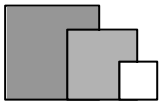
Research Report 0102

Competition and economic performance

Applications of SCALES' sector model on competition MOCO



SCALES

SCientific AnaLysis of Entrepreneurship and SMEs

Henry Nieuwenhuijsen

Joyce Nijkamp

RR

Zoetermeer, May 2001

ISBN: 90-371-0822-9
Price: NLG 35.-
Order number: H0102

This report has been written in the framework of the research programme SCALES (Scientific AnaLysis of Entrepreneurship and SMEs), which is financed by the Netherlands Ministry of Economic Affairs.

The authors thank Ton Kwaak and Gerrit de Wit for reactions on earlier drafts of this report. The authors thank the Dutch Central Board for the Retail Trade (HBD) for their financial assistance.

EIM / Business & Policy Research employs 170 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

Contents

Summary

In this study, we use a sector model on competition, called MOCO, to analyse the contribution of competition to sector performance. We do this for two different time periods. First, we investigate what the probable influence of competition has been in the past, viz. the 1988-1999 period. Subsequently, we investigate what influence competition might have in the future, viz. the 2001-2012 period.

We do not pretend that the results of MOCO are exact. However, we consider them to be helpful to get an impression of the order of magnitude of the effects under investigation.

Working of the model MOCO

MOCO distinguishes two exogenous competition variables, viz. *turbulence* and *concentration*. If turbulence increases or concentration decreases, competition increases. For both variables we measure the effects on sector performance. We distinguish between six performance variables: growth rates of real value added, employment, product price, wage, labour productivity and the net profit margin. We distinguish between two sectors: manufacturing and services.

MOCO distinguishes two endogenous competition variables: the *share of exports* in total sales and the *share of competing imports* in total domestic demand. Competition increases if these variables increase. More competition has direct and indirect effects on prices and productivity. More competition results directly in higher total factor productivity growth and lower product and factor prices. Turbulence has a relatively large impact on total factor productivity compared to concentration. Turbulence has a relatively large impact in services compared to manufacturing. Concentration has a relatively large impact on prices compared to turbulence. More competition results *in*directly in lower prices and higher productivity through *cross effects* between productivity and prices. Higher productivity leads to lower prices through lower average costs, and lower prices lead to higher productivity through higher exports and imports shares.

Influences of competition in period 1988-1999

In the period 1988-1999, competition increased in both manufacturing and services. In manufacturing, both turbulence increased and concentration decreased. In services, turbulence increased as well. Because of data problems we have not investigated the influence of concentration.

The increase in competition resulted in an increase in *labour productivity growth* in both sectors. The average yearly contribution of competition to labour productivity growth is almost 0.2 percent points change in services and 0.03 percent points change in manufacturing. The relatively small contribution of competition to labour productivity in manufacturing is explained by the low impact of turbulence in this sector, which is the most important competition variable inducing labour productivity growth.

The *growth of real value added* has increased in both sectors. The average yearly contribution of competition to the growth of real value added is about 0.2 percent points change in manufacturing and 0.05 percent points change in services. The relatively low contribution of competition to real value added growth in services is explained by the large impact of concentration on real value added growth, which is assumed to be constant in services.

The increase in competition resulted in an increase in *employment growth* in manufacturing but in a decrease in services. The average yearly contribution of increased competition to

employment growth is 0.2 percent points change in manufacturing and –0.1 percent points in services. The *increase* in manufacturing is due to lower prices and higher demand growth, induced by the decrease in concentration. The *decrease* in services is due to the considerable increase in total factor productivity growth, induced by the increase in turbulence.
The increased competition resulted in a decrease in the *net profit margin* in manufacturing but in an increase in services. The average yearly contribution of increased competition to the net profit margin is –0.9 percent points in manufacturing and 0.02 percent points in services. The decrease in manufacturing is explained by the large impact of concentration on the mark-up. The increase in services is explained by the large impact of turbulence on productivity growth. It implies that the effect of lower prices on demand growth is large compared to the effect of lower prices on the mark-up.
Increased competition has decreased *factor and product prices* in both manufacturing and services. In manufacturing, the contribution of competition to the product price is –0.2 percent points and in services the contribution is –0.1 percent points. In manufacturing, the contribution of competition to the price of labour is –0.1 percent points and in services, the contribution is –0.01 percent points. The relatively large price effects in manufacturing are due to the relatively large impact of concentration on prices compared to turbulence. The relatively small wage effect in services is also explained by the relatively large increase in labour productivity in this sector.

