*Research Report 9812/E*

# SICLASS: Forecasting the European enterprise sector by industry and size class

**SCALES**
SCientific AnaLysis of Entrepreneurship and SMEs

*Niels Bosma*
*Ton Kwaak*

Zoetermeer, April 1999

ISBN: 90-371-0728-1
Price: NLG 35.-
Order number: H9812

EIM / Small Business Research and Consultancy employs 150 professionals. EIM provides policy- and practice-oriented socio-economic information on and for all sectors in private enterprise and for policy-makers. EIM is established in Zoetermeer. Besides on the Netherlands, EIM also focuses on the European economy and on other continents. You may contact us for more information about EIM and its services.

| | |
|---|---|
| Address: | Italiëlaan 33 |
| Mailing address: | P.O. Box 7001 |
| | 2701 AA Zoetermeer |
| Telephone: | + 31 79 341 36 34 |
| Fax: | + 31 79 341 50 24 |
| Website: | www.eim.nl |

This publication has been written in the framework of EIM's economic modelling programme Scales, which is financed by the Dutch Ministry of Economic Affairs.

# Contents

# Summary


### Size classes in the European Union

It is generally acknowledged that the size-class distribution of enterprises in a country is an important characteristic of its economy. Small and medium-sized enterprises (SMEs) are affected by the economic environment in a different way to large enterprises. At the same time, large concentrations of SMEs have other impacts on important economic features than small SME concentrations do.

The EU countries are increasingly co-operating and adjusting to each other's needs in order to achieve optimal joint output. However, country differences – at least for the coming decade – cannot, to say the least, be ignored. Accordingly, the existing differences in (and policies towards) size-class structures should be acknowledged. Given the development of continuing co-operation, this gives great support for a model at EU-level in which size classes are modelled explicitly. SICLASS is such a model.

### Purpose of SICLASS

First of all, SICLASS is used to provide estimates of the current size and structure of European non-primary private enterprise. In this estimating process, various results from short-term statistics are combined with the model in order to make these estimates as realistic as possible.
Next, SICLASS can be used to explore the future of the European SME-sector. That is, given a macro-economic scenario (possibly disaggregated by industry), a picture of the size-class pattern of economic development can be drawn. In addition, alternative scenarios can also be developed to analyse the impact of various macro-economic policy measures.

### Basic features of SICLASS

SICLASS is a model that consists of individual country models having an identical structure. Differences between countries are obtained by varying parameters. Analysis is done in different ways. A top-down approach is used – especially for sales and value added – that starts from macro-economic demand and subsequently disaggregates to the industry and size-class level. For employment and the number of enterprises a bottom-up technique is applied, calculating variables at the industry/size class level and then aggregating to the industry level. Observed macro-economic developments constrain the simu-

lated developments, however. Thus, the model always operates as a top-down model in the end.

The tracking performance of the model is tested by regressing actual and simulated data for 1988-1993. It is concluded that SICLASS adequately describes the developments of size-class structures on both industry-level and country-level.

**Application of SICLASS**

As an illustration of the model's potential use, a scenario for 1998-2003 is set to serve as a baseline projection for other scenarios. This baseline scenario is mainly based on the principle of a continuation of the trends observed in 1988-1998, accounting for the general convergence of the economies of the EU-countries. The base line scenario demonstrates prospects for 1998-2003 that – besides differences between countries and industries – reveal differences between size classes as well.

Two alternative scenarios are set up to investigate the impact of foreign and domestic demand on size-class patterns. Comparing the alternatives to the baseline projection indicates a large contribution of exports to the size-class pattern of real value added growth for both SMEs and large enterprises, while the impact of domestic demand is smaller than one would expect from the share of domestic sales in total sales only. A similar conclusion can be drawn for the contributions of exports and domestic sales to the size-class pattern of employment. This is a result of the inter-relation between enterprises, as modelled by in the input-output relations in SICLASS. The policy implication of this finding is, that governments wanting to improve their countries' international competitiveness should focus their measures not only on exporting firms themselves, but also to their suppliers – even though these might not export themselves.

The scenarios used illustrate the importance of acknowledging different size-class structures. Various other scenarios may be given, possibly focusing on the industry level. Relevance to the continuing integration of the European Union is clear and simulation may be an adequate tool for policy analysis.

# 1 Introduction

### Aim of this publication

In the nineties, EIM Small Business Research and Consultancy developed the SICLASS-model. This is an econometric model intended to derive information on the size-class pattern of economic development in the European Union (EU) based on macro-economic data and – when available – data by industry. Thus, it provides an industry/size-class disaggregation of macro-economic development for the EU countries. Since the model has been in use for several years now, the current report seeks to document the model, and to present it to the general public.

### Purpose of SICLASS

Basically, SICLASS serves two purposes. First of all, it is used to provide estimates of the current size and structure of non-primary private enterprise[1]. Though such data – on a harmonised basis – are provided by EUROSTAT[2], it is not possible to obtain *recent* statistical data on this subject. So, starting from EUROSTAT data, SICLASS is used to provide estimates of the current size and structure of European non-primary private enterprise[3]. In this estimating process, various results from short-term statistics are combined with the model to make these estimates as realistic as possible.

Next, SICLASS can be used to explore the future of the European SME-sector. That is, given a macro-economic scenario (perhaps disaggregated by industry), a picture of the size-class pattern of economic development can be drawn. In addition, alternative scenarios can be developed as well as to analyse the impact of various macroeconomic policy measures.

### Overview of chapters

Chapter 2 presents a general, non-technical overview of SICLASS. Subsequently, chapter 3 discusses the main equations of the model in full detail[4]. Chapter 4 gives the results of some model simulations, illustrating the model's potential use in forecasting and policy analysis.

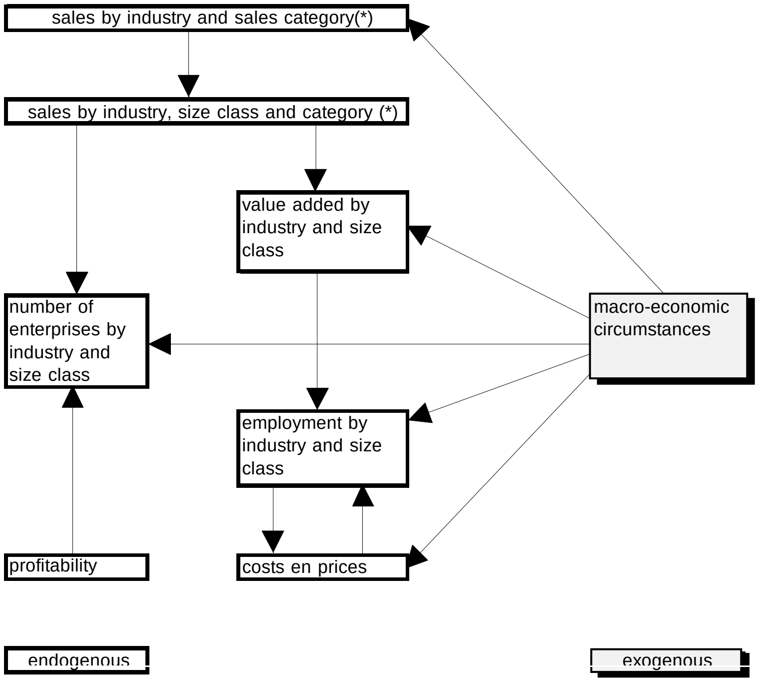
1 All enterprises, except those industries in which price-setting and/or entrepreneurs' income are to a large extent regulated. Therefore, agriculture and non-market services are excluded.
2 EUROSTAT (1988, 1990, 1992, 1995, 1998).
3 Results were presented in a/o EIM (1994-1998); EIM/ENSR (1993-1997).
4 Readers can skip this chapter if they do not want to go into the technicalities of SICLASS in-depth.

# 2 Overview of the model

## 2.1 Introduction

SICLASS is a model that – for each individual country – derives the size-class pattern of economic development from macro-economic data. Thus, the model consists of 15 individual country models, that have identical structures. The distinctions between countries are made by varying parameters. Figure 2.1 displays the general structure of these country models.

Figure 2.1 Diagram of a SICLASS country model




Thus, macro-economic data constitute the model's exogenous input data, while the model's output consists of the industry and size-class pattern of economic development in terms of:

- (real) sales, disaggregated by sales category (exports, consumer goods, investment goods, intermediate goods and services)
- (real) value added
- employment
- costs, prices and profitability
- the number of enterprises.

It should be stressed that the analysis is done at a fairly detailed industry disaggregation[1], since industries differ significantly as regards SME-presence[2]. Furthermore, it should be noted that SICLASS actually has three levels of aggregation:

- the macro-economic level – which is exogenous to the model
- the industry level (without distinguishing size classes).
- the industry/size-class level.

As can be seen from Figure 2.1, in some cases – especially sales and value added – the analysis is top-down, starting from macro-economic demand, disaggregating it to the industry level, and subsequently to the industry/size-class level. As regards employment and the number of enterprises, on the other hand, a bottom-up approach is followed: variables are calculated at the industry/size-class level, and subsequently aggregated to the industry level. In all cases, however, macro-economic developments act as constraint to simulated developments; thus, in the end, the model always operates as a top-down model.

This chapter presents a general, non-technical description of the model. The way the model is actually operated in practice will also be discussed. In chapter 3, the main equations are discussed in detail.

## 2.2 Real sales and value added

Here, a sharp distinction should be made between the industry sub-model, and the industry/size-class sub-model, since the former constitutes inputs for the latter.

### 2.2.1 Real sales

Four sales categories are distinguished: final sales (exports, consumer goods, investment goods) and intermediate goods and services. By and large, all final sales categories are treated in the same way; only intermediate goods and services are calculated differently.

#### Final sales – industry level

For each category, sales are directly related to macro-economic demand. Basically, for each industry a constant elasticity between

1 Annex II presents the industries distinguished in SICLASS.
2 For example, at EU-level, average enterprise size differs between 4 in for example construction, and 33 in extraction (EIM/ENSR, 1997).

macro-economic demand and sales is assumed[1]. Macro-economic exports act as direct constraints on exports by industry. So on average, the elasticity between sales by industry and macro-economic demand equals one for exports. For the other categories, the elasticity between sales by industry and macro-economic demand is – on average – less than one, since part of macro-economic demand is supplied by foreign enterprises, and it is assumed that the share of foreign suppliers in total sales generally increases[2].

### Sales of intermediate goods and services – industry level

Once final sales are known[3], a standard Leontief input-output model is used to calculate demand for intermediate goods and services. In this step, the amounts of imported intermediate goods and services are calculated as well. Note that use of intermediate goods and services is used to trim model results on GDP-data (if available).

### Real sales by category – industry/size-class level

For each category, the same procedure is followed. First, demand growth (potential sales growth) is calculated. The difference between demand growth and actual sales growth by industry should be interpreted as the result of import penetration: part of demand is fulfilled by foreign suppliers. Now, it is assumed that small firms are more vulnerable to import penetration than large enterprises[4] are. Thus, total sales growth of an industry is distributed over size classes, with small firms' sales growing at lower rates than the industry average if demand grows faster than supply (and large enterprises' sales growing at higher rates than industry average at the same time), and small firms' sales growing faster than the industry average if demand grows less than supply.

