovation strategies are often expected to work best inside smaller companies. It seems that there are certain innovation diseconomies of scale.

The Economist mentions two reasons why bigger firms lose terrain in innovation:

- Cheap venture capital: Scientists with good ideas are no longer dependent on the multinationals to realize their inventions, they are often able to start their own companies, or sell the products of their research to the large companies, at the stage where economies of scale are becoming important. This is not so much a diseconomy of scale as it is a reduction of an important economy of scale of the past.
- Many things established firms do well, such as looking after their current customers, results from properties that hinder innovative behaviour. This is particularly the case when the innovation deals with 'disruptive' or radical technologies. Often, the new technology competes with the traditional business of an enterprise (Internet banking, e-commerce).

These were some of the rational reasons, but sometimes the panic in big firms seems more the result of overvaluation of small Internet firms than of a real crisis of innovation in bigger firms. Because of this overpricing smaller firms are able to remain independent even without making profits, these companies are booming and attract talented staff from bigger firms. And when bigger ones buy the smaller firms, the talented staff that produced valuable ideas prove hard to keep. One solution in this overall panic is searched in increasing 'intrapreneurship' and thus trying to make innovation more of a bottom-up process.

Some experts think that this restructuring towards intrapreneurship, combined with the strategy of buying small and innovative firms, will not improve the results of large companies. In their view, big companies should focus on their own specific strengths and thus concentrate on projects with high costs and low uncertainty, leaving low cost-high uncertainty projects to mature in small companies before adopting them. In other words, bigger companies should just deal with the innovation economies and diseconomies of scale and make them work for the company, instead of wasting energy fighting against them.

Transport and distribution costs

With larger production volumes at one site (this does particularly count at the level of outlets, not companies) transportation costs of

the products to customers or of customers to the production site increase. It depends on the size of the market relative to the size of the producer how important these costs are. If a firm's optimal size (or minimum efficient scale) is so large that it should meet all demand in a large region, transport and distribution costs are more important than in case of several firms producing at optimal size in the same regional market. High transport costs in terms of consumer time or producer costs stimulate proximity of production to consumers and thus the existence of small firms. Particularly for services and high-volume or highly perishable goods, transport costs can be high. Caused by technological development, transport costs and transport time structurally decreased over the last century. However, even in the age of Internet and e-commerce, transport costs still are important in explaining the existence of for instance small shops, cafés and restaurants. For this kind of firms, location close to customers is an important competitive advantage. Besides, if firms produce for regions that are different in terms of consumer tastes, distribution costs are also relatively high in terms of marketing (see Thurik, 1996).

3.1.3 Economies of scope

Economies of scope are comparable to economies of scale. Average costs do not decrease with increasing volume of production but with an increasing number of different products made.

Economies of scope

Economies of scope occur when an increase in the number of different products produced, causes average costs of production to fall.

Economies of scope occur when there are indivisibilities (as with scale economies) in inputs to the production process, or when there are complementarities. These complementarities can be found in the following aspects (see Nooteboom, 1993).

Complementarities

- Residual materials of production: For instance, the use of remainder energy that follows from industrial production for producing own energy.
- Risks: For instance, diminishing risks of currency fluctuations by both importing and exporting.

- **Time:** For instance, when two or more products with different demand peaks are produced/sold by one company, such as ice cream and hot chocolate.
- **Brand name:** New products can benefit from established brand names.
- **Technology:** When the same technology can be used for production of different products. This advantage is most obvious for products that are technically identical but are placed on the market as different products, with new design, marketing, etc. In fact, goods that are from a technical viewpoint homogeneous goods, can be heterogeneous from an economic/marketing point of view.

Synergy

Another important factor for economies of scope is interaction between different product groups of a company, for example discussions during business meetings, where experiences and new insights are shared. This is particularly relevant if the products are counterparts for a single final product, and specifications vary constantly. This interaction requires coincidence of time and often also of space (although electronic communication changes these requirements). Inseparability is also a reason for economies of scope. Think, for instance, of a soccer team without a goalkeeper, or an orchestra without a conductor. All these factors are examples of synergy, an often heard buzzword in management literature, entailing that the entirety is more than the sum of the individual parts, or: energy comes from the right combination of people and equipment in a stimulating environment.

3.1.4 Diseconomies of scope

Diseconomies of scope can be seen as the factor behind the 'back to basics' trend that was important over the last decade (see also box 3.1). The factors causing diseconomies of scope are comparable to those causing diseconomies of scale (see section 3.1.2), and most are found in the field of human capabilities. Often, the 'back to basics' trend is caused by changes in weight attached to economies of specialization and economies of scope. If a firm makes one field of products (say, four-wheel drive all-terrain vehicles like Landrover produces), the knowledge gained while working with that product is also relevant to problems with related products, such as sedans or motorcycles (economies of scope). On the other hand, specializing in one product decreases the complexity of the organization, and has other economies of scale (or of specialization). For instance, customers are more homogeneous when one sells four-wheel drives only, and this

is positive for market research, and for promotion and image building (sponsor four-wheel events and teams).

Box 3.3 Rethinking the traditional organization: splitting up key activities

Hagel and Singer (1999) recently wrote an article in the Harvard Business Review in which the key question was: ‘What business are you really in?’ They stated that the answer for most companies would be: in three, and that they don’t even know it. The question and its answer were based on the fact that most companies have three main activities of which the writers think that they belong to separate businesses.

First, these three activities and their characteristics are discussed: product innovation, customer-relationship management and infrastructure management.

Activity	Product innovation	Customer-relationship management	Infrastructure management
Description	Concievevment of attractive new products and services and their commercialization	Identification, attraction and the building of relationships with customers	Building and managing facilities for high-volume, repetitive operational tasks
Economics	Early market entry allows for a premium price and a large market share: SPEED is key	High costs of customer acquisition make it imperative to gain large shares of wallet; economies of SCOPE are key	High fixed costs make large volumes essential to achieving low unit costs; economies of SCALE are key
Culture	EMPLOYEE-centred, coddling the creative ‘stars’	CUSTOMER-oriented, service-oriented, customer comes first	COST-focused, stress on standardization, predictability, etc.
Competition	BATTLE FOR TALENT, low barriers to entry, many small players thrive	BATTLE FOR SCOPE, rapid consolidation, a few big players dominate	BATTLE FOR SCALE, rapid consolidation, a few big players dominate

Source: Hagel and Singer, 1999.

According to the authors, these three activities rarely map the organizational structure of a corporation correctly. Product innovation, for example, typically extends beyond the boundaries of a product development unit (its logical organizational ‘home’ unit) to include such activities as conducting market research, training of employees, etc. Rather than representing discrete organizational units, the three activities correspond to what are popularly called ‘core processes’. Because these activities, as shown, have imperatives that are by nature conflicting, Hagel and Singer (1999) see them as separate businesses. So the key question (‘What business are you really in?’) has three answers for most multinationals: one company, three businesses is commonplace. This will in

the end hinder optimalization and will lead to a fracturing of global companies along the fault lines between these activities. The authors use the newspaper industry as an example of how things have changed and will change according to their theory:

- **Product innovation:** This activity is increasingly being outsourced; the average metropolitan newspaper relies on wire services, syndicated columnists and publishers of speciality magazine inserts to fill the paper each day.
- **Infrastructure management:** Many newspapers rely on specialist printers that produce the paper for them. So, just as product innovation, this activity has become a separate industry.
- **Customer-relationship management:** This is more and more becoming the focus of the papers, attracting and binding customers to a concept.

So the old-fashioned newspaper with in-house journalism and printing is soon making way to new-style organizations that give new meaning to the term back to basics. Hagel and Singer (1999) think that this is a rational development and will lead the way for other industries to follow.

3.1.5 Economies of scale and scope and firm size

To compose the long-run average cost curve (LRAC) of a firm (or an industry), all fixed and variable costs are added. The cost curve thus combines the costs of production, where economies of scale are important, and costs of management and organization, where the most important diseconomies of scale prevail (when production grows large enough). To complicate things, most firms produce more than one product, with a different optimal scale for every product, and often the most efficient scales of the different production processes needed do not fit perfectly well either. This leads in most cases to a U-shaped cost curve, from which an optimal firm size (production volume with the lowest average costs) can be determined.¹ The low-

¹ The LRAC curve can also be structurally downward sloping (or L shaped), which implies the production process is a natural monopoly. In this case fixed costs are high enough to offset all other costs and production is most efficient if there is only one firm, so that one firm can meet all market demand at a lower cost than two or more firms could. Examples of natural monopolies are found in network industries such as railway and metro networks or fixed telephony networks. In the latter example, however, the natural monopoly is no longer a fact, since technological developments made it possible to use other (existing) fixed networks, like the energy and television cables, for telephony as well.

est point of the LRAC curve is the minimum efficient scale of a firm (MES), i.e. the smallest scale at which minimum unit costs are attained (Scherer & Ross, 1990, p. 103). In figure 3.1 an LRAC curve is presented.