Possible influence of competition in period 2001-2012

Competition increased over the last decade. We investigate the economic consequences of a continuation of this trend in the period 2001-2005. More precisely, we assume turbulence to catch up in this period with the level of Germany in 1999 (this implies an increase of 0.24 percent points per year for manufacturing and 1 percent point for services). Furthermore, we assume for concentration in manufacturing a continuation of the observed 1988-1999 trend. Firstly, we investigate average sector performance over the 2001-2005 period. Secondly, we investigate short-term effects (2005) and medium-term effects (2012). We also present the results for 2001, which give an indication of the direct, immediate effects of changes in competition.
The average yearly contribution of increased competition to sector performance in the 2001-2005 period is qualitatively the same as for the 1988-1999 period. The effects of turbulence on the performance variables are larger in the 2001-2005 period for both sectors. This is explained by the larger yearly change in turbulence in the 2001-2005 period. The effects of concentration on the performance variables are smaller for the 2001-2005 period. This is explained by the shorter time period of 5 years compared to the 10 years comprised by the 1988-1999 period, implying that the cumulative change in concentration is smaller. Sector performance in 2005 gives an indication of the short-term effects of the increased competition during the 2001-2005. Sector performance in 2012 gives an indication of the medium-term effects of increased competition during the 2001-2005 period. The short-term effects are comparable to the average effects over the 2001-2005 period, only they are larger. Medium-term effects differ from short-term effects and can be larger or smaller. In the medium term, direct effects of *changes* in turbulence and concentration on the mark-up are absent and indirect effects of these changes have worked out. In 2012, the growth of employment is negative in manufacturing, while it is positive in 2005. This is explained by the more moderate effect on demand growth than in the short term, as the mark-up decreases only indirectly, and also by a faster labour substitution than in the short-term. In both sectors, the negative effect on the profit margin is larger in 2012 than in 2005. This is explained by higher total factor productivity growth in 2012, leading to a higher growth in the

exports share, which increases the pressure on the mark-up. The effects on prices and real value added in 2012 have the same sign as in 2005 but are smaller in absolute values. In the short term, not only levels but also *changes* in turbulence and concentration affect the pressure on the mark-up and factor prices.

1 Introduction

Competition policy is an important field of economic policy. The common opinion among economists and policy makers about competition is that it positively affects economic growth. Competition is considered to lower prices, to enhance productivity, to initiate innovation and to ease entry of new firms. Many studies give evidence about these propositions on competition. Recent evidence for Dutch manufacturing is given by Lever (1997), and Lever and Nieuwenhuijsen (1999). Lever shows the impact of competition on prices, and Lever and Nieuwenhuijsen show the impact of competition on productivity.

It is stated that the Dutch economy is not at the forefront with respect to its competitive ability. The discussion about the competitive ability of the Dutch economy started in the early nineties and was initiated by the acceleration of international competition, the European legislation and the emergence of the European Internal Market. Since then, several policy measures to enlarge the competitive ability of the Dutch economy have been taken. Institutional entry requirements were lowered, protected professions and former public utilities were liberalised and (partly) privatised. An independent competition authority was set up to monitor the competitiveness of markets and to intervene in case of misuse of market power.

It is important to get more insight in the contribution of competition to economic performance. EIM has developed a model on competition within the SCALES programme, called MOCO. In this study, we use this model to analyse the effects of *turbulence* and *concentration* on economic performance of sectors. We limit ourselves to two sectors, viz. manufacturing and services. Using MOCO, we investigate which part of economic growth in the 1988-1999 period can be attributed to changes in turbulence and concentration, respectively. For the 2001-2005 period, we make predictions on the basis of a competition scenario. For this period, we separately look at *short-term* and *medium-term* effects of changes in turbulence and concentration.

The rest of the report is organized as follows. In section 2, we give a non-technical summary of the model. We give the assumptions on the impacts of turbulence and concentration on prices and productivity. In section 3, we present data on the competition variables used in MOCO. These variables are turbulence, concentration, imports and exports shares. In section 4, we deal with the 1988-1999 period. In 4.1, we present the results of a *what if* study, in which we investigate the contribution of turbulence and concentration to average sector performance in manufacturing and services. In 4.2, we present the results of a sensitivity analysis with respect to the impacts of turbulence on product and factor prices. In section 5, we deal with the 2001-2005 period. For this period, we use a competition scenario, in which reasonable assumptions are made about yearly changes in turbulence and concentration. In 5.1, we investigate average effects over the 2001-2005 period. In 5.2, we investigate *short-term* and *medium-term* effects separately. The appendix gives the assumptions of MOCO and the definitions and symbols of the variables used.