Of course, for each industry, consistency between total sales and sales by size class is imposed.

1 As regards consumer goods and investment goods, the structure of supply is taken into account: consumer goods are broken down into food and non-food (both using a constant elasticity for macro-economic demand), while regarding investment goods, a distinction between investment in machinery and other investment is made (both macro-economic categories are exogenous).

2 Ideally, one would proceed as follows. First, calculate total demand by industry, that is, including competing imports. Next calculate the share of imports in total demand by industry. Finally, one calculates total sales of domestic firms. However, lack of data prevents such an approach. Of course, for many service industries import penetration does not play a role.

3 Including stockbuilding, which is assumed to be a constant fraction of total sales.

4 Kwaak (1998).

### 2.2.2 Real value added

Using the industry model, real value added growth can be derived from the input-output model (see also section 2.4). It is assumed that for each industry, size-class differences regarding real value added growth correspond to differences in real sales growth. Again, consistency between real value added growth by size class and industry results is imposed.

## 2.3 Employment

As has been stated already, employment growth is calculated in a bottom-up fashion, that is, directly at the industry/size-class level`[1]. The employment equations are fairly standard: employment is explained by production, real wages and technological change.

In general, the elasticity with respect to production is less than one (Verdoorn's Law), pointing at economies of scale. These are assumed to be largest in large enterprises. Furthermore, large enterprises differ from SMEs with respect to the effect of labour hoarding: this is greatest in small firms.

Within industries, the (absolute) elasticity of employment with respect to real wages (nominal wages are exogenous) is negatively related to enterprise size. In other words, changes in real wages have larger impacts in small firms than in larger enterprises. This, of course, is related to the fact that in general, small firms are more labour-intensive than large enterprises.

Technological change is represented by an autonomous increase in labour productivity. This effect is larger in large firms than in small enterprises.

If employment in, e.g., very small enterprises increases quickly, this might be the result of two factors: either very small firms get larger, or small firms have been decreasing size so that they come to belong to very small firms (for example, if an enterprise of 11 occupied persons (small) sheds two employees during a year without contracting new employees, it becomes very small). SICLASS has a module (based on Kleijweg and Nieuwenhuisen (1996)) to estimate the impact of this crossing size-brackets of enterprises on the size-class pattern of employment growth[2].

1 Of course, consistency with macro-economic data is imposed.
2 It appears, however, that in medium term, this effect is negligible; only during stages of the business cycle can significant effects be found; see EIM/ENSR (1996, 1997).

## 2.4 Costs and profitability

Here again, a distinction should be made between the industry level and the industry/size-class level: actually, prices are calculated at industry level – taking into account costs as well as elements of competition. For each sales category, price development by size class is set equal to industry averages.

Thus, for each industry, prices are calculated taking into account unit costs and a reference price. For exports, the macro-economic deflator of exports is used as a reference point. For domestic sales (all categories), the consumption price index is used.

Unit costs are calculated by taking into account the following: use of intermediate goods and services of domestic origin[1], imported intermediate goods and services, and labour costs.

## 2.5 Number of enterprises

Theoretically, one should analyse the development of the number of enterprises acknowledging the net effects of entry, exit and other structural changes on the population of enterprises[2]. However, no harmonised data on this subject are available[3]. Therefore, the net change of the number of enterprises is calculated in SICLASS.

Two main factors are assumed to affect the (net) growth of the number of enterprises:

- production growth and profitability. Both affect the number of enterprises positively: production growth might be viewed as an increasing demand for entrepreneurship, while increasing profitability makes it more attractive to start an enterprise. Also, these factors might increase the chance of survival for existing firms, and so decrease the exit of enterprises.
- population growth and unemployment. Population growth obviously means an increase in potential entrepreneurs. The mechanism behind the impact of unemployment on the number of enterprises is as follows: becoming unemployed generally means reduction in income, which might be compensated if one starts his/her own enterprise. Therefore, an increase in unemployment implies an increase in the number of enterprises as well.

1 Since SICLASS uses an input-output framework, price change in one sector therefore affect costs – and prices as well – in other industries.
2 See Kwaak (1998) for such an approach in a macro-sectoral model.
3 EIM/ENSR (1996), presents an attempt to construct harmonised data on the entry and exit of enterprises in EU-countries.

## 2.6 Operation of SICLASS

Basically, SICLASS can be run using its exogenous variables only – macro-economic demand growth, wages, population growth and unemployment in each country – as inputs. However, the system can also be updated with sectoral information. For example, if SICLASS were used to analyse the size-class pattern of economic development starting from a macro-sectoral scenario (instead of a purely macro-economic one) results would be adjusted to the available sectoral data in the scenario. This has not been done in the simulations in chapter 4, but it has been done in the exercises in the framework of the European Observatory for SMEs, where SICLASS has been used to estimate recent developments of the European SME-sector. For example, information on the export performance of industries from 'Industrial Trends'[1] has been used to benchmark growth of exports. Also, data from the Labour Force Survey on employment and the number of self employed are used to calibrate the development of employment and growth in the number of enterprises. By so doing, the business cycle in each country is also taken into account.

Concluding, the design and operation of SICLASS are such that justification is built in, integrating the many sorts of knowledge.

1 EUROSTAT: Industrial Trends – monthly statistics (various issues).

# 3 Main equations

## 3.1 Introduction

This chapter discusses the main equations of SICLASS. It should be noted that all country models have the same structure, and therefore, no reference is made to countries when the general structure of the equations is discussed. See annex I for the variable names.

## 3.2 Real sales, stockbuilding and value added

Here the industry sub-model and the industry/size-class sub-model, should be clearly distinguished, since the former constitutes inputs for the latter.

### 3.2.1 Real sales and stockbuilding

**Exports**

Equation (3.1) explains export growth at industry level. As can be seen, export growth by industry is linearly related to macro-economic export growth, whilst in all cases, consistency with macro-data is imposed.

The elasticity of exports by industry on average equals 1. It is relatively large in many business services industries, and relatively low in extraction and basic industries such as the chemical industry. A trendwise decrease in export ($\beta < 0$) has been assumed for non-market services.

***equation 3.1: real exports by industry***

| | | | |
|---|---|---|---|
| $\mathbf{EXTVR_i}$= | | $\alpha_i \cdot \mathbf{EXTVR_{macro}}$ | relation with macro exports |
| | + | $\beta_i$ | constant |
| | + | **spreader** | impose consistency between industry and macro data |

where:

| | |
|---|---|
| $EXTVR_i$ | real export growth in industry *j* (%) |
| $EXTVR_{macro}$ | macro-economic real export growth (%) |
| $\alpha_i$, $\beta_i$ | coefficients (on average, $\alpha_i$ approximately equals 1, while $\beta_i$ approximately equals 0) |

In (3.2), export growth by industry is further disaggregated by size class. As can be seen, size classes within an industry react differently to differences between the industry export growth and the corresponding macro-data. It is assumed that in very small and small enterprises, exports grow fastest if industry export is above the macro-data. In other words, a more than average increase in export in an industry is to a relatively large extent accomplished by very small and small enterprises. The reasoning behind this is that smaller firms have a lower propensity to export (see also section 4.3), because it is relatively difficult for them to operate on foreign markets. If industry exports grow more than average, it has apparently become easier to operate on foreign markets, and therefore, smaller firms' exports increase fastest.

***equation 3.2: real exports by industry and size class***

| | | |
|---|---|---|
| $EXSVR_{i,j}$ = | $\mathbf{EXTVR_j}$ | development at industry level |
| | + $\alpha_j \cdot (\mathbf{EXTVR_i - EXTVR_{macro}})$ | size-class specific volatility |
| | + **spreader** | impose consistency between industry and industry/size-class model |

where:

| | |
|---|---|
| $EXSVR_{i,j}$ | real export growth in size class *i* in industry *j* (%) |
| $EXTVR_j$ | real export growth in industry *j* (%) |
| $EXTVR_{macro}$ | macro-economic real export growth (%) |
| $\alpha_j$ | coefficient (on average equal to 0) |

## Consumer goods

Real sales growth of consumer goods by industries is calculated in three stages. In equation (3.3) total consumption demand is broken down into two categories: food and non-food. The elasticity with respect to total consumption ($\alpha$) equals about 0.6 for food, and 1.2 for non-food. Furthermore, $\beta$ is positive for non-food, while it is negative for food. Both indicate a decreasing share of food in total budget.

***equation 3.3: real sales of consumer goods by category***

| | | | |
|---|---|---|---|
| $\mathbf{CGKVR_c}$= | | $\alpha_c \cdot \underline{\mathbf{CGXVR}}$ | development at macro level |
| | + | $\beta_c$ | constant |
| | + | **spreader** | impose consistency between category and macro data |

where:

| | |
|---|---|
| $CGKVR_c$ | real value added growth in category *c* (*c*: food, non-food) (%) |
| CGXVR | macro-economic real consumption growth (exogenous; %) |
| $\alpha_c$, $\beta_c$ | coefficients ($\alpha_c$ on average 1, $\beta_c$ on average 0) |

Next, equation (3.4) indicates that potential real sales growth is calculated taking into account the structure of supply, and the growth of consumption demand for food and non-food). Potential sales growth can therefore be identified as demand for consumer goods and services for the industry.

***equation 3.4: potential real sales of consumer goods by industry***

$$\mathbf{CGTVR_{i,\,pot}} = \Sigma_C\, w_{i,\,c} \cdot \mathbf{CGKVR_c} \quad \text{development by category}$$

where:

| | |
|---|---|
| $CGTVR_{i,\,pot}$ | potential real growth of sales of consumer goods in industry *j* (%) |
| $CGKVR_c$ | real value added growth in category *c* (*c*: food, non-food) (%) |
| $w_{i,\,c}$ | share of category *c* in total sales of consumer goods of industry *i* |

Additionally, equation (3.5) describes how actual sales growth is derived from potential sales growth. If potential sales increase, actual sales will increase as well. However, actual sales will increase to a lesser extent since in many industries the corresponding elasticity α is less than 1. This holds especially for industries such as manufacturing and transport: these are exposed to international competition, and increasing internationalisation generally implies that the share of imports in total demand increases. In some industries – especially extraction and energy – β is negative as well; these are the typical industries in which various policy measures to remove international trade barriers[1] are becoming effective[2].

1 For example, from the European Commission's 1992 programme.
2 It should be noted that increasing imports imply that the market shares of domestic firms decrease. On the other hand increasing imports imply increasing exports by other countries as well. This is, however, not directly visible in SICLASS since exports are exogenous.