Practical limitations to optimal scale determination

Although the theory of economies of scale and scope provides an elaborate explanation of how the optimal size of firms can be determined, in real life we see that within industries similar firms have very different sizes. There are, within the theory of economies of scale and scope, different explanations for this fact, some of which are already mentioned.

Homogeneous goods is no realistic assumption

First, a limitation to the application of the theory of economies of scale and scope lies in the fact that the theory presupposes homogeneous goods. However, even in the (very rare) cases of goods that are technically seen perfectly homogeneous, there can be differentiation when the producer adds value in, for instance:

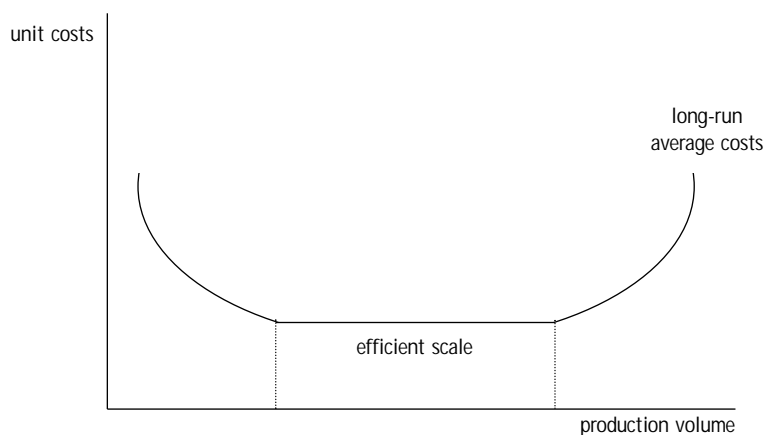
- reputation
- service
- convenience of a distribution concept, etc.

Most companies try to differentiate their products from their competitors by creating comparative advantages in one of these fields. What really matters is not whether engineers see the difference between two competing products but that consumers see the difference, or just feel it.

Costs curves may have a range of points where scale is 'optimal'

Second, there can be constant returns to scale after the point where the minimum efficient scale is reached. In that case, the lowest point of the cost curve is flat for a large part, see figure 3.2. The costs curve can also be at the lowest point at different output levels with intervals of high unit costs in between. In these cases, the optimal scale is not a single point but can be a (large) range of output levels.

Figure 3.2 long-run average costs curve with range of efficient production volumes



Technology and other input factors are not homogeneous either

A third explanation is that technology can be heterogeneous, and different firms use different technologies for the production of the same products (and thus these firms have different cost functions, and different optimal scales). Fourth, differences in firm size can be caused by heterogeneous quality of fixed input factors such as management and entrepreneurship.

3.2 Transaction-costs theory

Transaction-costs economics is important in explaining why firms exist and why firms grow larger. This theory does not explain why production processes grow larger (as the theory behind economies of scale and scope does) but why firms integrate up- or downstream activities within one firm (vertical integration), while other firms specialize to make full use of economies of scale. Transaction-costs economics supplement the neo-classical economic theory with explanations for the 'make-or-buy' decisions of firms. You (1995) states it as follows: 'While in the technological approach (economies of scale and scope), firm size is determined by efficient allocation of resources, the transaction costs approach incorporates the costs of the process of allocation itself. This process consists of contracting, bargaining, control, etc.'

Transaction costs

Transaction-costs theory explains the 'boundaries of the firm' not only with technical cost factors, but also with the costs of the allocation process. Costs of allocating are, for instance, costs of bargaining, drawing up contracts and costs of control of different processes and contracts.

The theory of transaction costs originates with Coase (1937), see Holmstrom and Roberts (1998). When the market mechanism would be the optimal mechanism of allocating scarce resources, there would not be so much activity within firms. Coase explained the existence of integrated firms by transaction costs in a world with imperfect information. As opposed to the behavioural assumptions of neo-classical economists, economic agents are considered to be bounded in their rationality, which makes room for opportunism. Bounded rationality originates from scarcity of information and limited capacity for information processing. To prevent opportunism from occurring, contracts should take opportunism into account. Bounded rationality and opportunism are the reason why transaction costs exist and why organizing and co-ordinating production are less costly in a formal organization than co-ordinating every aspect through a market.

Stages of transactions

A transaction consists of three stages:

- Contact
- Contract
- Control.

In the first stage, of contact, there are search costs made by the buyer and marketing costs made by the seller. In the stage of contract, the costs are made in the preparation of an agreement to transact, in which it is attempted to anticipate possible problems during execution. These costs include searching information on the reliability of the transaction partner or the degree to which investments will be sunk, or costs of negotiation, legal advice, etc. In the stage of control, after the commitment to transact has been made, there are costs of monitoring and probably also of arbitration, litigation, loss of investments due to the relation breaking up, etc. (Nooteboom, 1993).

Frequency, uncertainty, asset specificity

Transaction costs depend on three factors:

- Frequency
- Uncertainty
- Asset specificity.

Frequency means that the more often a transaction occurs, the higher are the costs of outsourcing. Costs of outsourcing are also high when there is much uncertainty about a relationship or a contract (for instance, it can be uncertain whether the supplier will always deliver in time, or whether the products are always of good quality). High asset specificity means that the investment in a relationship has sunk costs¹; the alternative uses or proceeds of the investment are low (for instance, when a firm develops special equipment that can be used to make a product for one of their customers only).²

The higher the levels of uncertainty and asset specificity, the more complex contracts between firms are. Organization within a firm can lower costs in these cases, compared to market organization. The three factors frequency, uncertainty and asset specificity are positively related to internal governance (within the firm). If these factors are high, vertical integration is more likely.

3.2.1 Transaction costs and firm size

In general, transaction-costs theory shows that for transactions with low transaction costs, outsourcing can be attractive (for instance, for business functions in which there are economies of scale for the specialized firm and diseconomies of scope for the outsourcing firm), while for transactions with high transaction costs (high frequency, high asset specificity, high risk) integration in the hierarchy of the firm is preferable.

Below, the main assumptions and determinants of transaction costs are discussed and 'checked' for scale effects (Nooteboom, 1993).

Assumptions of behaviour: bounded rationality and opportunism
Characteristics of contracts: frequency, uncertainty and asset specificity.

Bounded rationality

Bounded rationality is a relatively larger cost factor in small firms than in large firms, because small firms have disadvantages along three 'dimensions of rationality'.

1 The distinction between sunk costs and other costs is that the former results in assets for which there is no market, so once bought regaining of the money is impossible.
2 Asset specificity can create the 'hold-up problem', which gives a traditional explanation for increases in firm size (particularly vertical integration), according to Holmstrom and Roberts (1998). The hold-up problem is a type of market failure which occurs when contracts involve fixed costs in relationship-specific assets and this changes bargaining positions between the contracting parties over time and creates market power for one of the parties (once the sunk investment is made by the supplier, then the buyer has a stronger position and can start to re-negotiate the conditions of the contract (see CPB, 1997, p. 50).

- **Width:** Small firms generally have fewer functional areas in staff support. Larger firms need more information, but are also better able to employ specialized staff in different functional areas.
- **Depth:** In small firms the education level of the entrepreneur and staff is generally lower than in large firms, which limits the capacity to absorb external information. Of course, there are many exceptions to this fact, for instance small firms in science-based sectors.
- **Variety:** In small firms, the perspective from which external scanning is performed is often dominated, and thereby restricted, by the personal perspective of the entrepreneur.

To compensate for these disadvantages compared to large firms, small firms make more costs, for instance by extensive external networking, which again increases transaction costs for the small firm (these costs are called second-order costs of transaction).

Opportunism and uncertainty

Smaller firms face higher transaction costs because they are more sensitive to uncertainty and they are more vulnerable to opportunism of (large) transaction partners. On the other hand, small firms (and particularly new firms) bring about higher transaction costs for their partners because of a higher perceived risk, due to lack of reputation and the risk of discontinuity; for instance, a firm that has built up a reliable name as a transaction partner, offers a reduction of the perceived risk of opportunism and thereby offers lower transaction costs to current and potential partners at the expense of the foregone benefits of opportunism.

Asset specificity

A disadvantage for small firms is that, due to their size, which makes it impossible to gain economies of scale, small firms often follow niche strategies and specialize in certain products or services. This increases the risk of investing in and dependency on customer-specific relations (asset specificity). Besides, smaller firms often lack the formal administrative and monitoring procedures that are required in the 'control' stage of contracts.