2 The model

2.1 Building blocks

MOCO is a one-sector simulation model, with which we are able to measure the influence of turbulence and concentration on sector performance. The model uses six exogenous variables: the product price abroad (of foreign competitors), the volume of world trade, total domestic demand and (measures of) the concentration rate, turbulence and union coverage. Endogenous variables are factor prices and own product price, exports, domestic sales, total sales, imports, factor demands, labour productivity, total costs, marginal costs and profits. For the own product price, factor prices, exports, domestic sales, imports and the three factor demands, the model needs base-year values. The model has been programmed in SPSS and can be used for short-term and medium-term forecasting (1-10 years).
The model can be divided into four blocks.

Domestic sales

This block consists of a demand equation for exports and an equation for the share of competing imports, i.e. the ratio between imports and domestic sales. Exports are determined by world trade and (own and foreign) product prices. The share of competing imports is determined by domestic demand and (own and foreign) product prices. Total domestic demand is exogenous. Elasticities with respect to these variables are taken from De Wit (2001).

Prices

This block consists of equations for product and factor prices. Factor prices are determined by factor productivity and by competition. The product price is assumed to be equal to marginal costs[1] raised by a mark-up, calculated from the Lerner index[2] and determined by competition (Lever, 1997). Three competition variables are incorporated in all price equations: the exports share in total sales, turbulence and concentration. Union coverage is an additional competition variable in the wage equation.

Factor demand

This block consists of equations for factor demand (capital, labour and intermediate goods). Factor demands[3] are determined by production technology (Cobb-Douglas), competition and total demand. Three competition variables are incorporated in the production equation: turbulence, concentration and the exports share. These variables are found to influence total factor productivity growth (Lever and Nieuwenhuijsen, 1999; Bosma and Nieuwenhuijsen, 2000). Competition elasticities of supply are from and Lever and Nieuwenhuijsen (1999). Factor elasticities of supply are from the National Accounts (Statistics Netherlands).

[1] As we assume a Cobb-Douglas production function (constant returns to scale), marginal costs are assumed to be proportional to average costs.

[2] The Lerner index is defined as the difference between (own) product price and marginal costs, divided by the product price.

[3] They are equal to costs shares, as we assume a Cobb-Douglas technology and costs minimization (Varian, 1992, p. 55).

Conduct

This block consists of an equation for the *conjectural elasticity*, defined as the negative of the price elasticity of aggregate demand[1] times the Lerner index[2]. The higher the competitive pressure, the lower the conjectural elasticity.

2.2 Modelling the impact of competition on prices and productivity

More competition has a direct negative impact on prices, as more competition implies a higher pressure on the mark-up in factor and product markets. Competition has a direct positive impact on total factor productivity (TFP) growth, as competition leads to efficiency improvements[3] of the plants operating in the market. MOCO captures also the *in*direct price and productivity effects of competition: A higher total factor productivity growth leads to further price increases through lower average costs. Lower prices lead to more competition through a higher exports share and a lower share of competing imports. These higher exports and imports shares induce a further increase in factor productivity growth.
Various empirical studies have been used to determine the direct impacts of the competition variables mentioned, on prices and productivity (Lever en Nieuwenhuijsen, 1999; Bosma and Nieuwenhuijsen, 1999; Lever, 1999; De Wit, 2000). The assumptions we make in MOCO are conform the empirical findings or based on it. The assumptions concerning the impacts of competition variables on total factor productivity growth are presented in table 1a. The assumptions concerning the direct impacts of competition variables on prices are presented in table 1b.

Table 1a Impact competition variables (in % points) on TFP growth (in percentage change)

	Manufacturing		Services		Manufacturing & services[4]	
Variable	Turbulence	Concentration	Turbulence	Concentration	Exports share	Imports share
TFP growth	-0.02[1]	-0.003[2]	-0.08[3]	-	0.006[2]	-0.012[2]

1 Estimation: 25% of effect of turbulence on TFP growth in services.
2 Source: Lever en Nieuwenhuijsen (1999), table 5.4, pp. 122-123.
3 Source: Bosma and Nieuwenhuijsen (1999).
4 The coefficients are estimated only for manufacturing. Coefficients for services are assumed to be equal to the coefficients in manufacturing.