***equation 3.5: real sales of consumer goods by industry***

| | | | |
|---|---|---|---|
| $\mathbf{CGTVR_i =}$ | | $\alpha_i \cdot \mathbf{CGTVR_{i,\,pot}}$ | impact of potential sales |
| | + | $\beta_i$ | constant |

where:

| | |
|---|---|
| $CGTVR_j$ | real growth of sales of consumer goods in industry *j* (%) |
| $CGTVR_{j,\,pot}$ | potential real growth of sales of consumer goods in industry *j* (%) |
| $\alpha_i$, $\beta_i$ | coefficients (on average, $\alpha_i$ approximately equals 1, while $\beta_i$ approximately equals 0) |

Finally, equation (3.6) shows the way in which sales growth of consumer goods by industry are assigned to size classes. Sales growth by industry is taken as a starting point. If it appears that actual sales growth at industry level is less than demand – because of import penetration -, sales growth in smaller firms is least ($\alpha > 0$). This is because of the assumption that import penetration is most detrimental to small enterprises.

***equation 3.6: real sales of consumer goods by industry and***

***size class***

| | | | |
|---|---|---|---|
| $\mathbf{CGSVR_{i,\,j} =}$ | | $\mathbf{CGTVR_j}$ | development at industry level |
| | + | $\alpha_j \cdot (\mathbf{CGTVR_i - CGTVR_{j,\,pot}})$ | size-class specific volatility |
| | + | **spreader** | impose consistency between industry and industry/size-class model |

where:

| | |
|---|---|
| $CGSVR_{i,\,j}$ | real growth of sales of consumer goods in size class *i* in industry *j* |
| $CGTVR_j$ | real growth of sales of consumer goods in industry *j* (%) |
| $CGTVR_{j,\,pot}$ | potential real growth of sales of consumer goods in industry *j* (%) |
| $\alpha_j$ | coefficient |

## Investment goods

As regards investment goods, the approach is the same as for consumer goods. First, potential sales growth is calculated at the industry level using (3.7). A distinction is made between investment in machinery, and other investment. Other than for consumer goods, no endogenous breakdown into categories is made; instead, investment by category is exogenous.

***equation 3.7: potential real sales of investment goods by industry***

| | | |
|---|---|---|
| $\mathbf{IGTVR_{i,\,pot}} =$ | $\Sigma_C\, w_{i,\,c} \cdot \underline{\mathbf{IGKVR_c}}$ | development by category |

where:

| | |
|---|---|
| $IGTVR_{i,\,pot}$ | potential real growth of sales of investment goods in industry *j* (%) |
| $IGKVR_c$ | real investment growth in category *c* (*c*: machinery, other) (exogenous; %) |
| $w_{i,\,c}$ | share of category *c* in total sales of investment goods of industry *i* |

Next, actual sales growth is derived from potential sales growth (3.8). Here again, industries that are exposed to international competition will generally see sales growth lag behind potential sales growth as a result of increasing market shares of foreign competitors.

***equation 3.8: real sales of investment goods by industry***

| | | |
|---|---|---|
| $\mathbf{IGTVR_i} =$ | $\alpha_\mathbf{i} \cdot \mathbf{IGTVR_{i,\,pot}}$ | impact of potential sales |
| | $+\ \beta_\mathbf{I}$ | constant |

where:

| | |
|---|---|
| $IGTVR_j$ | real growth of sales of investment goods in industry *j* (%) |
| $IGTVR_{j,\,pot}$ | potential real growth of sales of investment goods in industry *j* (%) |
| $\alpha_i$, $\beta_i$ | coefficients (on average, $\alpha_i$ approximately equals 1, while $\beta_i$ approximately equals 0) |

Finally, sales growth by industry is distributed over size classes (3.9). Here as well, it is assumed that smaller firms are hurt most by import penetration, and as a result, a is positive for very small and small firms, while it is negative for medium-sized enterprises.

***equation 3.9: real sales of investment goods by industry and size class***

$$\mathbf{IGSVR_{i,\,j}} = \mathbf{IGTVR_j} \quad \text{development at industry level}$$
$$+\ \alpha_j \bullet (\mathbf{IGTVR_i} - \mathbf{IGTVR_{j,\,pot}}) \quad \text{size-class specific volatility}$$
$$+\ \mathbf{spreader} \quad \text{impose consistency between industry and industry/size-class model}$$

where:

| | |
|---|---|
| $IGSVR_{i,\,j}$ | real growth of sales of investment goods in size class *i* in industry *j* |
| $IGTVR_j$ | real growth of sales of investment goods in industry *j* (%) |
| $IGTVR_{j,\,pot}$ | potential real growth of sales of investment goods in industry *j* (%) |
| $\alpha_j$ | coefficient |

## Sales of intermediate goods and services

At the industry level, an input-output approach is followed[1]. Thus, growth in potential sales of intermediate goods and services is calculated as in (3.10). The assumption of fixed technical coefficients implies that demand for intermediate goods and services grows at the same rate as gross production. Total sales of intermediate goods is obtained by aggregating sales to all demanding industries.

***equation 3.10 real growth of sales of intermediate goods by industry***

$$\mathbf{DUTVR_{i,\,i'}} = \mathbf{QGTVR_i}$$

where:

| | |
|---|---|
| $DUTVR_{i,\,i'}$ | real growth of demand for intermediate goods and services by industry *i* to industry *i'* (%) |
| $QGTVR_{i'}$ | real growth of gross production in industry *i'* (%) |

As can be seen from (3.11), sales of intermediate goods and services are assumed to grow at the same rate in each size-bracket within an industry.

1 In Kwaak (1998), such an approach is used at (the) industry/size-class level in a model for The Netherlands. As no adequate input-output tables are available for the other countries of the EU, this approach could not be followed in SICLASS.

***equation 3.11 real growth of sales of intermediate goods by industry and size class***

$$INSVR_{i,j} = INTVR_i$$

where:

| | |
|---|---|
| $INSVR_{i,j}$ | real growth of sales of intermediate goods and services by size class *j* of industry *i* |
| $INTVR_i$, | real growth of sales of intermediate goods and services in industry *i* (%) |

**Stockbuilding**

Stockbuilding is relevant only for the industry level of SICLASS, since it is used to calculate gross production. As can be seen from (3.12), stockbuilding is assumed to be a constant fraction of total sales.

***equation 3.12 real stockbuilding by industry***

$$SBTVN_i = SATVN_i \cdot (SBTWN_{j,\,t-1} / SATWN_{i,\,t-1})$$

where:

| | |
|---|---|
| $SBTVN_j$ | real stockbuilding in industry *j* |
| $SBTWN_j$ | value of stockbuilding in industry *j* |
| $SATVN_j$ | real sales in industry *j* (%) |
| $SATWN_j$ | value of sales in industry *j* (%) |

## 3.2.2 Real value added

In the industry model, real value added growth is derived directly from the input-output model, as can be seen from (3.13). Note that – similar to demand for intermediate goods and services supplied by domestic firms – it has been assumed that imports of intermediate goods and services is proportional to gross production.

***equation 3.13 real value added by industry***

$$QGTVN_j = EXTVN_j + CGTVN_j + IGTVN_j + INTVN_j + SBTVN_j$$
$$TUTVN_j = DUTVN_j + MUTVN_j$$
$$YGTVN_j = QGTVN_j - TUTVN_j$$

where:

| | |
|---|---|
| $QGTVN_j$ | real gross production in industry *j* |
| $EXTVN_j$ | real exports in industry *j* |
| $CGTVN_j$ | real sales of consumer goods in industry *j* |
| $IGTVN_j$ | real sales of investment goods in industry *j* in industry *j* |
| $INTVN_j$ | real sales of intermediate goods and services in industry *j* |
| $TUTVN_j$ | real total use in industry *j* |
| $DUTVN_j$ | real use, domestically produced in industry *j* |
| $MUTVN_j$ | real use, imported in industry *j* |
| $YGTVN_j$ | real value added in industry *j* |

Because of lack of data, a similar breakdown of gross production into use of intermediate goods and services and value added cannot be made at the size-class level. Therefore, SICLASS directly estimates real value added growth by assuming that for each industry, size-class differences regarding real value added growth correspond to differences in real sales growth. This is shown in (3.14). The spreader imposes consistency between real value added growth by size class and the industry total.

***equation 3.14: real value added growth by industry and size class***

| | | |
|---|---|---|
| $YGSVR_{i,j} =$ | $YGTVR_j$ | development at industry level |
| | $+ \; SASVR_{i,j} - SATVR_{i,j}$ | size-class difference real sales |
| | + **spreader** | impose consistency between industry and industry/size-class model |

where:

| | |
|---|---|
| $YGSVR_{i,j}$ | real value added growth in size class *i* in industry *j* (%) |
| $YGTVR_j$ | real value added growth in industry *j* (%) |
| $SASVR_{i,j}$ | real sales growth in size class *i* in industry *j* (%) |
| $SATVR_{i,j}$ | real sales growth in industry *j* (%) |

## 3.3 Employment

Employment equations are presented in equation (3.15). Explanatory variables are:

- production growth. An increase in production will ceteris paribus imply employment growth. It is assumed that large enterprises benefit more from economies of scale than smaller enterprises do; therefore, the production elasticity of employment ($\alpha$) is smallest in large enterprises. Furthermore, it is assumed there is a lag when enterprises adjust the work force to production. This lag – indicated by $(1 - \upsilon)$ – is largest in small enterprises. A reason for this is the existence of threshold labour in small firms.
- real wages. The impact of changes in real wages is greatest in small enterprises, because of the labour intensive nature of these firms.
- technological change. It is assumed that over time, labour productivity increases in an autonomous way as well. This is reflected by the constant term $\gamma$. The impact of technological change is greatest in large firms.

***equation 3.15: employment by industry and size class***

$$\mathbf{EMSMR_{i,j}} = \alpha_{\mathbf{i,j}} \cdot (\upsilon_{\mathbf{i,j}} \cdot \mathbf{YGSVR_{i,j}} + (1 - \upsilon_{\mathbf{i,j}}) \cdot \mathbf{YSSVR_{i,j}}) \quad \text{production growth}$$

$$+ \beta_{\mathbf{i,j}} \cdot (\underline{\mathbf{LCSPR}}_{\mathbf{i,j}} - \mathbf{YGSPR_{i,j}}) \quad \text{real wages}$$

$$+ \gamma_{\mathbf{i,j}} \quad \text{technological change}$$

where:

| | |
|---|---|
| $EMSMR_{i,j}$ | rate of change of employment in size class *i* in industry *j* (%) |
| $YGSVR_{i,j}$ | real value added growth in size class *i* in industry *j* (%) |
| $YSSVR_{i,j}$ | medium-term real value added growth in size class *i* in industry *j* (%) |
| $LCSPR_{i,j}$ | labour costs per employee in size class *i* in industry *j* (exogenous; %) |
| $YGSPR_{i,j}$ | deflator of value added growth in size class *i* in industry *j* (%) |
| $\alpha, \upsilon, \beta, \gamma$ | $0 < \alpha, \upsilon < 1; \beta, \gamma < 0$ |

## 3.4 Costs and prices

At the industry level, prices are calculated as a weighted average of unit costs and a reference price. For each sales category, price changes by size class are set equal to the corresponding sectoral average.