It can be concluded that in vertical relations between a larger and a smaller firm, the smaller firm generally faces the biggest part of the transaction costs, which can result in one-sided dependency if the small firm cannot develop countervailing power. Nooteboom (1993) signals that small firms try to compensate for transactional weakness

in several ways: by mobilizing the typical behavioural strengths of the small firm such as market flexibility, motivation, entrepreneurial drive, unorthodox ventures, niche markets or by being 'lean and mean'.

3.3 Agency-costs theory; motivation of individuals

Coase's theory of the firm, where transaction costs explain the boundaries of the firm (or the choice between market and firm co-ordination of transactions), has got several extensions. One of the best known is that of agency costs.

Agency costs

Agency-costs theory is about the different motives of 'principals' and 'agents'. It looks at how incentives should be directed in situations where people or firms co-operate in activities with a joint output. Principals are owners or shareholders, agents are employees or managers.

In Ekelund and Hébert (1997) and Schmalensee and Willig (1989, Ch. 2), agency-costs theory is explained as a factor that can justify vertical integration or disintegration. The theory is about how important the right incentives are, when people or firms co-operate in activities with a joint output. Most of the activities of firms involve team effort, and a team, like a chain, is only as strong as its weakest link. When inputs of different team members are not measurable or very difficult to measure, a free-rider problem can arise. Individuals can choose to work without any dedication or to hardly work at all (shirking). Monitoring the team members can in theory prevent this unproductive behaviour. When the firm owner does the monitoring, this solution will work, since the owner has the incentive of maximizing his revenues. When, however, the monitoring is done by a manager, and the manager does not have the right incentives to optimize productivity, the manager himself should be monitored as well.

Managers' motives and firm size

There are also less rational and less economic factors playing a role in why firms grow or stay small, like the motivation of the entrepreneur, the manager or the stockholders of a firm. Not all small firms want to grow large and not all mergers are motivated by cost factors. This latter factor is worked out more extensively in box 3.4.

Box 3.4 Irrational motives behind mergers?

Fast growth of main activities is not the only reason why companies join forces, it is in fact well-known that mergers often don't bring increased profitability (stock value) at all: The Economist (Jan. 9, 1999) shows that repeated analyses have all reached the same conclusion: in the medium term, fewer than half of all mergers add value. Another source (Beursmedia/Betten, Oct. 13, 1999) shows that 70% of the mergers in which at least one big company is involved turn out to be a waste, 15% even result in a failure and only 15% are a success (in the Netherlands). Recent statistics show that while the rate of the average stock does climb when the announcement of a merger is made, after 6 months this development doesn't persist, after 18 months the extra value is totally gone and after three years the stocks are traded at prices below the general average. They also show that 50% of the mergers among the big conglomerates are turned back after a while.

Then what are the other reasons, besides rational economic analysis? Roughly, the arguments can be divided into two main categories:

1. Status: The urge of a company to be the market leader, and the drive of career-driven managers to make a mark. As it is stated in The Economist (Jan. 9, 1999) 'For a manager the surest way to make a mark in a short time (job times of 'chief executive officers' (CEOs) are five years on average) is to buy something big.'
2. Defensive reactions: In a world where scale economies have become magic words, a CEO's worst nightmare is to be too late and, when the merger game is over, to be the only small player left. Other reasons for defensive reactions are based on the wish for autonomy (if in the end you are the only small fish in the pool, you will be eaten yourself) or on the fear of looking foolish. According to The Economist (Jan. 9, 1999) managers are frightened by contracting markets (for instance, in the defence industry), by falling commodity prices (for instance, in the oil industry), by excess capacity in key markets (for instance, in the car industry), by the uncertainties of technological change (for instance, with banking and telecom), or by the soaring costs of research (for instance, in pharmaceuticals).'

While the first motive, status, is a psychological reason, the second motive, defensive reactions, can be economic in its nature. The fact that fear is a strong motivation behind many conditions shows, however, that these decisions are often not rational.

3.3.1 Agency costs and firm size

The view of the manager as monitor of team members and team production raises some important questions: who will, for instance, monitor the manager? Does the manager also have an incentive to shirk? Ekelund and Hébert (1997) show that the institutional composition of the firm is relevant to answer these questions, and particularly the pattern of incentives, both positive and negative, given to managers. Firstly, managers are disciplined by the market. If they perform poorly, monitor-managers will be fired and the owner will install competing managers. Secondly, managers can be rewarded as 'residual claimants' who share in the profits or rewards of team production. Managers thus have both positive and negative incentives to be efficient monitors of team production.

The following assumptions are relevant for firm size:

1. The ownership of the firm (I): For a small firm the manager is considered to be the owner or at least to be an important stockholder, or to be closely related to one of these. Managers of larger firms, however, are considered to be more comparable to normal employees, who may face profit sharing but are not so-called residual claimants.
2. The ownership of the firm (II): The owner of a small firm is more interested in the whole picture (in the continuity of the firm, job security for the entrepreneur himself and the employees, etc.) compared to the shareholder of a multinational who is only interested in profit (expectations) and the value of his shares.
3. The organization of the firm: The small firm has fewer layers so that the owner at the top of the hierarchy has (almost) daily contacts with the 'work floor'. For this reason, for the owner of a small firm, monitoring takes less time and effort than for the owners of large companies.
4. The skills of managers: Large multinational-managers, particularly at the lower and medium levels, are more specialized, small-firm managers have a more all-round function.

The main issue in Agency Theory is the aligning of the interests of the 'principal' and the 'agent'. The principal can be the firm owner or the shareholders, while the agent is the employee (a manager is also an employee). A first advantage of small firms is that in a small firm with few layers of hierarchy there is a dominant entrepreneur/owner who is always present and keeps an eye open for his own sake because he is the residual claimant. Every penny lost in the process will come entirely out of the pocket of the owner, so he will monitor

intensively whether he makes rational economic decisions (costs of monitoring versus costs of shirking). Besides, as is explained under assumption 3, the time and effort it takes to monitor a small firm is relatively low. This altogether will make costs of monitoring and shirking in small or starting enterprises considerably lower than in older and bigger ones with multiple owners.

The solution for the incentive problems with monitoring in larger companies is often found in profit sharing for managers. This is not as easy as it looks either, taking into account the different possibilities of determining the companies' profit, and all kinds of options for a manager to shirk anyway, independent of the profitability. Furthermore, other important performance indicators could be taken into account as well (this is particularly relevant in the long term because an important part of the shareholders may not care about other performance indicators than profit because of their short-term focus). A positive scale effect is that bigger firms can more easily attract the highly qualified (and specialized) managers (see assumption 4) (see Ekelund and Hébert, 1997).

Box 3.5 The goal of the entrepreneur

Roughly spoken, there are two types of entrepreneurs: the so-called shopkeeper and the Schumpeterian type.

The Schumpeterian-type entrepreneur distinguishes himself by his never-ending quest for creative innovations and higher market share. Schumpeterian-type entrepreneurs are motivated by more than just money, they want to be winners, and they want to achieve ever-higher goals.

The shopkeeper is the type of entrepreneur who went into business for reasons such as:

- to achieve a certain degree of freedom
- being the son/daughter of the former owner
- being the son/daughter of someone of the same profession
- having lost a job, or due to a bad labour market situation, etc.

It is easy to understand that these types of motivation do not necessarily push the shopkeeper to strive for higher performance once settled. Moreover, striving for higher performance may necessitate more investments and thus reliance on stockholders or outside investors, resulting in decreasing control by the shopkeeper over his (family) business, and his freedom of decision making.

3.4 Demand factors and life cycles of firms

Demand factors

For some products demand is not large enough or changes too fast to generate scale economies. This is true when the geographical market size (country, region) is small,¹ or when the product just is too specialized to attract a large group of customers (niche markets) (see also section 3.1.1 about economies of specialization and vertical integration). The factor of market size explains why the European market, and internationalization in general, leads to structural changes in firm size. In case of economies of scale, firms might realize a more optimal position on their cost curve when the market grows. Without market restrictions, and with the increasing technological development, a sector such as banking may turn out to be a natural oligopoly, on world scale. For goods with fast-changing demand time doesn't allow for the reaping of scale economies. Furthermore, the economy is booming in America and Western Europe and this increases the demand for 'tailor-made' products, individualism is gaining ground in the consumer's psychology. Still, technological development is important here as well, it can diminish the relevancy of demand and increase the relevancy of economies of scale. With more flexible production methods, improving communication over long distances and reduced transport prices and time, production can now be centralized easier than some time ago, and scale can be increased.