1 The price elasticity of aggregate demand is a weighted average of the price elasticity of domestic demand and exports.

2 In Lever, Nieuwenhuijsen and van Stel (1999), more discussion and explanation about the conjectural elasticity can be found.

3 In the model of Campbell (1997), persistent improvement to embodied technology induces obsolete plants to cease production, causing exit to rise. Only new plants embody the new technology and when they become operational after entry, TFP growth rises. In fact, this model explains the positive relation between turbulence and TFP growth observed empirically, from competitive entry.

Table 1b Impact of the competition variables (in % points change) on prices (in percentage change)

	Manufacturing			Services	
Variable	Δ turbulence	Δ concentration	Δ exports share	Δ turbulence	Δ exports share[6]
Product price	-0.02[1]	0.198[3]	-0.121[5]	-0.08[1]	-0.121
Price capital	-0.005[2]	0.05[4]	-0.030[4]	-0.02[4]	-0.030
Price intermediate goods	-0.005[2]	0.05[4]	-0.030[4]	-0.02[4]	-0.030
Price labour	-0.01[1]	0.098[5]	-0.088[5]	-0.04[1]	-0.088

1 Estimation: 10% of effect of concentration on product price and 25% of effect in services.
2 Estimation: turbulence= 25% of effect found by Nieuwenhuijsen et al. in services.
3 Source: Lever (1999), p. 23, table 1.
4 Estimation: 25% of effect on output price. Source: National Accounts (2000), Statistics Netherlands (CBS).
5 Source: Lever (1999), p. 24, table 2.
6 The coefficients are estimated only for manufacturing. Coefficients for services are assumed to be equal to the coefficients in manufacturing.

Total factor productivity growth is most sensitive to competition in services. Furthermore, turbulence has the largest impact on total factor productivity growth compared to the other competition variables. This is empirically shown by Lever and Nieuwenhuijsen (1999). The negative effect of competition on prices is empirically shown by Lever (1999). Note that while turbulence, concentration and the exports share affect prices directly, the imports share does not. Lever (1999) shows that the competitive pressure of competing imports on the domestic market is not important.

The tables show that the effect of concentration on prices is relatively large compared to turbulence, while its effect on total factor productivity is relatively small. Concentration is the most important competition variable in affecting the mark-up. Turbulence is the most important determinant in affecting total factor productivity. In both cases, exports and imports shares lie between the impacts of concentration and turbulence.

The output elasticities and the elasticities with respect to the imports and exports equations, which are needed to calculate the indirect effects of changes in the competition variables on prices and productivity, are given in the Appendix.

3 Historical facts and figures on competition

In this chapter, we show to what extent competition has actually increased in the 1988-1999 period. We distinguish four indicators of competition, viz. turbulence, concentration, the imports share and the exports share. Turbulence is measured by the sum of gross entry and exit of firms divided by the total number of firms. Concentration is measured by the C4-ratio, defined as the market share of the 4 largest firms in terms of employment. The exports share is measured by sales in foreign countries, divided by total sales. The imports share is measured by domestic demand of foreign products, divided by total domestic demand. In 3.1, we present and discuss the figures on turbulence. In 3.2, we present and discuss the figures on imports and exports shares. In 3.3, we present and discuss the figures on concentration.

3.1 Turbulence

Table 2 presents *entry and exit rates* over the 1987-1999 period. Entry and exit rates have increased considerably in this period. Owing to this, turbulence has increased enormously, especially in services. In this sector, turbulence increased with about 25 percent from 1987 to 1999 (more than 2 percent points). This is about 0.24 percent points change per year on average. In manufacturing, turbulence has increased with about 7% from 1987 to 1999 (about 0.7 percent points). This is about 0.06 percent points change per year on average. In our simulation model, the yearly change in turbulence in the 1988-1999 period is set equal to these averages (section 4).