## Costs by industry

The following cost categories are taken into account:

- labour costs. These result from employment (section 3.3) and labour costs per employee (exogenous)
- costs of intermediate goods and services. A distinction is made between:
  - domestically produced goods and services, whose price is calculated endogenously in SICLASS
  - imported goods and services. The prices of imports are implemented exogenously.

The accounting rules used to calculate unit costs are presented in (3.16).

***equation 3.16: total and unit cost per industry***

$$TCTWN_j = TUTWN_j + LCTWN_j$$
$$TUTWN_j = DUTWN_j + MUTWN_j$$
$$DUTWN_j = \Sigma_I \, DUTWN_{i,\,j}$$
$$TCTQR_j = 100 \cdot ((1 + 0.01 \cdot TCTWR_j)/(1 + 0.01 \cdot QGTVR_j) - 1)$$

where:

| | |
|---|---|
| TCTWNj | value total cost in industry *j* |
| $TCTQR_j$ | rate of change of total cost in industry *j*, per unit of gross production (%) |
| $TCTWR_j$ | rate of change of total cost in industry *j* (%) |
| $TUTWN_j$ | total use of intermediate goods and services in industry *j* |
| $LCTWN_j$ | labour costs in industry *j* |
| $DUTWN_j$ | total use of intermediate goods and services in industry *j*, domestically produced |
| $DUTWN_{i,\,j}$ | use of intermediate goods and services in industry *j*, produced by industry *i* |
| $MUTWN_j$ | imports of intermediate goods and services in industry *j* |
| $QGTVR_j$ | real growth of gross production |

## Prices by industry

Prices are calculated as a weighted average of unit costs and a reference price, the weight of costs being 0.75, and the weight of the reference price 0.25. A distinction is made between prices of goods and services sold on foreign markets and those sold on domestic markets:

- as regards exports, the macro-economic export deflator is used (3.17)
- for domestic sales, the private consumption deflator serves as a reference price (3.18).

***equation 3.17: price of exports by industry***

| | | |
|---|---|---|
| $\mathbf{EXTPR_i =}$ | $\mathbf{0.75 \bullet TCTQR_j}$ | impact of costs |
| | $\mathbf{+\ 0.25 \bullet \underline{EXTPR}_{macro}}$ | impact of reference price |
| | **+ spreader** | impose consistency between industry and macro data |

where:

| | |
|---|---|
| $EXTPR_i$ | rate of change of export price of industry *j* (%) |
| $TCTQR_j$ | rate of change of total cost in industry *j*, per unit of gross production (%) |
| $EXTPR_{macro}$ | rate of change of macro-economic export price (exogenous; %) |

***equation 3.18: price of domestic sales (3 categories) by industry***

| | | |
|---|---|---|
| $\mathbf{DOTPR_i =}$ | $\mathbf{0.75 \bullet TCTQR_j}$ | impact of costs |
| | $\mathbf{+\ 0.25 \bullet \underline{CGXPR}}$ | impact of reference price |
| | **+ spreader** | impose consistency between industry and macro data |

where:

| | |
|---|---|
| $DOTPR_j$ | rate of change of price of domestic sales (consumer goods, investment goods, intermediate goods and services) of industry *j* (%) |
| $TCTQR_j$ | rate of change of total cost in industry *j*, per unit of gross production (%) |
| CGXPR | rate of change of consumption price index (exogenous; %) |

Finally, the deflator of value added can be calculated according to the definition of value added.

### Prices by industry and size class

As can be seen from (3.19), price changes within an industry are the same for each size-bracket for all sales categories. As a result, differences between size classes regarding sales price change merely reflect differences in the structure of sales (domestic vs. foreign) and the difference between export prices and prices of goods and services sold domestically.

***equation 3.19: price of sales (4 categories) by industry and size class***

| | | |
|---|---|---|
| $\mathbf{SASPR_{i,j}} =$ | $\mathbf{SATPR_{j}}$ | development at industry level |

where:

| | |
|---|---|
| $SASPR_{i,j}$ | rate of change of prices (export, consumer goods, investment goods, intermediate goods and services) in size class *i* in industry *j* |
| $SATPR_{i,j}$ | rate of change of prices (export, consumer goods, investment goods, intermediate goods and services) in industry *j* |

At the size-class level, value added cannot be calculated according to its definition. Therefore, the value added deflator is calculated in a similar way to real value added growth (section 3.1), assuming that differences between size classes within an industry regarding sales prices are reflected in differences regarding the change in the value added deflator.

***equation 3.20: value added deflator by industry and size class***

| | | |
|---|---|---|
| $\mathbf{YGSPR_{i,j}} =$ | $\mathbf{YGTPR_{j}}$ | development at industry level |
| | $+\ \mathbf{SASPR_{i,j}} - \mathbf{SATPR_{i,j}}$ | size-class difference real sales |
| | **+ spreader** | impose consistency between industry and industry/size-class model |

where:

| | |
|---|---|
| $YGSPR_{i,j}$ | value added deflator in size class *i* in industry *j* (%) |
| $YGTPR_{j}$ | value added deflator in industry *j* (%) |
| $SASPR_{i,j}$ | sales deflator in size class *i* in industry *j* (%) |
| $SATPR_{i,j}$ | sales deflator in industry *j* (%) |

## 3.5 Number of enterprises

Changes in the number of enterprises are caused by entries and exits. Unfortunately, due to lack of data, it is not possible to model these flows separately. The growth of the number of enterprises (resulting from entry and exit) in each industry and size class is explained by six variables, as equation (3.21) points out. Their impacts can be categorised as follows:

- impact of sales growth. The number of enterprises is assumed to be positively related to sales volume in the corresponding industry and size class. This represents the demand for entrepreneurship. For very small firms in some countries[1] an additional increase results if population growth undermines sales growth and a negative adjustment results if population growth exceeds production growth.
- impact of population growth. The impact of population growth and the change in population growth on the number of enterprises is expected to be of significance for very small firms in some countries only.
- impact of unemployment. Both unemployment and the change in unemployment are assumed to affect the growth of very small businesses positively. The reasoning behind this is the hypothesis that unemployed people may create their own jobs by starting a (very small) firm if they do not succeed in finding a job.

***equation 3.21: number of enterprises by industry and size class***

| | | |
|---|---|---|
| $\mathbf{EPSFR_{i,\,j}} =$ | $\alpha_1 * \mathbf{SASVR_{i,\,j}}$ | impact sales growth |
| | $+\ \alpha_2 * \mathbf{SASVR_{i,\,j}} - \mathbf{POPFR}$ | impact per capita sales growth |
| | $+\ \alpha_3 * \mathbf{POPFR}$ | impact population growth |
| | $+\ \alpha_4 * (\mathbf{POPFR} - \mathbf{POPFR_{t-1}})$ | impact change population growth |
| | $+\ \alpha_5 * \mathbf{UNTQN}$ | impact unemployment level |
| | $+\ \alpha_6 * \mathbf{UNTQD}$ | impact unemployment change |

where:

| | |
|---|---|
| $EPSFR_{i,\,j}$ | rate of change of the number of enterprises in size class *i* in industry *j* (%) |
| $SASVR_{i,\,j}$ | rate of change of the volume of total sales in size class *i* in industry *j* (%) |
| POPFR | rate of change of the population (%) |
| UNTQN | unemployment rate (%) |
| UNTQD | absolute change of the unemployment rate (%) |
| $\alpha_1 – \alpha_6$ | $\alpha_1 – \alpha_6 \geq 0$ |
| | $\alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6 = 0$ for small, medium-sized and large enterprises |
| | $\alpha_2, \alpha_3, \alpha_4 = 0$ for very small firms in most cases |

1 Belgium, France, Ireland, Luxembourg, Portugal.

# 4 Simulations

## 4.1 Introduction

This chapter presents a number of simulation results. To start with, SICLASS' tracking performance is discussed in section 4.1. Subsequently, a scenario for the European enterprise sector 1998-2003 is presented. Finally, an example of policy analysis using SICLASS is given in section 4.4.

## 4.2 Tracking performance

To check the tracking performance of SICLASS, the model has been run for 1988-1993, and it will be reviewed whether the size-class structure of the European economy as estimated for 1993 is in accordance with actual data[1]. This section investigates whether this is the case:

- at country level. Thus, the main question is: to what extent does the simulated size-class structure by country in 1993 differ from the actual size-class structure?
- at industry level. Here, the main question is: to what extent does the simulated size-class structure by industry in 1993 differ from the actual size-class structure?

For the analysis, regressions of the following type are run:

$$a_{i,j} = \alpha \cdot f_{i,j} + \beta$$

where

| | |
|---|---|
| $a_{i,j}$ | actual share of size class i in country or industry j (for example, the actual share of small enterprises in Belgian employment) |
| $f_{i,j}$ | simulated share of size class i in country or industry j |

In the case of perfect forecasting, one would have $\alpha = 1$ and $\beta = 0$. Regression analysis provides the possibility to investigate whether $\alpha$ and $\beta$ differ significantly from 1 and 0, respectively.

The analysis has been done for three variables: employment, turnover and value added. Below, differences between actual and simulated shares of size classes for each of these variables will be discussed.

1 As has been explained, the model is normally run adding partially available statistical information. In the present application, however, this has not been done. Thus, a strong test of the forecasting ability of SICLASS is achieved.

## Actual and simulated employment shares

Figure 4.1 presents actual and simulated shares of size-bands in total employment in Europe. As regards small and medium-sized enterprises, differences between actual and simulated employment shares are negligible. With respect to large and very small enterprises, differences are slightly larger, amounting to an over-estimate of 0.2 percentage-point for large enterprises, and an under-estimate of the same size for very small enterprises. This should be evaluated against an actual employment share of about one third for both very small and large enterprises.

Table 4.1 shows the results of the regression analysis comparing the simulated employment shares of each size class with respect to actual shares. In all cases, $\alpha$ does not significantly differ from 1, nor does $\beta$ significantly differ from 0.

It may be concluded, that SICLASS adequately describes the development of the employment share of size classes.

## Actual and simulated turnover shares

Simulated and actual turnover shares for the EU are presented in Figure 4.2. Only minor differences can be observed. Table 4.2 presents the results of the regression analyses. As for employment, the coefficients are of the right magnitude.

By and large, one may conclude that SICLASS describes the size-class distribution of turnover quite well.