Life cycle theory of the firm

New, young firms are almost always very small, and it rarely happens that firms start at their theoretically 'optimal' size. In Chapter 2 we already saw that in the Netherlands, existing firms do not change much in size, measured over a period of 5 years. New firms, however, are the ones that create most new jobs. The life cycle theory of the firm gives an explanation for the fact that small firms can exist, while they produce (far) below their theoretically optimal scale (or minimum efficient scale). According to the life cycle theory (see de Jong, 1993 and 1998), firms walk through several phases (possibly opposite phases for different products), from the moment they enter the market with a new product or an innovation, through expansion, maturity and stagnation. Learning (and the economies of scale that learning can generate, see section 3.1.1) is very important, particularly in the first stages of the life cycle of the firm. To reach a stage of

¹ An example can be found in the difference between firms in the (thinly populated) Canadian economy and in the much larger market of the US. Canadian firms often face too small market demand to operate at minimum costs and, therefore, firms often produce different products and are less often specialised than firms in the United States.

efficient production and optimal size, firms have to go through the process of learning and gaining experience to reach that size. During each phase of the life cycle different factors influence the optimal scale of the firm. In the stage of expansion strong market growth is facilitating entry of competitors and autonomous firm growth, while in a 'mature' market, take-overs become important to increase market share. The stage in the life cycle for the dominant product of a firm thus partly determines the decision to increase or decrease in scale. Of course, other factors may be equally important, such as the general economic situation, the availability of qualified labour, the institutional environment, etc.

Box 3.6 gives a short impression of how firm size is explained empirically. 'Gibrat's law' gives a statistical explanation for the large differences in firm size. It says that firm size differs randomly. There is, however, evidence that the statistical explanation does not hold in most empirical studies.

Box 3.6 'Gibrat's law'

Many articles are written on 'Gibrat's law' which states that growth follows a random walk independently of firm size, no size group of firms should show significantly higher growth rates than another and growth today does not influence growth tomorrow (no persistence of growth).

The possibility of a relation between firm size and growth has been a big subject in recent decades. A large number of studies have been done world-wide to find out which size group of firms is responsible for the highest growth rates and the largest job creation.

The majority of the studies rejects the validity of Gibrat's law, Almus and Nerlinger (1998) point at some of these studies: Wagner (1992), Reid (1995), Harhoff, Stahl and Woywode (1998), and Weiss (1998).

Some conclusions that can be made from the studies mentioned above are:

- Growth is not independent of size: Smaller firms possess higher growth potential than larger ones, growth rates decrease with size and age.
- Growth is not random: Growth today influences growth tomorrow, there is a 'persistence of growth'.

- When the law is tested for size groups individually, deviations from the law are strongest for the smallest size groups.

One can say that these results support the life cycle theory of the firm:

- Firms grow relatively strong at first, then growth declines.
- Growth isn't random in the life cycle theory either.

3.5 Concluding remarks

The current Chapter investigated how firm size can be influenced by firm-specific factors. The following basic mechanisms are elaborated:

- economies of scale and scope
- transactions-costs theory
- agency-costs theory
- demand factors and life cycle theory of the firm.

Some of these factors are specific to the market the firm is in, for instance the cost structure of the technology or the transaction costs and demand factors, others are more general such as managers' motives and life cycle effects. It seems reasonable to assume that the specific factors present natural borders to firm size in a certain market, while within these borders, size can fluctuate because of the general factors. For instance, a company that produces and supplies electricity will need a certain minimum scale in order to be a serious competitor, this minimum efficient scale can be the result of high fixed technical costs, fixed costs of transactions (setting up a system of measurement and payment), or demand factors that make large companies seem more reliable to consumers of electricity.

These natural borders are relevant for all the competitors in the (same) market, where the companies start to differ strategically is in their decisions concerning the processes of the value chain. Which activities are kept in-house and which are outsourced? Exactly how big the specific company is can then be explained by looking at external factors, such as demand factors and the stage of the life cycle it is in, and by looking at internal factors. The latter ones are parts of the culture of the organization and the management that give each company its own 'face', these factors are important in influencing, for instance, the entrepreneurial spirit in a company (innovativeness, competitive aggressiveness, proactivity, etc.) and the overall commitment.

Interaction of all determinants of scale at the level of the firm is relevant. The theory of economies of scale and scope and the theory of transaction costs originate from different periods in economic history, but they are trying to explain the same problems. While they use different assumptions and preconditions (particularly as regards human behaviour and rationality), they are strongly supplementing each other. Transaction-costs theory only makes sense when the theory of economies of scale and scope is taken into account.

4 Determinants of scale at the sectoral level

In this Chapter we search for theoretical explanations for the average size and size distribution of a sector or industry cluster. It should be noted that there is no straight boundary between the factors determining size at the firm level (Chapter 3) and at the sectoral level. Obviously, firms in one sector often have similar characteristics (costs structures), and particularly the transaction-costs theory (section 3.2) is important in explaining the size of sectors as well as the size of the firm. In the current Chapter, however, we focus on relations between firms, such as motives for co-operation and clustering and on factors that influence the size of firms in the whole sector, such as the economic situation or the market structure. Section 4.1 looks at external economies of scale, section 4.2 at network economies and section 4.3 at the theory about standard setting. These theories give important explanations for co-operation or anti-co-operative behaviour. Section 4.4 concludes.

4.1 External economies of scale

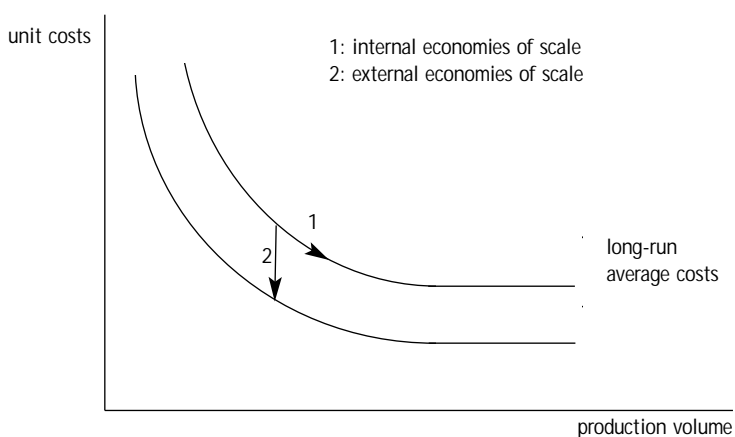
Internal economies of scale (see section 3.1) seem to have decreased in significance over the last decades, with the movement away from large-scale mass production to more flexible production methods (see Piore and Sabel, 1984). This may explain part of the average size decrease of firms. According to Oughton & Whittam (1997), external economies of scale are increasingly important.

External economies of scale

External economies of scale occur when an expansion of total industry output causes average industry costs to fall.

External economies of scale are forces which cause the supply price to fall as the industry expands. These are external effects, because they affect the industry as a whole, not the individual firm proportionally. With external scale economies, the expansion of a competitive industry brings about cost reductions. These cost reductions arise not at the firm level but at the industry level or a local or regional level and are reflected in a downward movement of the entire costs curve of (all) firms whereas internal economies of scale reflect movements along the costs curve of a firm (see figure 4.1) (see Oughton & Whittam, 1997, p. 4).

Figure 4.1 Long-run average costs curve of firms in a sector with internal and external economies of scale



The expansion of the industry is in adding new firms, not in scale increase of existing firms, since all firms, by definition, already have their optimum size in competitive markets. The mechanism is that: 'if the industry grows larger, it becomes possible to reorganize the industry, making greater use of specialization and division of labour. In turn, specialization and division of labour improve the productivity of labour and other resources, and so cut costs'. The long-run supply curve shifts downwards in industries with external economies of scale (see McCain, 1981, p. 224).

Oughton and Whittam (1997) distinguish 3 types of external economies of scale:

1. pecuniary or competitive external economies
2. technological or exogenous external economies
3. collective external economies.

Ad 1) Competitive external economies

Competitive external economies of scale follow from internal economies of scale in a competitive market environment; costs reductions caused by internal economies of scale are passed on as lower prices to consumers and buyers, so that external economies of scale can rise. For instance, when investment in new capacity in an industry lowers prices and increases benefits for other firms or consumers. Since internal economies of scale are caused by high fixed costs (indivisibilities), which imply entry barriers and thus limited competitiveness of the relevant markets, it can be questioned whether internal scale economies will always lead to the passing on of cost decreases. However, under the condition of competitive markets, the passing on

of costs decreases in prices and the occurrence of external scale economies is possible.