Table 2 Entry and exit rates 1987-1999*

	Entry rate (%)		Exit rate (%)		Turbulence (entry+exit)	
	Manufacturing	Services	Manufacturing	Services	Manufacturing	Services
1987	6.55	7.95	3.52	4.17	10.06	12.13
1988	6.58	8.21	3.69	4.29	10.28	12.50
1989	6.72	8.49	3.61	4.13	10.33	12.62
1990	6.71	8.39	3.43	4.12	10.14	12.51
1991	6.88	8.80	3.49	4.20	10.37	12.99
1992	6.82	9.40	3.77	4.66	10.58	14.06
1993	6.52	9.62	4.22	4.97	10.74	14.59
1994	6.12	9.27	4.04	4.96	10.16	14.23
1995	6.66	9.80	3.91	5.14	10.58	14.93
1996	6.58	9.33	3.74	4.87	10.32	14.20
1997	6.60	9.21	4.08	5.07	10.69	14.28
1998	6.91	9.09	4.22	5.24	11.13	14.33
1999	6.56	9.54	4.19	5.42	10.75	14.96

* Source: Bangma e.a. (EIM, 2000).

3.2 Internationalisation

Table 3 presents imports and exports shares over the 1987-1999 period. Internationalisation has increased moderately in manufacturing. Both the (competing) imports share and the exports share increased with approximately 6% per year on average. In our simulation model, the yearly change of world trade in the 1988-1999 period is set equal to these averages (section 4).

In services, international trade is less important than in manufacturing. Exports shares in services are approximately 4.5 times lower than in manufacturing. Imports shares in services are approximately 8 times lower than in manufacturing. Furthermore, imports and exports shares have hardly changed in services. The increase in the exports share is only between 0.03 and 0.04 percent points change per year on average over the 1987-1999 period. Over

the 1996-1999 period[1], the increase in the imports share is between 0.02 and 0.03 percent points change per year on average.
While imports and exports shares in services differ considerably from manufacturing in absolute terms, in relative terms they do not differ that much. In services, the exports share has increased with about 4% over the 1987-1999 period, compared to 6% in manufacturing. The imports share has increased with 0.4% on average over the 1996-1999 period, compared to 0.3% in manufacturing. It indicates that the relative degree of internationalisation of the sectors has not changed much[2].

Table 3 Share of exports in total sales and share of competing imports in total domestic demand 1987-1999*

	Exports share (%)		Imports share (%)	
	Manufacturing	Services	Manufacturing	Services
1987	47.35	10.49	46.58	
1988	48.52	11.07	47.11	
1989	50.09	11.14	48.86	
1990	49.80	11.07	48.66	
1991	49.50	11.08	48.89	
1992	48.83	10.84	48.27	
1993	48.12	10.95	46.45	
1994	49.59	10.72	48.07	
1995	50.53	10.49	48.73	6.36
1996	49.68	10.47	47.90	6.20
1997	50.63	8.88	48.72	6.32
1998	50.12	10.89	49.33	6.44
1999				

* Source: I/O tables, imports matrices (National Accounts) and own calculations.

3.3 Concentration

Concentration is measured by the C4-ratio. C4-ratios are available at *class level*[3] (DUMA 2000), but only for manufacturing. DUMA is EIM's database on manufacturing. The C4's are aggregated up to the manufacturing level after weighting with employment. Table 4 shows that the C4-ratio has decreased in manufacturing throughout the 1987-1999 period, indicating that competition between domestic firms has increased in this sector.

1 Data on imports shares are only available since 1996 in services.

2 Note that since 1994, fluctuations in the change in imports and export shares have been considerable in manufacturing. Positive and negative growth alternated, but moved in the same direction until 1998. In 1998, imports and export shares moved in opposite direction. In this year, the increase in imports was considerable, but at the expense of exports. It might indicate a deterioration of the international competitiveness of manufacturing. In contrast to manufacturing, in services fluctuations kept moderate. Only in 1997 the export share was relatively low.

3 The class level (according to the European classification system) is identical to the *3-digit* level (Dutch classification system).

Table 4 Concentration in manufacturing 1987-1999*

	C4 (%)
1987	36.57
1988	35.54
1989	35.11
1990	34.84
1991	33.76
1992	32.91
1993	32.31
1994	31.19
1995	30.16
1996	29.21
1997**	28.70
1998**	28.19
1999**	27.69

* Source: C4: DUMA (EIM); C4's are aggregated over markets defined at the class level (3-digit) by weighting with employment.