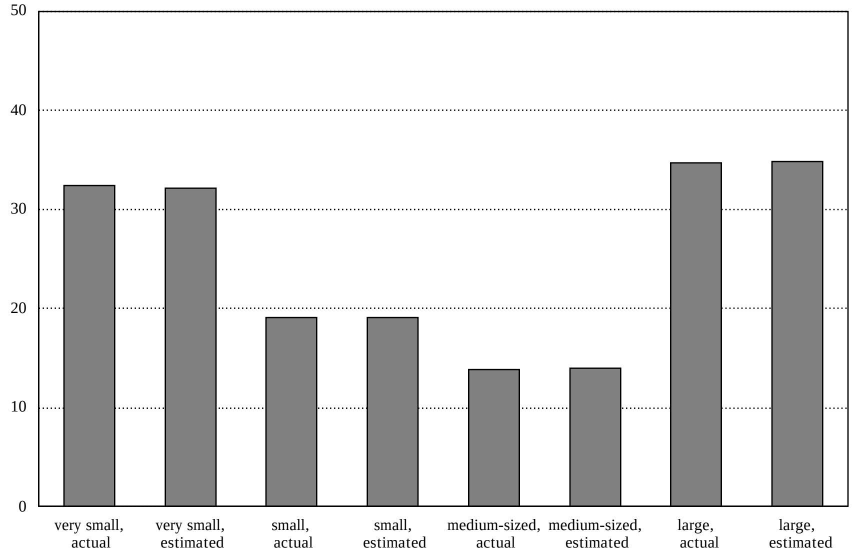
## Actual and simulated value added shares

Results regarding simulated and actual shares of size classes in value added are presented in Figure 4.3; Table 4.3 gives the corresponding regression results. SICLASS slightly overestimates the share of very small and large enterprises; correspondingly, the share of small enterprises is underestimated. With respect to the regression results, the following should be noted:

- in all cases but one, $\alpha$ and $\beta$ are of the correct magnitude
- only for the regression results by country is $\beta$ significantly less than 0. This is more or less compensated by the estimate of $\alpha$, which is slightly greater than 0.

In general, SICLASS satisfactorily simulates the development of value added shares.

Figure 4.1 Actual and estimated shares of size classes in total employment



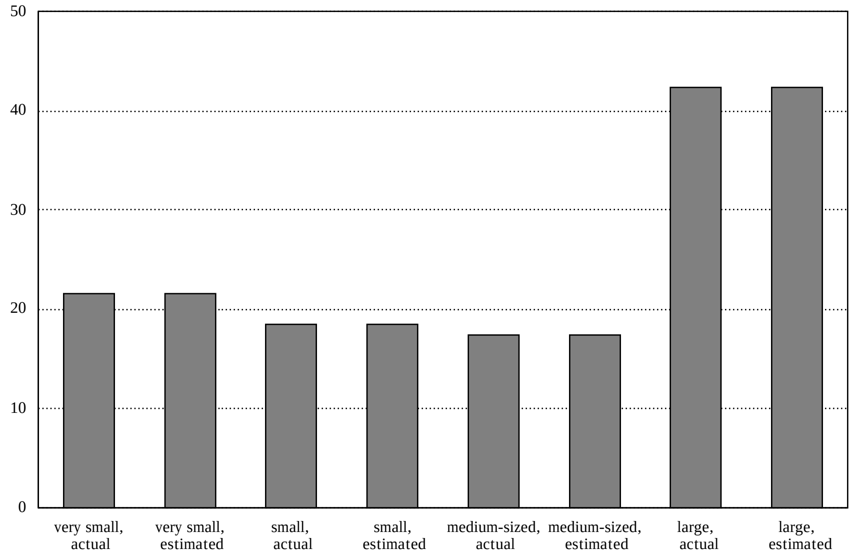

Source: EIM Small Business Research and Consultancy.

Table 4.1 Regression results with respect to actual and simulated employment shares (t-values between parentheses)

| | $\alpha$ | $\beta$ (%) | $R^2_{adj}$ |
|---|---|---|---|
| ***industries*** | | | |
| very small | 0.99* | 0.09** | 0.99 |
| | (534.8) | (1.4) | |
| small | 1.00* | -0.03** | 0.99 |
| | (253.1) | (0.3) | |
| medium sized | 1.00* | -0.02** | 0.99 |
| | (182.5) | (0.3) | |
| large | 1.00* | 0.20** | 0.99 |
| | (268.8) | (0.8) | |
| ***countries*** | | | |
| very small | 1.02* | -0.13** | 0.99 |
| | (81.5) | (0.3) | |
| small | 0.98* | 0.30** | 0.99 |
| | (59.2) | (0.9) | |
| medium sized | 1.02* | -0.51** | 0.99 |
| | (57.1) | (1.6) | |
| large | 0.99* | 0.25** | 0.99 |
| | (108.0) | (0.8) | |

* Not different from 1 (95% confidence level).
** Not different from 0 (95% confidence level).
Source: EIM Small Business Research and Consultancy.

Figure 4.2 Actual and estimated shares of size classes in total turnover



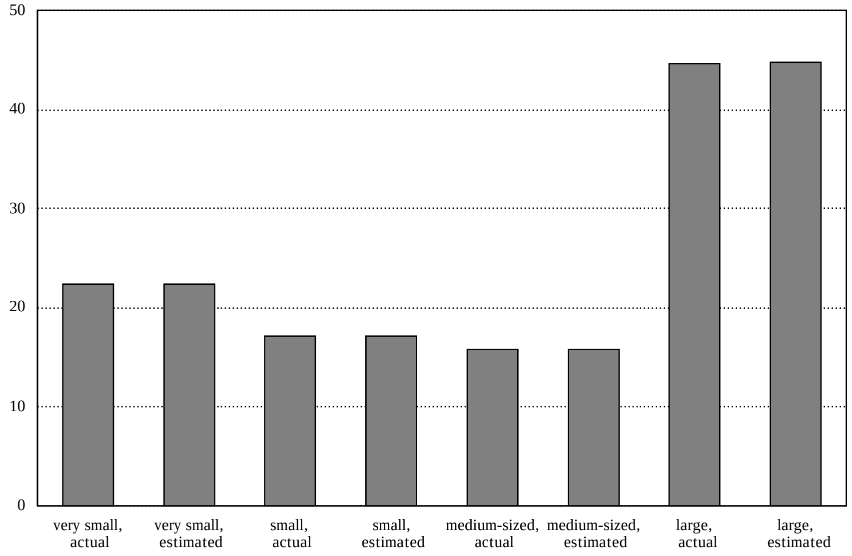

Source: EIM Small Business Research and Consultancy.

Table 4.2 Regression results with respect to actual and simulated turnover shares (t-values between parentheses)

| | $\alpha$ | $\beta$ (%) | $R^2_{adj}$ |
|---|---|---|---|
| ***industries*** | | | |
| very small | 0.99* | 0.02** | 0.99 |
| | (346.7) | (0.3) | |
| small | 1.00* | -0.05** | 0.99 |
| | (300.7) | (0.8) | |
| medium sized | 1.00* | 0.02** | 0.99 |
| | (105.1) | (0.1) | |
| large | 1.00* | 0.01** | 0.99 |
| | (375.1) | (0.1) | |
| ***countries*** | | | |
| very small | 1.01* | -0.17** | 0.99 |
| | (109.5) | (0.7) | |
| small | 0.99* | 0.15** | 0.99 |
| | (127.6) | (1.0) | |
| medium sized | 1.00* | -0.07** | 0.99 |
| | (83.6) | (0.3) | |
| large | 0.99* | 0.12** | 0.99 |
| | (178.2) | (0.6) | |

* Not different from 1 (95% confidence level).
** Not different from 0 (95% confidence level).
Source: EIM Small Business Research and Consultancy.

Figure 4.3 Actual and estimated shares of size classes in total value added




Source: EIM Small Business Research and Consultancy.

Table 4.3 Regression results with respect to actual and simulated value added shares (t-values between parentheses)

| | α | β (%) | $R^2_{adj}$ |
|---|---|---|---|
| ***industries*** | | | |
| very small | 0.99* | -0.01** | 0.99 |
| | (170.5) | (0.0) | |
| small | 1.01* | -0.08** | 0.99 |
| | (181.3) | (0.7) | |
| medium sized | 1.00* | 0.06** | 0.99 |
| | (82.2) | (0.3) | |
| large | 1.00* | 0.22** | 0.99 |
| | (288.3) | (1.4) | |
| ***countries*** | | | |
| very small | 1.02* | -0.29** | 0.99 |
| | (109.6) | (1.3) | |
| small | 0.99* | 0.26** | 0.99 |
| | (82.0) | (1.3) | |
| medium sized | 1.02* | -0.36 | 0.99 |
| | (118.3) | (2.3) | |
| large | 0.99* | 0.30** | 0.99 |
| | (95.7) | (0.6) | |

* Not different from 1 (95% confidence level).
** Not different from 0 (95% confidence level).
Source: EIM Small Business Research and Consultancy.

## 4.3 Baseline scenario 1998-2003

A baseline scenario is constructed that serves as a point of reference for a policy analysis experiment presented in section 4.4. As regards the assumptions behind the baseline scenario, the leading principle is the continuation of trends 1988-1998, including the principle that during the scenario period, general convergence of the economies of the EU-countries will occur. This is discussed briefly in section 4.2.1. Section 4.2.2 then presents the scenario results.

### 4.3.1 Assumptions

Table 4.4 lists the assumptions made on the exogenous variables. Their values first of all reflect a continuation of historical trends. Deviations of this basic principle take into account the following assumptions:

- A trendwise decrease in inflation rates has been assumed – as was the case during 1988-1998 (CGXPR, LCTPR, MUTPR, RWTPR).
- In conformity with past developments, a decrease in real growth of government expenditure (GMCVR) and population growth (POPFR) was assumed.
- As regards private consumption, investment demand, exports and imports (CGXVR, IGBVR/IGMVR, RWTVR, IMPVR), upward convergence to the mean has been assumed. Thus, in countries showing less than average growth of these variables, these variables are assumed to show accelerated growth, while in the other countries, growth rates are kept constant at their 1988-1998 value. This reflects the principle of convergence of EU Member States.
- Finally, with respect to unemployment (UNTQN ), downward convergence to the mean has been assumed.