Ad 2) Technological/exogenous external economies

Technological or exogenous external economies are independent of the degree of competition and independent of internal economies of scale. Exogenous economies appear when an individual firm profits from the level of output and utilization of factors of another firm or group of firms (the costs curve of the individual firm shifts down and entry barriers are lowered). It can involve infrastructure investments or education programmes that are financed by groups of firms, or by the government, but from which all firms can profit. It also involves spillover effects of technological knowledge and innovation.

Ad 3) Collective external economies

Collective external economies arise when firms co-operate by pooling fixed costs. This leads to a downward shift of the average costs curve (of the co-operating firms) and to lower entry barriers (but only if entry to the network of co-operating firms is not restricted). Collective external economies of scale enable small firms to generate scale economies, by co-operating, particularly as regards secondary business functions such as R&D and marketing. Co-operation can reduce the minimum efficient scale in markets and it will enlarge competition because entry barriers are lowered. However, with many of these functions, firms also profit when they do not participate themselves, so that they can act as free riders. There are different ways in which co-operation can be stimulated and free riding prevented. Using game theory and examples of successful co-operation, Oughton and Whittam (1997) show that co-operating in formal structures such as joint ventures has proved to be the most effective way. The theory of agency costs applies to these kinds of problems, see section 3.3.

4.2 Network externalities

The concept of network externalities is the following (see Liebowitz and Margolis, 1994):

Network externalities

Network externalities occur if the utility that a user derives from consumption of the good increases with the number of other agents consuming the good (as with telephony, e-mail, fax machines, etc.).

The characteristics of external economies of scale as described above are largely overlapping with those of network externalities, which are

investigated in this section. There is, however, an important difference between the two mechanisms: Network externalities mean that the value of a good increases for consumers with the number of units sold (as is the case with telephone or e-mail connections; the value of your e-mail connection increases when a larger group of your friends or business partners is getting connected as well). This implies an upward shift in the demand curve, and thus an increase in production. With external scale economies, the costs curve shifts downward, which lowers prices, increases demand, value and production, etc. Figures 4.2 and 4.3 show these shifts in costs and demand curves. The costs curve is in these examples supposed to correspond with the supply curve and costs (or prices) are for simplicity assumed to be constant.

Figure 4.2 Demand shift with network effects

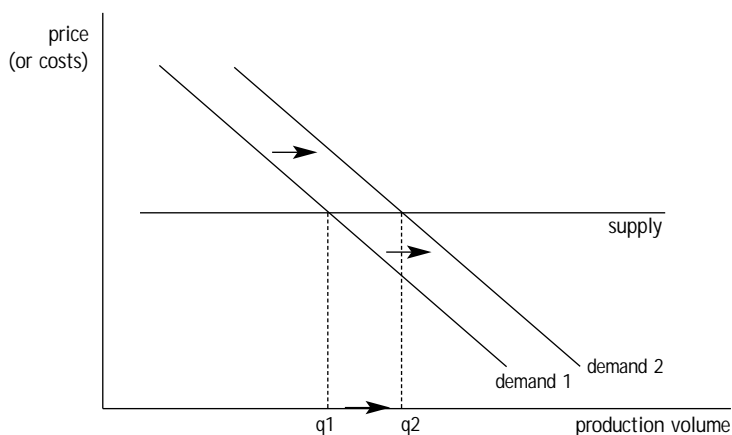
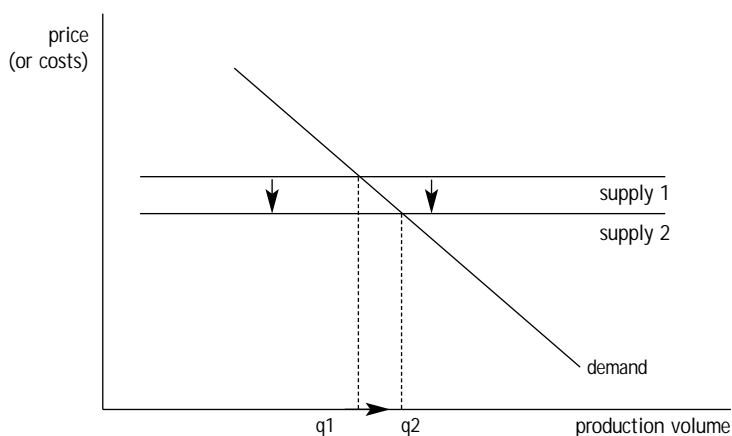


Figure 4.3 Supply shift with external economies of scale



Economides (1996) distinguishes positive consumption and production externalities of networks. The first is, as described above, that the value of a unit of the good increases with the number of units sold. There is a positive production effect because this consumption effect does not imply an upward sloping demand curve, but an upward shift in the (as usual) downward sloping demand curve which is the result of an increase in the number of units expected to be sold (Economides, 1996, p. 678).

As already mentioned above, the typical application of this theory is to telecommunication networks, where the value of a fax, telephone or e-mail connection increases in value with every new connection added to the network. Not only the communication and information sectors are network industries, but also the transport and railroad sector (when more people use the train, it is worthwhile to invest in more stations and connections). There are, however, many other sectors in the economy (sectors without physical networks) where network externalities can be found, think about the value of fashion clothes or popular movies and, of course, software. When most companies use the software operating system Windows, it is easier to adjust to that standard than to choose another (incompatible) system. This subject is further elaborated in the next section and in box 4.1 below.

Box 4.1 Network effects in information goods

Information goods (software, movies, radio and television programmes, etc.) are goods for which the fixed costs of production are (sometimes extremely) high, particularly when large R&D inputs are needed, while the reproduction costs are tending to zero. This means there are huge economies of scale to be reaped in production of information goods (see Varian, 1999). The issue is complicated by the fact that for some information goods, and particularly for software operating systems and applications, there are also important network effects; Windows is an attractive system because almost everyone uses it and all these users can exchange their work easily. How should such products, with high fixed costs and very low marginal costs of reproduction, and with network effects, be priced in a market?

Normally, such information goods are sold by 'creaming off' the market and by applying price discrimination before competition forces prices down to variable costs. An example of creaming off can be seen in the film industry. Movies are first shown in the the-

atres, and only after some time videotapes can be bought and only later the movies are shown on television. Price and quality discrimination is commonplace in these markets, not only in time but also between consumer groups, for instance when businesses pay more than students.

These markets for information goods typically are monopolistic competition markets, based on product differentiation. This means that competitors with exactly the same products are scarce, but that there is competition of products with different specifications that satisfy identical needs. In such markets, pricing restrictions are at first less rigid than those in 'normal' competitive markets (with homogeneous goods), but since the market of information goods has relatively low entry barriers, competing companies will soon copy a successful product and start competing on price.

In the software market, the same strategy of creaming off the market and price discrimination is usually followed, but lately, we also see new software offered free-of-charge. The reason for this is found in the network effects. The good will only gain value when as many people as possible use it. So in order to win, producers try to gain a large consumer base quickly by providing the product (almost) free-of-charge (see Varian, 1999).

In such a market, earning back of the high investments that were made to develop the product should follow later, when a (partial) monopoly position is reached and applications and updates can be sold against relatively high margins. For Internet software, advertising should compensate the strategy of free distribution of software.

4.3 Standard setting and lock-in effects

A factor related to network externalities that is important in explaining size and size distribution at the firm level is standard setting. This strategic factor is particularly important in modern economic sectors like the IT and computer industry, or sectors which are strongly influenced by IT and other new technologies. In these industries, strategic decisions made in the past often determine firm size in the future, since the development of the new industry depends on which technology is chosen as a standard. Once a technology has become a standard, entry is prevented by network externalities, providing pos-

itive feedbacks for the standard product and (partial) monopoly positions are created (see, for instance, the case of Microsoft, box 4.2). Technologies may display increasing returns of adoption, and often one out of several competing technologies ends up as the standard while not necessarily being the 'best' technology (see Arthur, 1989). The fact that not always the 'best' product wins in the market, can be seen as a kind of market failure. This means that the market outcome is not optimal. Economic literature on standards has given a lot of attention to this possibility of market failure with respect to opting for a standard. The argument is essentially this: an established standard can persist over a challenging standard, even where all users prefer the challenging standard. This is the result of the fact that users are unable to co-ordinate their choices and do not have perfect information.

Standard setting and particularly lock-in effects can be illustrated with an example about which much discussion is going on recently, that is the case of Microsoft. Box 4.2 elaborates this case.

Box 4.2 Microsoft and the rules of the software market

The company of Bill Gates is accused by the United States Government of the abuse of market power. That Microsoft has this power is quite obvious (nearly all PCs on this planet use the operating system Windows), and the judge already made clear that there is sufficient prove of abuse. Where does the 'success story' start? How is it possible for one company to virtually wipe out all competitors and become such a 'monster' corporation? This box illustrates that this has all been the result of software market-specific strategies.