** Estimated by assuming a relative change of –1.76% (= average of period 1984-1996).

Concentration has decreased with about 0.74 percent points per year on average. In our simulation model, the yearly change in concentration in manufacturing is set equal to this average, both in the 1988-1999 period and the 1999-2005 period (section 4 and section 5). Concentration rates are not available for services. We assume the simulated yearly change in concentration to be zero in services, as in many service sectors smallness is dominant. We consider MOCO to generate reliable estimations of the impact of competition in services, even though we assume the concentration rate to be constant.

4 Influence of competition in period 1988-1999

We investigate the effects of the increased competition on sector performance during the 1988-1999 period. We distinguish between manufacturing and services. We estimate the effects of increased *turbulence* and *concentration*. By looking at the difference between the simulation results with and without allowing turbulence and concentration to change, we isolate the effects of turbulence and concentration on the performance variables. Turbulence and concentration are exogenous[1] in the model, while exports and imports shares are endogenous (see section 2). Exports and imports shares are directly affected by the foreign product price and world trade and indirectly affected by turbulence and concentration. Turbulence and concentration affect international competitiveness as they influence prices. The simulation results include the effects of changes in imports and exports shares on economic

[1] We consider turbulence and concentration to be determined by factors *outside* the model, such as competition legislation and culture.

performance only to the extent changes in these variables are induced by (changes in) the exogenous competition variables, i.e. turbulence or concentration[1].

The rest of the chapter is organised as follows. In section 4.1, we present the simulation results with respect to the effects of the increased competition in the 1988-1999 period on economic performance. We calculate the effects on yearly growth rates of *real value added*, *employment, labour productivity*, *product price* and *wages* and on the *net profit margin*. We present averages over the 1988-1999 period. In section 4.2, we perform a sensitivity analysis for services with respect to the parameters that measure the impact of turbulence on wages and the product price, respectively. These parameters are important in services, while they are not empirically estimated.

4.1 Influence of competition in period 1988-1999

We calculate the influence of turbulence and concentration in the 1988-1999 period on sector performance. The yearly changes in turbulence (0.24 % points) and concentration (-0.74 % points) are set equal to the actual yearly averages over this period. Table 5 gives the simulation results.

[1] We do not include the effects of changes in imports and export shares that are induced by other variables than turbulence and concentration, such as world trade and the foreign output price. However, we consider these variables not to be affected (much) by changes in competition that originate from national policy.

Table 5 Effects of increased competition in 1988-1999 on sector performance (in % points change)

Variable	Manufacturing	Services
Averages 1988-1999 period		
Growth rate labour productivity		
- turbulence-induced	0.021	0.185
- concentration-induced	0.010	0.000
Growth rate real value added		
- turbulence-induced	0.018	0.051
- concentration-induced	0.196	0.000
Growth rate employment		
- turbulence-induced	-0.003	-0.134
- concentration-induced	0.186	0.000
Net profit margin		
- turbulence-induced	0.001	0.021
- concentration-induced	-0.914	0.000
Growth rate product price		
- turbulence-induced	-0.009	-0.144
- concentration-induced	-0.225	0.000
Growth rate wages		
- turbulence-induced	-0.001	-0.010
- concentration-induced	-0.123	0.000

The effect of turbulence on the performance variables is relatively large in services. This is explained by both the larger increase in turbulence compared to manufacturing, and the larger impacts of turbulence on prices and total factor productivity (see tables 1a and 1b). In manufacturing, the effect of turbulence is small compared to the effect of concentration. This is explained by both the small increase in turbulence and its relatively small impact on prices and total factor productivity. Below we discuss the effects of the changes in turbulence and concentration in the 1988-1999 period on the performance variables during this period.

More competition has lead to an increase in *labour productivity growth* in both sectors. Production factors are more efficiently utilized (Lever and Nieuwenhuijsen, 1999). Note that factor substitution, induced by changes in relative factor prices, affects labour productivity negatively in this period. However, this negative *substitution effect* is relatively small[1] compared to the positive *productivity effect* of more efficient factor utilisation. In manufacturing, the increase in labour productivity growth is relatively small compared to services. This is due to the relatively small impact of concentration on total factor productivity (see table 1a) compared to turbulence and the relatively small increase in turbulence. Factor substitution is relatively large in manufacturing, due to the relatively strong effect of concentration on price competition in the labour market (see table 1b).

[1] The moderate degree of factor substitution is the consequence of the Cobb-Douglas specification of the production function in which costs shares remain constant.