Table 4.4 Assumptions baseline scenario, 1998-2003

| | real variables | | | | | | prices, wages | | | | population, labour market | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CGXVR | GMCVR | IGBVR | IGMVR | RWTVR | IMPVR | CGXPR | RWTPR | MUTPR | TLCPR | POPFR | UNTQN |
| | average annual percent change | | | | | | | | | | | % |
| Austria | 2.2 | 1.1 | 2.3 | 2.6 | 5.3 | 4.7 | 2.3 | 1.9 | 1.7 | 3.5 | 0.4 | 8.2 |
| Belgium | 1.8 | 1.0 | 3.5 | 3.6 | 5.2 | 5.0 | 1.9 | 0.6 | 0.6 | 2.8 | 0.4 | 8.8 |
| Denmark | 2.3 | 1.2 | 0.6 | 3.2 | 4.5 | 4.1 | 2.6 | 2.7 | 1.1 | 3.4 | 0.4 | 7.5 |
| Finland | 1.2 | 1.2 | -0.6 | -0.3 | 5.9 | 3.4 | 1.4 | 2.6 | 3.0 | 2.9 | 0.4 | 11.4 |
| France | 1.9 | 1.3 | 0.8 | 2.1 | 5.4 | 4.3 | 1.7 | 0.4 | 0.6 | 2.7 | 0.4 | 10.5 |
| Germany | 2.3 | 1.2 | 3.3 | 3.0 | 6.2 | 5.4 | 2.0 | 0.9 | 0.7 | 3.4 | 0.2 | 7.4 |
| Greece | 1.9 | 1.0 | 3.4 | 8.5 | 3.9 | 7.1 | 4.7 | 5.3 | 5.6 | 6.9 | 0.5 | 8.4 |
| Ireland | 4.2 | 2.3 | 7.4 | 4.5 | 10.8 | 8.5 | 2.5 | 0.5 | 1.8 | 3.6 | 0.0 | 12.7 |
| Italy | 1.5 | 1.0 | 0.5 | 2.2 | 6.4 | 4.3 | 2.4 | 3.7 | 3.2 | 3.8 | 0.1 | 10.4 |
| Luxembourg | 2.8 | 3.2 | 3.9 | 1.9 | 4.8 | 3.9 | 1.9 | 0.8 | 0.7 | 3.4 | 0.0 | 2.6 |
| Netherlands | 2.6 | 2.0 | 1.6 | 4.2 | 5.3 | 4.8 | 2.1 | 0.6 | 0.5 | 3.3 | 0.7 | 6.7 |
| Portugal | 2.9 | 1.0 | 4.4 | 3.7 | 7.2 | 7.1 | 2.3 | 3.3 | 2.6 | 4.0 | 0.1 | 5.5 |
| Spain | 2.2 | 1.8 | 2.8 | 2.6 | 8.5 | 8.0 | 2.2 | 3.0 | 2.2 | 2.2 | 0.2 | 17.4 |
| Sweden | 0.9 | 1.0 | -1.2 | 1.6 | 5.7 | 4.0 | 1.8 | 2.3 | 2.3 | 3.8 | 0.4 | 6.9 |
| United Kingdom | 2.0 | 1.0 | 1.1 | 1.8 | 5.2 | 4.6 | 2.5 | 2.9 | 2.2 | 4.4 | 0.3 | 8.3 |
| EU | 2.0 | 1.2 | 1.6 | 2.6 | 5.7 | 5.1 | 2.4 | 2.6 | 2.3 | 4.2 | 0.3 | 8.7 |

Source: EIM Small Business Research and Consultancy.

## 4.3.2 Results

### At the EU-level

*Macro-economic*

Table 4.5 summarises results with respect to sales. There is a positive correlation between enterprise size and real sales growth: for example, in very small enterprises, sales growth amounts to 2.4% a year, while in large enterprises, real sales grow at an average annual rate of 2.8%. To a large extent, however, this is the result of differences in the composition of sales. Real domestic sales growth is greatest in SMEs, while there are no large differences between SMEs and large enterprises regarding export growth. Since exports is the fastest growing sales category, and the share of exports in total sales is greatest in large enterprises, total sales growth is positively correlated with enterprise size.

As can be seen from table 4.6, real value added growth is positively correlated with enterprise size as well[1]. On a general level – SMEs *versus* large enterprises – this holds also for labour productivity, but it should be noted that in fact, labour productivity grows at the same rate in small, medium-sized and large enterprises. Only in very small enterprises does productivity growth lag behind. This is probably due to the number of enterprises growing faster than the number of employees (also see below)[2]. Because of this pattern of labour productivity growth, differences between size classes regarding employment growth are much smaller than might be expected from differences in real value added growth.

Wages rise faster than prices, so the real wage rate increases. However, the rise in real wages is lower than labour productivity growth, which means that real unit labour costs decrease. This indicates an increase in profitability[3].

Finally, the number of enterprises increases in all size classes, but least in very small enterprises (Figure 4.4). The lagging behind of the

1 This, of course, follows rather directly from the way real value added growth by size-class has been modelled.

2 In the Dutch PRISMA-model (Kwaak, 1999) labour productivity of employees does not show very significant differences between large and small enterprises, but the picture regarding total labour productivity (thus, including self employed) is often blurred by the development of the number of self-employed. Note that such explicit modelling of employment of self-employed and employees can not – as yet – be done in SICLASS.

3 Gross operating surplus can be defined as 1 – LS, with LS the share of labour in value added: $LS = p_e \cdot E / p_y \cdot Y$, where (in levels) E: employment, Y: value added, and $p_f$ price of variable f. Real unit labour cost are defined as: $rulc = (p_e - p_y) - (y - e)$, where all variables now denote percentage changes. Thus a decrease in real unit labour costs implies an increase in gross operating surplus.

number of very small enterprises results from the lagging behind of production growth.

Table 4.5 Real sales growth in non-primary private enterprise, EU, 1998-2003

| | SME | | | | large | total |
|---|---|---|---|---|---|---|
| | very small | small | medium-sized | total | | |
| | average annual percent change | | | | | |
| domestic sales: | | | | | | |
| • consumer goods | 1.7 | 1.3 | 0.8 | 1.4 | 0.6 | 1.1 |
| • investment goods | 1.9 | 1.8 | 1.2 | 1.7 | 0.6 | 1.3 |
| • intermediate goods | 2.7 | 2.8 | 2.8 | 2.8 | 2.8 | 2.8 |
| • total | 2.2 | 2.2 | 2.0 | 2.1 | 1.9 | 2.0 |
| exports | 5.3 | 5.7 | 6.3 | 5.9 | 5.9 | 5.9 |
| total sales | 2.4 | 2.6 | 2.7 | 2.6 | 2.8 | 2.7 |

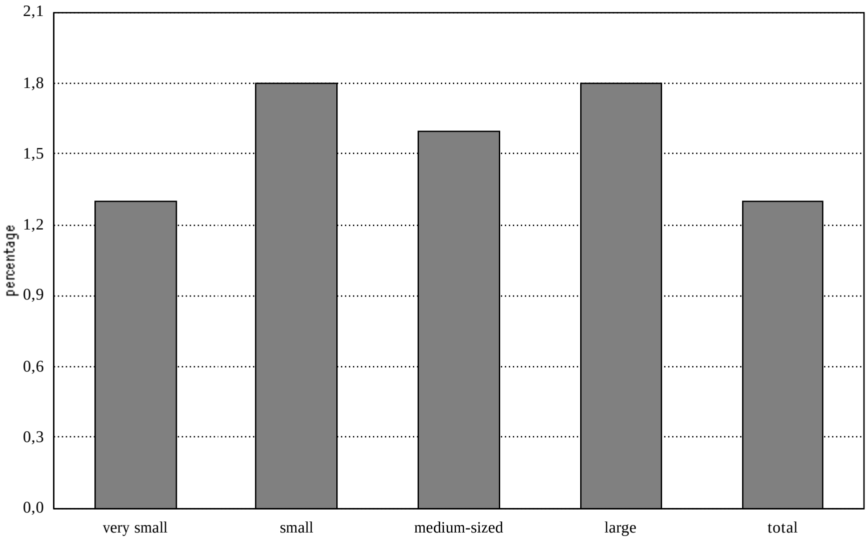
Source: EIM Small Business Research and Consultancy.

Table 4.6 Real value added growth, labour productivity and employment, real wages and real unit labour costs in non-primary private enterprise, EU, 1998-2003

| | SME | | | | large | total |
|---|---|---|---|---|---|---|
| | very small | small | medium-sized | total | | |
| | average annual percent change | | | | | |
| value added | 2.1 | 2.4 | 2.6 | 2.3 | 2.6 | 2.4 |
| labour productivity | 1.9 | 2.3 | 2.3 | 2.1 | 2.3 | 2.2 |
| employment | 0.1 | 0.1 | 0.2 | 0.2 | 0.3 | 0.2 |
| real wages | 1.4 | 1.5 | 1.6 | 1.5 | 1.5 | 1.5 |
| real unit labour costs | -0.5 | -0.7 | -0.7 | -0.6 | -0.7 | -0.7 |

Source: EIM Small Business Research and Consultancy.

Figure 4.4 Growth of number of enterprises, EU, 1998-2003




Source: EIM Small Business Research and Consultancy.

*By industry*

Tables 4.7 and 4.8 show the typical industry asymmetry regarding the results at the EU-level. The positive correlation of real value added growth with enterprise size found on the macro-level holds only for manufacturing and producer services. All other industries have higher real value added growth in SMEs as compared to large enterprises. The most striking differences appear in extraction and retail distribution.

For labour productivity growth, fewer differences between SMEs and large enterprises are found. Whereas the macro-economic results point to symmetry between real value added and labour productivity growth, this seems not to be the case at the industry level. Extraction has a small annual decline in labour productivity for the simulated time period, whereas manufacturing is expected to exhibit the largest productivity growth among industries.

Differences regarding employment growth appear both between size classes and between industries. This result is not surprising, considering the asymmetric results of real value added and labour productivity. Having a real value added growth of 2.4% and a small decline in labour productivity, extraction shows the largest rise in employment compared to the other industries. Retail distribution is expected to have the largest decline (0.7%) in employment.

The real wage rate increases in all industries at similar rates – between 1.3% and 1.8%. Extraction is the only exception with considerably less annual real wage growth. The real increase in unit labour costs for extraction relates to the decline in labour productivity. All other industries show an annual decline in real unit labour costs. The most striking differences between size classes are observed in retail distribution and personal services.

Table 4.7 Real value added, labour productivity and employment, EU, 1998-2003

| | real value added | | | labour productivity | | | employment | | |
|---|---|---|---|---|---|---|---|---|---|
| | SME | large | total | SME | large | total | SME | large | total |
| | average annual percent change | | | | | | | | |
| extraction (incl. energy) | 3.3 | 2.1 | 2.4 | 1.5 | -0.6 | -0.1 | 1.8 | 2.7 | 2.5 |
| manufacturing | 3.1 | 3.7 | 3.4 | 2.9 | 3.2 | 3.1 | 0.1 | 0.5 | 0.3 |
| construction | 1.9 | 1.4 | 1.8 | 1.9 | 1.9 | 1.9 | -0.1 | -0.5 | -0.1 |
| wholesale trade | 2.9 | 2.5 | 2.8 | 2.3 | 2.3 | 2.3 | 0.5 | 0.2 | 0.5 |
| retail distribution (incl. car and repair) | 1.9 | 1.0 | 1.7 | 2.2 | 2.9 | 2.4 | -0.4 | -1.8 | -0.7 |
| transport, communication | 2.6 | 2.1 | 2.3 | 1.5 | 1.9 | 1.7 | 1.1 | 0.3 | 0.6 |
| producer services | 2.3 | 2.5 | 2.4 | 1.4 | 1.3 | 1.4 | 0.9 | 1.2 | 1.0 |
| personal services | 1.5 | 1.4 | 1.5 | 1.8 | 2.3 | 1.9 | -0.3 | -0.9 | -0.4 |
| total | 2.3 | 2.6 | 2.4 | 2.1 | 2.3 | 2.2 | 0.2 | 0.3 | 0.2 |

Source: EIM Small Business Research and Consultancy.