In the early days of personal computers, there were only two main competitors: IBM and Apple. IBM was by far the biggest, the then still young Microsoft company made a deal with IBM to install all PCs with the MS DOS operating system. This immediately made Microsoft the biggest player in the software market. Experts have always pointed to the advantages of the Apple system: the use of the mouse, the graphical buttons, the overall user friendliness.

When Microsoft introduced Windows it was obvious from the start that most of the advantages of the Apple system had been incorporated by Microsoft (but still, the majority of the experts preferred the Apple system). Microsoft became an even bigger player, even

when IBM lost its dominant position. (A customer or company can easily change computer brand, but it cannot change software system as simply.) The continuing dominance of Microsoft with MS DOS and Windows made that all application manufacturers were almost forced to write their products for these operating systems (all potential customers used these systems). Application manufacturers were fighting among each other to get the favour of Microsoft, who gained a strong foothold in bargaining both with customers as well as suppliers of software. Microsoft was able to show enormous profit rates, which is by itself proof of a monopoly position.

The Internet revolution, however, presented a strong threat to Bill Gates c.s. Personal computers became network computers with the possibility of the market of operating system software being replaced by the market of Internet browsers and server software. Bill Gates quickly understood the threat and launched an aggressive attack on the main competitor, Netscape (from Netscape Navigator). Evidence for this attack strategy written down in one of his memos was found by the lawyers. Of course, the goal was to gain control of the new market, too. Microsoft made its own browser (Microsoft Explorer) and made it a standard part of the Windows package. The Explorer icon was put on the desktop. But in addition, Microsoft used its power to force the hardware producers to use its Internet browser instead of Netscape Navigator and to delete the Navigator icon by threatening not to supply Windows anymore. When users wanted to install the more popular Netscape Navigator by themselves, Windows wouldn't co-operate.

The market share of Netscape Navigator declined quickly, and even the countermeasure of supplying the browser free-of-charge didn't work. Because Netscape was not part of the Windows package, distribution costs were higher, and there was not as much money available for innovation. The only solution left was seeking a partner, and Netscape was driven into the arms of Microsoft partner AOL. This ended the threat of competition for Internet Explorer.

In the lawsuit against Microsoft, Judge Penfield Jackson's opinion is clear: Microsoft has abused its power, Microsoft earned its profits over the back of the consumer, by killing the threat of more advanced or cheaper products and, finally, Microsoft's behaviour has imposed severe damage to the economy. At the time of writing, Microsoft is judged guilty of abusing its power, but sentencing

has not been imposed as yet. There are four possible punishments for Microsoft, in case Microsoft does not win the case. These options are; breaking up the firm, forcing Microsoft to allow competitors to sell and improve Windows, requiring Microsoft to distribute rival software products such as Netscape's Internet browser, or forcing the firm to stop price discrimination.

4.4 Concluding remarks

Where Chapter 3 focused on firm size of the individual firm, Chapter 4 deals with how firm size differs and is distributed over a group of firms, and how determinants of scale influence the average size and size distribution of all firms within a sector. The following theories are worked out:

- external economies of scale and scope
- network externalities
- standard setting and lock-in effects.

External economies of scale and scope can explain why the number of firms within a sector or a cluster increases, and it can explain changes in the average firm size within sectors. For instance, external economies of scale occur when a new technology becomes available, and it lowers the costs of all firms in the sector. This will decrease costs and prices, and increase demand and thus the number of firms. Through internal economies of scale, each firm may have a smaller minimum efficient scale, because of the cheaper technology.

Network effects and lock-in effects are less relevant for explaining average firm size; they can give an explanation for very skew size distributions within sectors. The attributes of a sector can create circumstances in which standards are becoming important and (temporary) monopoly situations can occur. The best examples of network sectors are found in ICT-related sectors, such as software and telecommunications.

5 Trends and structural changes in firm size

The previous chapters showed how so-called 'basic mechanisms' are working for firms and sectors. Attributes of firms determine which mechanisms are relevant. For instance, for firms with high fixed costs, economies of scale can explain a large firm size. However, attributes are influenced by external factors. The market size may grow because of trade liberalization, or fixed costs may decrease because of technological developments. External changes have the strongest impact when they are structural; then they are called trends. The objective of the present Chapter is to link the basic mechanisms to the actual, dynamic situation of the (Dutch) economy. We try to explain why the macro picture does not show too many changes, while at the sectoral and particularly the micro level, the dynamics are strong. The objective is not to be complete or to give empirically justified relationships. The current Chapter is based on the information of the literature study in the preceding chapters, and on the boxes with illustrations and examples throughout chapters 3 and 4. In section 5.1 we elaborate six important structural trends, and the way in which they can affect firm size. Where possible, we link the trends to the Dutch developments in firm size, as elaborated in Chapter 2. Section 5.2 summarizes the results.

5.1 Strategic trends and basic mechanisms

Trends

According to CPB (1997) trends are: 'changes of conditions that persist for a certain period of time'. 'Conditions' in this definition are 'the characteristics of the environment that affect co-ordination: there are social, technological, economic and demographic trends'

Looking at relevant literature on trends (see a.o. Acs, Carlsson and Thurik (1996), Peters and Lever (1996) and Brock and Evans (1986)), the following six trends seem to be the most relevant:

1. Globalization and internationalization
2. Technological development
3. Deregulation and liberalization
4. Increase of uncertainty
5. (Mass) individualization
6. Flexibility of labour relations and increasing education level.

After a brief description of every trend, we shall investigate whether and how the trend affects the environment of firms and, subsequently, how it affects individual firms. Then we elaborate the basic scale mechanisms that are influenced by such changes. The basic mechanism may cause a relative scale increase or decrease; this outcome is worked out where possible. It is not our objective to be complete in this section, since there are many ways in which trends interact at the firm and the sector level, but we attempt to define the most relevant relationships.

5.1.1 Globalization

Globalization; changes in the environment of the firm

Globalization or internationalization means that the world is becoming smaller. One of the most important pillars of globalization is the increase of free trade among more countries. Many treaties were drafted during the last decades, such as for instance GATT/WTO, NAFTA and between the EU Member States. Not only goods are traded more easily. There is also a growing mobility of capital and labour throughout the world. Globalization also means that the 'distance of control' of firms or individuals increases, caused by the use of new means of communication.

What does globalization mean for the environment of firms and the attributes of the sector in which firms operate? Five points are relevant:

- increasing market size
- opening up of new markets
- intensified competition
- changes in demand characteristics
- growing supply of capital and labour.

First, increasing world trade enhances the size of the relevant geographical market (for instance, from the Netherlands to the European Union). Second, new markets can be accessed that were not open to trade before. A new market can be another country or a market for a new product. Third, opening up your home market means also a growing number of competitors and, thus, intensified international competition. International competition is also increasing because firms have larger distance of control by using information and communication technology. A firm based in Amsterdam can easily manage its subsidiaries, in say, Kuala Lumpur, without physical presence there. Fourth, within a globalizing world, the characteristics of

demand change. On the one hand, international consumers are developing more and more the same taste, while on the other hand there are significant groups of consumers who have different tastes. These groups were too small to accommodate in segmented markets, but can be accommodated now. A fifth and last change in environment is that not only global trade in goods is facilitated, but also mobility of human capital and financial capital can find its way more easily across international borders. This means that the supply of (high-quality) labour increases, as well as the supply of capital.

Relevant basic mechanisms and scale

How do the changes in firm and sector environment affect the basic mechanisms that are relevant for firm size? There are many factors interrelated here. According to the classification in Chapters 3 and 4, we first deal with the relevant factors at the level of the firm, then with the relevant factors at the sectoral level.

At the firm level: size increase

The firm-specific determinants of scale are all changed by globalization. When new markets are reached, and existing markets are growing larger, firms can realize economies of scale and scope more easily. The availability of production factors such as labour and capital is to a lesser extent a bottleneck factor for reaching economies of scale. Another factor that may cause (average) firm size to increase is that international competition intensifies as a consequence of globalization. Stronger competition will have impact on the basic mechanism of transaction and agency costs. Firms and managers have to act more efficient (X-inefficiencies will be reduced), to deal with the competitive environment. This is often a reason for firms to strengthen their position by merging or taking over other firms. Examples can be found in the banking sector, where the number of mergers grew, and where the large firms have grown larger over the past years (see Chapter 2).¹ Also the business services sector (accountants, consultancy) is strongly influenced by the globalization trend. From nationally oriented enterprises, these enterprises are increasing their markets world-wide. In this sector the number of mergers and acquisitions grew strongly.