Table 4.8 Real wages and real unit labour costs, EU, 1998-2003

| | real wages | | | real unit labour costs | | |
|---|---|---|---|---|---|---|
| | SME | large | total | SME | large | total |
| | average annual percent change | | | | | |
| extraction (incl. energy) | 0.7 | 0.4 | 0.5 | -0.7 | 1.0 | 0.6 |
| manufacturing | 1.6 | 2.0 | 1.8 | -1.3 | -1.2 | -1.3 |
| construction | 1.4 | 1.5 | 1.4 | -0.5 | -0.4 | -0.5 |
| wholesale trade | 1.6 | 1.6 | 1.6 | -0.7 | -0.7 | -0.7 |
| retail distribution (incl. car and repair) | 1.8 | 1.8 | 1.8 | -0.4 | -1.1 | -0.6 |
| transport, communication | 1.3 | 1.6 | 1.5 | -0.2 | -0.3 | -0.1 |
| producer services | 1.3 | 1.3 | 1.3 | -0.1 | 0.0 | -0.1 |
| personal services | 1.6 | 1.5 | 1.6 | -0.2 | -0.8 | -0.3 |
| total | 1.5 | 1.5 | 1.5 | -0.6 | -0.7 | -0.7 |

Source: EIM Small Business Research and Consultancy.

## By country

The output of the baseline projection at (the) EU-level is the result of the output of the individual EU-members. Tables 4.9 and 4.10 demonstrate the country differences. Real value added growth ranges – when firm-size is not distinguished – from 0.8% in the United Kingdom to 9.3% in Ireland, as table 4.9 illustrates. Most countries show larger growth rates for large enterprises as compared to SMEs. Exceptions are Austria, Greece, Ireland, Luxembourg, Portugal and United Kingdom.

Labour productivity is expected to show the highest growth rates in Ireland. Generally (and at the EU-level), labour productivity is positively correlated with firm-size. The opposite pattern is observed for Austria, France, Greece, Ireland, The Netherlands and Portugal.

Most countries show labour productivity growth that slightly undermines real value added growth. This generally results in small annual employment rises. Employment is, however, expected to decline in Denmark, Greece and the United Kingdom. Highest growth rates are for Ireland (due to high value added growth) and for Austria and Spain (due to low labour productivity growth).

Table 4.10 suggests that the low labour productivity growth for Austria and Spain cannot be seen separately from the low real wage growth for both countries. Therefore, real unit labour costs decline annually, which all the same suggests positive profitability. Sweden is the only country that has an annual real wage increase exceeding the labour productivity increase. Most striking differences regarding firm-size concern Austria, with decreasing labour costs for SMEs and increasing labour costs for large enterprises. The general pattern is that the annual labour costs decrease for SMEs undermines the decrease for large enterprises. Apart from Austria, the opposite is found for France, Germany, The Netherlands and Portugal.

Table 4.9 Real value added, labour productivity and employment, 1998-2003

| | real value added | | | labour productivity | | | employment | | |
|---|---|---|---|---|---|---|---|---|---|
| | SME | large | total | SME | large | total | SME | large | total |
| | average annual percent change | | | | | | | | |
| Austria | 2.2 | 1.7 | 2.0 | 0.9 | 0.3 | 0.6 | 1.3 | 1.4 | 1.3 |
| Belgium | 2.3 | 2.7 | 2.4 | 2.4 | 2.4 | 2.4 | 0.0 | 0.2 | 0.0 |
| Denmark | 1.5 | 1.6 | 1.5 | 1.7 | 2.2 | 1.9 | -0.2 | -0.6 | -0.3 |
| Finland | 1.6 | 2.1 | 1.9 | 1.4 | 2.1 | 1.7 | 0.2 | 0.1 | 0.1 |
| France | 2.3 | 3.1 | 2.7 | 2.4 | 2.3 | 2.5 | -0.1 | 0.7 | 0.2 |
| Germany | 3.2 | 3.7 | 3.4 | 2.7 | 2.7 | 2.7 | 0.4 | 0.9 | 0.6 |
| Greece | 2.4 | 2.0 | 2.2 | 2.7 | 2.4 | 2.6 | -0.3 | -0.5 | -0.3 |
| Ireland | 10.0 | 9.0 | 9.3 | 4.7 | 4.3 | 4.4 | 5.0 | 4.5 | 4.7 |
| Italy | 2.3 | 2.9 | 2.6 | 2.4 | 2.5 | 2.5 | -0.1 | 0.5 | 0.0 |
| Luxembourg | 3.4 | 3.2 | 3.3 | 2.5 | 2.8 | 2.6 | 0.9 | 0.4 | 0.8 |
| The Netherlands | 3.1 | 3.2 | 3.2 | 2.8 | 2.6 | 2.7 | 0.3 | 0.7 | 0.5 |
| Portugal | 3.6 | 3.5 | 3.6 | 3.2 | 2.4 | 3.0 | 0.4 | 1.0 | 0.6 |
| Spain | 2.3 | 2.7 | 2.5 | 1.0 | 1.1 | 1.2 | 1.3 | 1.6 | 1.3 |
| Sweden | 1.6 | 1.8 | 1.7 | 1.6 | 1.6 | 1.6 | 0.1 | 0.1 | 0.1 |
| United Kingdom | 0.9 | 0.8 | 0.8 | 1.8 | 2.6 | 2.1 | -0.9 | -1.7 | -1.2 |
| EU | 2.3 | 2.6 | 2.4 | 2.1 | 2.3 | 2.2 | 0.2 | 0.3 | 0.2 |

Source: EIM Small Business Research and Consultancy.

Table 4.10 Real wages and real unit labour costs, 1998-2003

| | real wages | | | real unit labour costs | | |
|---|---|---|---|---|---|---|
| | SME | large | total | SME | large | total |
| | average annual percent change | | | | | |
| Austria | 0.4 | 0.4 | 0.4 | -0.5 | 0.2 | -0.2 |
| Belgium | 1.9 | 2.0 | 2.0 | -0.4 | -0.4 | -0.4 |
| Denmark | 1.0 | 0.9 | 0.9 | -0.7 | -1.3 | -0.9 |
| Finland | 1.4 | 1.9 | 1.7 | 0.1 | -0.2 | -0.1 |
| France | 1.6 | 1.7 | 1.7 | -0.7 | -0.6 | -0.8 |
| Germany | 2.1 | 2.3 | 2.2 | -0.6 | -0.4 | -0.5 |
| Greece | 2.2 | 2.0 | 2.1 | -0.4 | -0.4 | -0.4 |
| Ireland | 2.8 | 2.5 | 2.6 | -1.8 | -1.8 | -1.7 |
| Italy | 1.4 | 1.2 | 1.3 | -1.0 | -1.2 | -1.1 |
| Luxembourg | 2.4 | 2.4 | 2.4 | -0.1 | -0.4 | -0.2 |
| The Netherlands | 2.4 | 2.3 | 2.4 | -0.4 | -0.3 | -0.3 |
| Portugal | 1.2 | 1.4 | 1.3 | -1.9 | -1.0 | -1.7 |
| Spain | 0.0 | 0.0 | 0.0 | -1.1 | -1.1 | -1.2 |
| Sweden | 1.8 | 2.1 | 2.0 | 0.2 | 0.4 | 0.3 |
| United Kingdom | 1.6 | 1.5 | 1.6 | -0.2 | -1.0 | -0.5 |
| EU-15 | 1.5 | 1.5 | 1.5 | -0.6 | -0.7 | -0.7 |

Source: EIM Small Business Research and Consultancy.

## 4.4 Policy analysis: impact of export demand on SMEs

In this section SICLASS will be used to demonstrate the (indirect) impact of exports on SMEs' development, and conversely, that a sound SME-sector is of crucial importance for a country's international competitiveness. Also, it will be shown that domestic demand has an important – though indirect – impact on LSEs development. The importance of SMEs in relation to export cannot directly be seen from looking at the propensities to export. As can be derived from table 4.11, there is a positive correlation between enterprise size and the propensity to export. Especially in very small enterprises, exports make up only a small share of total sales. However, the underlying structure resulting in the observed propensities to export – in terms of intermediate deliveries – are not revealed by table 4.11. Scenario analysis may give more insight.

Table 4.11 Propensity to export* by industry and size class, EU, 1998

| | SME | | | | large | total |
|---|---|---|---|---|---|---|
| | very small | small | medium-sized | total | | |
| | % | | | | | |
| extraction (incl. energy) | 10 | 14 | 11 | 12 | 9 | 10 |
| manufacturing | 14 | 24 | 28 | 24 | 42 | 34 |
| construction | 1 | 1 | 2 | 1 | 4 | 2 |
| wholesale trade | 16 | 16 | 13 | 15 | 11 | 14 |
| retail distribution (incl. car and repair) | 2 | 2 | 2 | 2 | 1 | 2 |
| transport, communication | 10 | 24 | 30 | 20 | 21 | 21 |
| producer services | 3 | 8 | 8 | 6 | 8 | 7 |
| personal services | 4 | 5 | 4 | 4 | 6 | 5 |
| total | 6 | 13 | 15 | 11 | 21 | 15 |

* Exports as percentage of total sales (including intra-EU exports).
Source: EIM Small Business Research and Consultancy.

The analysis is done in the following way. In the baseline scenario described above, export growth and growth of domestic final demand will subsequently be set to zero. So, three scenarios result:

1. the actual baseline 1998-2003
2. ditto, but export demand growth set to zero
3. like (2), but domestic final demand growth also set to zero.

Comparison of (1) and (2) provides insight in the total impact of export demand to both SMEs and LSEs. Comparison of (2) and (3) shows the total impact of domestic demand on the development of

SMEs and LSEs. Finally, (3) itself contains impacts of all other factors on the size-class pattern of economic development.

Note that this exercise is of an accounting nature. Since export growth itself affects domestic demand, from a macro-economic point of view the impact of exports can not be isolated from other developments. A similar argument holds for domestic demand as well. However, the analysis suffices to investigate the impact of foreign and domestic demand on the size-class pattern of economic development.

Results will be presented in terms of real value added growth and employment.

**Results for real value added growth**

Table 4.12 shows the over-all impact of exports and domestic demand on the size-class pattern of real value added growth in the scenario period. The following comments are in order:

- Taking into account the propensity to export of SMEs and large enterprises (11% and 21%), and export growth itself (almost 6% a year in both SMEs and LSEs), one may expect an impact of exports on average real value added growth of 0.6% in SMEs, and 1.2% in LSEs. It appears that actually, this impact is much larger at 1.6% a year in SMEs, and a yearly 2.4% in large enterprises. In other words, it appears that exports have large spin-offs to both small and large firms. This result suggests that although firms are not always involved in export activities themselves, they might be indirectly involved because they supply intermediate goods and services to firms that are exporting. Taking the policy point of view, measures aiming at the improvement of international competitiveness should not only be directed at exporting firms, but also at their supplier – even though they might not export themselves.
- Conversely, the impact of domestic demand on the size-class pattern of real value added growth is smaller than one would expect from the share of domestic sales in total sales only.
- Finally, all size-brackets are exposed to the impact of import penetration, as can be seen from the negative sign of the 'other factors' in table 4.12. However, there is no clear size-class pattern regarding the impact of import penetration on real value added growth.

Table 4.12 Contribution of exports, domestic demand and other factors to the size-class pattern of real value added growth, EU, 1998-2003

| | SME | | | | large | total |
|---|---|---|---|---|---|---|
| | very small | small | medium-sized | total | | |
| | average % growth | | | | | |
| total growth | 2.1 | 2.4 | 2.6 | 2.3 | 2.6 | 2.4 |
| impact of: | | | | | | |
| – foreign demand | 1.3 | 1.7 | 2.1 | 1.6 | 2.4 | 2.0 |
| – domestic demand | 1.1 | 1.0 | 0.8 | 0.9 | 0.5 | 0.8 |
| – other factors | -0.2 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 |

Source: EIM Small Business Research and Consultancy.

## Results for employment

Results for employment are displayed in table 4.13. The analysis is rather similar to the one on real value added, except for one aspect. Here, the 'other factors' have a much more negative impact on employment growth, and this impact is strongest in large firms. This is the result of technological change, boosting labour productivity more in large firms than in smaller enterprises.

Table 4.13 Contribution of exports, domestic demand and other factors to the size- class pattern of employment growth, EU, 1998-2003

| | SME | | | | large | total |
|---|---|---|---|---|---|---|
| | very small | small | medium-sized | total | | |
| | average % growth | | | | | |
| total growth | 0.1 | 0.1 | 0.2 | 0.2 | 0.3 | 0.2 |
| impact of: | | | | | | |
| – foreign demand | 0.5 | 1.0 | 1.4 | 0.8 | 1.8 | 1.2 |
| – domestic demand | 0.6 | 0.6 | 0.5 | 0.5 | 0.4 | 0.5 |
| – other factors | -1.0 | -1.4 | -1.6 | -1.2 | -1.9 | -1.4 |

Source: EIM Small Business Research and Consultancy.

# Literature

P. Wijmenga (1997): Effect on SMEs of joining the Single European market: The Czech republic – comparative analysis and macro-economic study (NEI, on behalf of ARP Business Development Agency Prague)

EIM (1994-1998): The state of small business in The Netherlands (several issues; Zoetermeer)

EIM/ENSR (1993): the European Observatory for SMEs – First Annual Report (Zoetermeer)

EIM/ENSR (1994): the European Observatory for SMEs – Second Annual Report (Zoetermeer)

EIM/ENSR (1995): the European Observatory for SMEs – Third Annual Report (Zoetermeer)

EIM/ENSR (1996): the European Observatory for SMEs – Fourth Annual Report (Zoetermeer)

EIM/ENSR (1997): the European Observatory for SMEs – Fifth Annual Report (Zoetermeer)

EUROSTAT (1988, 1990, 1992, 1995, 1998): Enterprises in Europe (First-Fifth Report; Luxembourg)

A. Kwaak (1998): PRISMA – Policy Research Instrument for Size Aspects in Macro-Economic Analysis (EIM, Research Report 9804/E)

A. Kleijweg, H. Nieuwenhuijsen (1996): Job Creation by size-class: measurement and empirical investigation (EIM, Research Report 9604/E)

W.H.J. Verhoeven (1989): An 8-industry model for SMEs (in Dutch: Een achtsectorenmodel voor het midden- en kleinbedrijf; EIM, Research Publikatie 29)

# Annex I: Names of variables

Variable names are listed in Table I.1. Each variable name consists of five capital letters, followed by a country-index. The first five letters can be interpreted as follows:

- the first three letters indicate the economic category (sales, employment, etc.). If applicable, the third letter indicates whether the variable belongs to the industry sub-model, or to the industry/size-0clas sub-model (for macro-economic variables, no such distinction is applicable)
- the fourth letter indicates the unit of measurement
- the fifth letter indicates the time dimension

Table I.1 Defined variables

| | |
|---|---|
| **economic category (first three letters; 'T' or an 'S' in the third position means that the variable belong to the industry or the industry/size-class sub-model)** | |
| CGK | consumption demand by category |
| CGS, CGT | sales of consumer goods |
| CGX | macro-economic consumption demand |
| DUT | use of intermediate goods and services, domestically produced |
| EMS, EMT | employment |
| EPS | number of enterprises |
| EXS, EXT | exports |
| IGK | investment demand by category |
| IGS, IGT | sales of investment goods |
| INS, INT | sales of intermediate goods and services |
| LBC | labour costs |
| MUT | use of intermediate goods and services, imported |
| POP | population |
| QGT | gross production |
| SAS, SAT | sales |
| SBT | stockbuilding |
| TCT | total costs |
| UNT | unemployment (UNTQ: unemployment as percentage of labour force) |
| YGS, YGT | value added |
| **unit of measurement (fourth position)** | |
| F | number of enterprises |
| M | occupied persons |
| P | price |
| Q | fraction of another variable (explained under 'economic category') |
| V | real (value in prices of preceding year) |
| W | value (in current prices) |
| **time dimension (fifth position)** | |
| D | absolute change from preceding year |
| N | level (flow variable) |
| R | relative change from preceding year (%) |
| Z | level (stock variable) |

# Annex II: Meta data

### Countries and zones

SICLASS distinguishes the following geographical units:

- countries
  - Austria
  - Belgium
  - Denmark
  - Finland
  - France
  - Germany
  - Greece
  - Ireland
  - Italy
  - Luxembourg
  - The Netherlands
  - Portugal
  - Spain
  - Sweden
  - United Kingdom
- zones
  - large countries (France, Germany, Italy, United Kingdom)
  - small countries (Austria, Belgium, Denmark, Finland, Greece, Ireland, Luxembourg, The Netherlands, Portugal, Spain, Sweden)
  - EU

Zonal results are calculated by aggregating individual countries.

### Size classes[1]

Four size classes are distinguished within the industries belonging to non-primary private enterprise:

- very small enterprises (0-9 employees)
- small enterprises (10-49 employees)
- medium-sized enterprises (50-249 employees)
- large enterprises (500 employees or more)

Very small, small and medium-sized enterprises make op the SME-sector.

1 Definitions are consistent with the official definitions of the EC (Official Journal of the European Commission, L 107/6, 1996).

### Industries

The following industries are distinguished, along with their corresponding NACE classification:

- mining of coal & lignite; extraction of peat; NACE 10
- extraction of crude petroleum & natural gas; NACE 11
- mining of metal ores; NACE 13
- other mining & quarrying; NACE 14
- manufacture of food products & beverages; NACE 15
- manufacture of tobacco products; NACE 16
- manufacture of textiles; NACE 17
- manufacture of wearing apparel; NACE 18
- manufacture of leather and leather products; NACE 19
- manufacture of wood and wood products; NACE 20
- manufacture of pulp, paper & paper products; NACE 21
- publishing, printing & reproduction of recorded media; NACE 22
- manufacture of coke, refined petroleum and nuclear fuel; NACE 23
- manufacture of chemicals, chemical products and man-made fibres; NACE 24
- manufacture of rubber and plastic products; NACE 25
- manufacture of other non-metallic mineral products; NACE 26
- manufacture of basic metals; NACE 27
- manufacture of fabricated metal products; NACE 28
- manufacture of machinery and equipment, n.e.c.; NACE 29
- manufacture of office machinery & computers; NACE 30
- manufacture of electrical machinery; NACE 31
- manufacture of radio, television & communication equipment; NACE 32
- manufacture of medical, precision & optical instruments; NACE 33
- manufacture of motor vehicles, trailers & semi-trailers; NACE 34
- manufacture of other transport equipment; NACE 35
- manufacture of furniture; manufacturing n.e.c.; NACE 36
- recycling; NACE 37
- electricity, gas, steam & hot water; NACE 40
- collection, purification & distribution of water; NACE 41
- construction; NACE 45
- sale, maintenance & repair of motor vehicles & motorcycles; NACE 50
- wholesale & commission trade, except of motor vehicles & motorcycles; NACE 51
- retail trade, repair of household goods; NACE 52
- hotels and restaurants; NACE 55
- land transport; transport via pipelines; NACE 60
- water transport; NACE 61
- air transport; NACE 62
- supporting & auxiliary transport activities; activities of travel agents; NACE 63
- post & telecommunication; NACE 64

- financial intermediation; NACE 65
- insurance & pension funding; NACE 66
- activities auxiliary to financial intermediation; NACE 67
- real estate activities; NACE 70
- renting of machinery & equipment; NACE 71
- computer & related activities; NACE 72
- research & development; NACE 73
- other business activities; NACE 74
- health and social work; NACE 85
- sewage & refuse disposal, sanitation & similar services; NACE 90
- activities of membership organisations n.e.c.; NACE 91
- recreational, cultural & sporting activities; NACE 92
- other service activities; NACE 93

# List of Research Reports

The research report series is the successor of both the research paper and the ‘research publicatie’ series. There is a consecutive report numbering followed by /x. For /x there are five options:

/E: a report of the department of Strategic Research, written in English;
/N: like /E, but written in Dutch;
/F: like /E, but written in French;
/A: a report of one of the other departments of the Research Institute for Small and Medium-sized Business;
/I: a report of the department of Strategic Research for internal purposes; external availability on request.

9301/E The intertemporal stability of the concentration-margins relationship in Dutch and U.S. manufacturing; Yvonne Prince and Roy Thurik
9302/E Persistence of profits and competitiveness in Dutch manufacturing; Aad Kleijweg
9303/E Small store presence in Japan; Martin A. Carree, Jeroen C.A. Potjes and A. Roy Thurik
9304/I Multi-factorial risk analysis and the sensitivity concept; Erik M. Vermeulen, Jaap Spronk and Nico van der Wijst
9305/E Do small firms’ price-cost margins follow those of large firms? First empirical results; Yvonne Prince and Roy Thurik
9306/A Export success of SMEs: an empirical study; Cinzia Mancini and Yvonne Prince
9307/N Het aandeel van het midden- en kleinbedrijf in de Nederlandse industrie; Kees Bakker en Roy Thurik
9308/E Multi-factorial risk analysis applied to firm evaluation; Erik M. Vermeulen, Jaap Spronk and Nico van der Wijst
9309/E Visualizing interfirm comparison; Erik M. Vermeulen, Jaap Spronk and Nico van der Wijst
9310/E Industry dynamics and small firm development in the European printing industry (Case Studies of Britain, The Netherlands and Denmark); Michael Kitson, Yvonne Prince and Mette Mönsted
9401/E Employment during the business cycle: evidence from Dutch manufacturing; Marcel H.C. Lever en Wilbert H.M. van der Hoeven
9402/N De Nederlandse industrie in internationaal perspectief: arbeidsproduktiviteit, lonen en concurrentiepositie; Aad Kleijweg en Sjaak Vollebregt
9403/E A micro-econometric analysis of interrelated factor demand; René Huigen, Aad Kleijweg, George van Leeuwen and Kees Zeelenberg
9404/E Between economies of scale and entrepreneurship; Roy Thurik
9405/F L’évolution structurelle du commerce de gros français; Luuk Klomp et Eugène Rebers
9406/I Basisinkomen: een inventarisatie van argumenten; Bob van Dijk