There are also factors causing firm size to decrease. The growing international competition can be detrimental for large firms that used to be 'protected' by national borders and trade regulation. New (small and dynamic) firms can profit by competing with the bureaucracy

¹ In Chapter 2, the financial services sector does not show an increase in relative terms (table 2.2) in the number of mergers. However, in absolute terms, the number of mergers does increase, and relatively stronger in banking than in the other financial services.

and rigidity of the incumbent firms. Transaction costs of trading and entering new markets are lower, of which small firms can profit more than large firms. Small (new) firms may also be better in finding new (missing) markets and niche markets that were too small to serve in national markets. An example of these effects in the Dutch economy can be found in the wholesale sector, where average firm size decreased over the past years.

At the sectoral level: small effects

Sector-specific determinants of scale can also change as a consequence of globalization, but less direct so than the firm-specific determinants. Of course, the external circumstances of the sector change with those of its firms. However, globalization does not directly cause external economies of scale or network effects to grow larger, or lock-in effects to occur. While these determinants probably would never be around in a world that was not globalized, they are not directly caused by globalization.

Globalization and firm size

It can be concluded that the globalization trend seems to predominantly favour scale increase. The growing market size, creation of new markets, the globalization of demand and of labour and capital supply and, finally, the intensified world-wide competition, all seem to stimulate scale increase. There are, of course, some reverse developments, such as the opportunities for smaller and less bureaucratic firms in the more dynamic world, where transaction costs are lower. However, scale increase seems to be the dominant outcome when we isolate the globalization trend from other developments.

5.1.2 Technological development

Technological development; changes in the environment of the firm

Technological development is one of the most radical factors of change in the environment of firms. The most important technological changes are currently the growing importance and growing use of information and communication technology (ICT), the developments in biotechnology and those in micro technology. The ICT trend is currently the most dominating trend, and seems to have the largest impact on scale. Therefore, we focus on the ICT trend in this section.

The Internet, the use of computers in all stages of the production and distribution process, the growing number and use of new methods to communicate and send large sets of data very fast, over large distances, are examples of what ICT accomplishes.

For firms and sectors technological development means that they are confronted with a more dynamic and more competitive environment. Firms that implement the new technology can often produce at lower costs and decrease their prices. New technology may decrease the minimum efficient scale of a production process. Also, firms are confronted with faster-changing supplies by their competitors, who use the technological development to enter new markets, create new products, or communicate in a different way with their clients.

Relevant basic mechanisms and scale

At the firm level: decreasing firm size

Technological development strongly affects the basic mechanisms at the firm level, since costs structures are often changed (because of external economies of scale, relevant at the sectoral level, see below). Technological development, and particularly ICT, lowers the transaction costs for firms, in communicating within the firm, or with suppliers and customers. Transactions can be settled faster and control is more transparent. This also implies that the position of smaller firms improves relative to that of large firms. Vertical integration is no longer needed to lower transaction costs. On the demand side, firms are confronted with faster-changing consumer tastes according to which they have to adjust their supply. Production processes are becoming more flexible and better adapted to demand. This process may increase the number of transactions, but it would not be possible if transaction costs had not decreased so strongly by the use of (information and communication) technology.

In the sectors of the Dutch economy, technological development was an important factor in explaining the average firm size decrease over the past ten years in among others manufacturing, financial services and business services (see Chapter 2). In manufacturing, scale economies became less important because of technological development, and in financial and business services the decreasing transactions costs were relevant.

At the sectoral level: size decrease and increase

At the level of the sector, technology also has a strong impact. External economies of scale, network effects and standard setting are

basic mechanisms that are strongly connected to technological development (in relation to the globalization and liberalization trends), and particularly ICT. While the process of innovating often urges a large firm size to facilitate economies of scale, after the innovation has been introduced and is available to the sector, it often causes minimum efficient firm size to decrease. Lowering the minimum efficient scale of new technologies provides opportunities for smaller competitors to reap the benefits of these technologies. These are external economies of scale; the increase of the sectoral output decreases average industry costs. Average firm size can be reduced and entry barriers to the industry lowered because of these external economies of scale.

Network effects are of particular importance. Almost all ICT-related products are linked to networks, and increase in value when the number of users grows. In a globalized and liberalized world, network effects can create new (often temporary) 'natural' monopolies. A natural strategy for firms in industries with network effects is to try to set new standards and thus lock-in customers.

Since the sectors of the Dutch economy presented in Chapter 2 are very aggregated, we cannot establish the impact of technological development on firm size. However, network effects can be expected to be relevant in the Dutch ICT sector, although these effects are often relevant in an international or global context. Examples of the impact of network effects are shown by the Dutch companies Philips and Baan. Standard setting is important for almost all products that Philips produces. It was successful with setting standards in its early history with the light bulb, and more recently with the introduction of the compact disc, but unsuccessful with products such as the 'Video 2000' and the 'Digital Compact Cassette'. The example of Baan, a company that develops integrated software products, shows how fragile and temporary success can be in network sectors. The company boomed a few years ago, but seems to be on its return now, while competitors are taking over rapidly.

Technological development and firm size

It can be concluded that the basic mechanisms that are relevant at the level of the firm decrease average firm size. However, the mechanisms at the sectoral level may also cause the average firm size to increase. It can be expected that size decrease will be dominant since the first factors are relevant in almost all sectors, while the size increasing mechanisms are only relevant for some specific sectors.

5.1.3 Deregulation and liberalization

Deregulation and liberalization; changes in the environment of the firm

Deregulation and liberalization of markets is a trend that is particularly relevant in European countries. There are several steps that governments have taken to create more dynamic and flexible markets, and to correct possible governance failures that had occurred after a period of increasing regulation. Deregulation started with privatization of state monopolies in public utilities. Postal services and telecommunications are appealing examples. Together with the privatization of the often state-owned enterprises in these sectors, these utility markets were liberalized (or 're-regulated'). The European countries also implemented stricter competition law. The objective is that in more liberal markets, the law should be strict in prohibiting price or market agreements between companies (cartels) and to prevent the abuse of market power. A third track of the deregulation policy is that governments should cut in superfluous regulation so that firms are less restricted in doing business. The latter track means that the Dutch government tries to bring down the administrative burden of regulation, that entry of new firms is made easier by abolishing the business-licensing requirements, or that specific regulations like the strict law on shop opening hours were abolished.

It follows from this brief overview that the environment of firms changes rather drastically because of deregulation. The following effects follow directly from deregulation:

- Intensified competition, national and international
- Lower entry barriers for starting firms
- Lower restrictions, limitations and regulatory burden for entrepreneurship in general.

By increasing competition and dynamics, deregulation strengthens the trend of technological development. When the environment is less stable, firms are forced to innovate, because otherwise they will lose customers. Clearly, globalization is also related to liberalization, because if trade between countries would not be liberalized, globalization would not be possible.

Relevant basic mechanisms and scale

At the firm level: predominantly size decrease

Relevant basic mechanisms at the level of the firm are changing when the regulatory environment changes. With more intense competition,

economies of scale and scope in the production process may be less relevant when compared to cost factors, while flexibility and adaptability (qualities of small firms) are increasingly important. A specific kind of deregulation, the regulatory compliance, is actually pushing down the fixed costs of regulation, and thus lowers economies of scale for satisfying regulatory administration. On the other hand, when economies of scale are relevant, the stronger competition can also increase their relevancy. This is the case in the telecommunications market. Stronger competition implies that costs have to be cut and scale and scope economies have to be utilized optimally.

In the Dutch situation, the improved (regulatory) climate for starting a firm (lower entry barriers, lower costs for regulatory compliance, etc.) is for a part reflected in the large number of new start-ups over the past years. The lowering of entry restrictions and the lowering of restrictions for entrepreneurs in general may increase transaction costs. The reason is that more entry and fewer rules may also lower transparency of the market. There may be more unqualified entrepreneurs, which increases search costs, costs of contracts and of control for every transaction. An increase in these costs means that firms are more inclined to integrate forwards or backwards instead of sourcing activities out. However, in most markets the transparency will be increased after some time when sectors introduce self-regulation systems and quality-control systems. A very important factor related to stronger competition is that uncertainty about the market development is growing. This leads to a rise in transaction costs, and may thus cause a rise in firm size.

Agency costs, the costs of finding the right incentive structure within a company, are supposed to decrease when competition increases. Usually, competition does not only increase in the product markets, but also in labour markets. Employees have more incentives to act in the interest of the firm, to reduce the likelihood of being fired, or to improve their prospects for a wage raise. Besides, the risk of bankruptcy is larger in strongly competitive markets. This also increases the incentives of employees to act in the interest of the firm (and maintenance of their jobs). Deregulation in general causes an increase of entrepreneurship (also within firms) and this may induce smaller average firm sizes. This development clearly shows in almost all sectors of the Dutch economy.

The fact that many new small firms enter the market in periods of liberalization (caused by lower entry restrictions) generates a life cycle effect. At that specific period in time, there are relatively more young and small firms.

At the sectoral level: size decrease?

Determinants of scale relevant at the sectoral level are also affected by deregulation. Internal economies of scale are passed on as cost decreases to the rest of the market if the environment is competitive. When cost reductions are passed on, external economies of scale occur, and this means that new (smaller) firms may enter and capitalize on lower costs. In network industries like telecommunication or electricity provision, competition policy plays an important role. Competition policy actually provides more strict rules in liberalized markets. While network industries may have the tendency to become (temporary) natural monopolies, competition policy should act to prevent the possible abuse of market power by such monopolistic companies.

Deregulation/liberalization and firm size

Summarizing, deregulation and liberalization affect the basic mechanisms both in the way that firm size may increase or decrease, but it can be expected that the size-decreasing effect dominates. We cannot draw an overall conclusion. Where firms with high fixed costs may grow more dependent on economies of scale, because of stronger competition, there are also more opportunities for entrepreneurship and small flexible firms. Transaction costs (and firm size) may increase because of less market transparency, but agency costs (and firm size) may decrease because of better incentives in competitive markets.

5.1.4 Other trends

The three trends described above are the most relevant trends for the impact on firm scale. There are some other trends relevant for scale, but they are all more or less derivations of the globalization, technological development and deregulation trends.

Increased uncertainty

The trend of increasing uncertainty is a result of both the increasing rates of competition and the fast technological change. The environment of firms is more uncertain, because in general the speed of change is increasing, product life cycles are shorter, there are more and more new competitors, there is more entry of new firms, all submarkets are more dynamic than they used to be and changes in demand are also uncertain.

At the level of the firm, uncertainty intervenes particularly with the basic mechanisms of transaction costs and agency costs. In section 3.2 it was stated that uncertainty is one of three factors that are relevant for the costs of a transaction. The other two factors are frequency of the transaction and the extent of asset specificity. When these factors are high, contracts between firms are more complex, and in-house organization of the activities is more likely. Higher uncertainty may thus stimulate scale increase. An uncertain environment also summons defensive reactions of firms. Many (big) firms show the defensive strategy of buying (small) successful firms in each possible field of development, just in case this field turns out to be a crucial one. This has to do with agency costs, i.e. the rationality or irrationality of decisions of agents, but also with the strategy of locking-in customers and standard setting. Firms do not take the risk of missing a new and crucial technological development.

In the Dutch economy, the relatively strong merger activity in business services may have been triggered by the high uncertainty in this market. Technological development and all kinds of new activities (e-commerce, multimedia applications, etc.) are creating uncertainty about the future, which large firms attempt to secure by incorporating knowledge and by spreading activities over different countries and activities.

Uncertainty and firm size

It can be concluded that the growing uncertainty in the environment of the firm predominantly seems to enhance scale increase.

(Mass) individualization

Mass individualization is a result of cultural and social developments. Increasing individualization and the search for an own identity can be seen as a cultural and social counterdevelopment to globalization. Consumers no longer want to be treated and identified with the average consumer, 'Joe Six-pack', but they want to be treated as an individual. Still, people identify themselves with social groups. Mass individualization entails that demand changes from mass products to individually adapted products. Firms react to this trend by supplying basic products that can be adjusted to the taste of the (individualized) consumer in the final stage. Technological development accommodates this development of customization.

Related to this trend is the trend of individualization on a world-wide scale. The groups that people identify themselves with are growing larger (these groups may be small within countries, but similar groups can be found all over the world). This is partly caused by popular (American) TV shows and music that are marketed for and received by people all over the world. Thus, there are many different niche groups, but the groups are large enough for suppliers to serve them.

Individualization interferes at the demand side of markets. There is a growing (world-wide) market for many products, particularly fashion products. The life cycles of these products become shorter, and the technological requirements for production are increasing (short delivery time, individual adaptations to products, etc.). Within national or regional sub-markets, there also may be a growing demand for special products. Such products may be higher in price, but should differ from the mass (off-the-peg) products (niche markets).

(Mass) individualization and firm size

Firm size may increase as a consequence of growing market size, while on the other hand the growing importance of flexibility and adjustability of suppliers, caused by mass individualization, may stimulate smallness. Opportunities for small firms may also grow because of the growing demand for high-quality speciality products in niche markets.

Flexibility of (labour) relations and increasing education level

The relations of firms with suppliers and customers, but also with their employees, are less stable than ten years ago, and this trend is increasing. Again, growing internationalization of markets, deregulation and competition are the factors behind this trend. Flexibility is an important characteristic of firms, which means that the workforce should also be flexible. On the demand side of the labour market, there is a growing need for more flexibility, but also on the supply side. Individualization is the most important trend behind this development. Labour participation of women has grown strongly; the education level has increased considerably over the last decades, not only in Western Europe and America but also in Asia. This 'new' labour force has relatively high expectations of their jobs. People want variety and their own responsibility, spare time is becoming more important, and it is becoming rare that people work their whole life for only

one or two companies. These developments are explained in Maslow's pyramid of motivations (see Maslow, 1970). This pyramid shows that when the first necessities of life are fulfilled, self-development becomes more important.

It is important for firms to be flexible enough to adapt to fast-changing market conditions, and to be attractive employers. Hence, the basic mechanisms of transaction costs, and particularly of agency costs, are important. Section 3.3 shows that small firms are often better at creating informal and flexible organizational structures, where workers have better incentives and higher motivation. On the other hand, scale economies are important for creating flexible labour relations. Bigger firms have advantages in the division of labour and providing attractive employment conditions. However, even in large firms, the problems with motivation and rewarding are solved by introducing more entrepreneurship (in smaller units with more responsibility) within the firm, and thus introducing aspects of small firms within large firms.

Flexibility and firm size

It can be concluded that flexibility of labour relations can both enhance scale increase and scale decrease, but smallness seems to have more advantages than largeness.

5.2 Concluding remarks

Structural trends in the economy have a strong impact on how basic mechanisms of firm size work, and on the relative importance of the different mechanisms. We saw that the trends may have impact on several basic mechanisms at the same time, and that more often than not, both scale increase and decrease can be the result of these changing conditions. Without the claim of being complete, the preceding section described some relevant trends and the way in which they could influence basic mechanisms of scale, and thus firm size. Table 5.1 summarizes the general results that follow from this 'exercise'.

Table 5.1 Dominating effects of trends on firm size, through mechanisms relevant at the firm level or at the sectoral level

	Firm level	Sectoral level	Overall
1. Globalization	++	0	++
2. Technological development	—/—	—/+	—
3. Deregulation/liberalization	—/—	—	—/—
4. Uncertainty	+/—	0	+/—
5. Individualization	+/—	0	+/—
6. Flexibility of (labour) relations	+/— —	0	—

+ (+) = on average, factors (strongly) increase average firm size; — (—) = factors (strongly) decrease firm size; 0 = factors do not affect firm size.

The table shows that for four trends the overall outcome seems to be clear. Globalization increases average firm size, since the determinants of scale at the level of the firm are predominantly affected in a way that increases firm size. The determinants at the sectoral level are not relevant here. Technological developments such as ICT can be expected to decrease average firm size. The factors relevant at the sectoral level do increase firm size (for instance lock-in effects), but it is expected that the firm-level determinants are dominant in decreasing average firm size. Deregulation and liberalization can also be expected to decrease average firm size, both caused by firm-level and sectoral-level determinants of scale. Finally, the trend of more flexibility also is expected to decrease firm size on average, since the dominating factor at the firm level is the advantage of small firms in being flexible. For the other trends, no dominant direction of the development of firm size can be seen.

The general conclusion is that the various trends can affect firm size of individual firms or sectors in different ways, and that it depends on the characteristics of the firm and its environment whether firms will increase or decrease in size. With all the theoretical explanations for firm and sector size in Chapters 3 and 4, we now are able to find arguments for many different aspects of changes in firm size. It has also become clear that there is never one theoretical explanation for a certain development. The characteristics of the firm and its owners and employees, the sector, the environment and structural changes in the environment all have their impact, often in opposite directions. It would be interesting for future research to study how the determinants of scale and trends affect firm size in specific sectors or other groups of firms in which strong changes were seen, so that the subject could be elaborated in a more empirical way.

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