More competition has lead to an increase in *real value added growth* in both sectors, which is the consequence of lower price increases (inflation). There are two reasons for the lower inflation. First, the pressure on average costs is higher through higher total factor productivity growth (Lever, 1997). Second, the pressure on the mark-up is higher. Higher pressure on the mark-up leads to higher real value added growth at given demand growth. Lower average costs lead to growth in real value added growth at given mark-up. Lower prices lead to both growth of exports (demand growth) and import substitution increase.

More competition has lead to an increase in *employment growth* in manufacturing, but to a decrease in services. This is the consequence of the opposite effects of changes in turbulence (negative) and concentration (positive) on employment growth. The effect of turbulence on employment growth is *negative*, as the impact of turbulence on the mark-up or conjectural variations is relatively small compared to the impact on total factor productivity growth (discussed in section 2). The effect of concentration on employment growth is *positive*, as the impact of concentration on factor productivity is relatively small compared to the impact on the mark-up. A lower mark-up induces employment growth both through an increase in demand and a decrease in the relative price of labour, which induces capital substitution. The relatively large impact of and change in concentration in manufacturing compared to turbulence explains the positive effect on employment growth in manufacturing. The relatively large impact of and change in turbulence in services compared to concentration explains the positive effect on employment growth in services. Note that even if the impact of and change in turbulence and concentration in manufacturing and services would have been equal, the increase in employment growth would have been much larger in manufacturing compared to services. This is the consequence of the price elasticity of exports being almost three times higher in manufacturing compared to services[1].

More competition has lead to an increase in the *net profit margin* in services, but to a considerable decrease in manufacturing. This is the consequence of the opposite effects of more pressure on the mark-up (negative) and higher productivity growth (positive) on the net profit margin. The impact of turbulence on total factor productivity growth and, thereby, demand growth is relatively large compared to the impact on the mark-up. Therefore, the positive effect of increased competition on the net profit margin dominates in services. The impact of concentration on total factor productivity growth is relatively small compared to the impact on the mark-up. Therefore, the negative effect of increased competition on the net profit margin dominates in manufacturing. Note that concentration is an important determinant of the conjectural elasticity (Lever, 1999) in manufacturing. This explains the exceptionally large effect of concentration on the profit margin in this sector. Profit margins are on average almost one percent point lower each year compared to the situation of constant concentration.

More competition has lead to lower *inflation* in both sectors. This is due to increased pressure on the mark-up as well as on marginal costs, induced by higher factor productivity growth. The growth of *wages* has decreased, too. The positive effect of higher labour productivity on wages is dominated by the negative effect of increased price competition in the labour market. This finding indicates that productivity growth not necessarily leads to higher wages or a positive wage-price spiral (in the short term). Competitive pressure suppresses wages in case productivity growth is induced by an increase in competition.

[1] Note that this is not only because of the direct effect of price on exports, but also because of the (second-order) indirect price effect through increased internationalisation.

4.2 Sensitivity analysis

The direct impacts of turbulence on prices or mark-up (see table 1b) are not empirically estimated but calculated from the impacts of concentration on these variables in manufacturing. As the yearly change in turbulence is considerable in services and the impacts important compared to concentration in this sector, we perform a sensitivity analysis on these parameters to get an idea of the sensitivity of the results to the calculated parameter values. We multiply the calculated effects of turbulence on prices with a factor 2 and a factor 0.5, respectively. Table 6 presents the simulation results.

Table 6 Sensitivity analysis services

Variable	Services	
Averages 1988-1999 period	Minimum 0.5 * basis value	Maximum 2 * basis value
Growth rate labour productivity		
- turbulence-induced	0.187	0.184
Growth rate real value added		
- turbulence-induced	0.050	0.053
Growth rate employment		
- turbulence-induced	-0.136	-0.132
Net profit margin		
- turbulence-induced	0.079	-0.037
Growth rate product price		
- turbulence-induced	-0.131	-0.158
Growth rate wages		
- turbulence-induced	-0.004	-0.017

The results are not very sensitive to changes in the impact of turbulence on factor and product prices. This is the consequence of the relatively small impact of turbulence on the mark-up compared to the impact on total factor productivity (not changed). The signs of the effects of turbulence do not change, except for the effect on the net profit margin. The negative effect on the net profit margin of a lower mark-up dominates the positive effect of the increased total factor productivity growth (for discussion, see section 4.1) in case the direct impact on the mark-up is 2 times the basis value.

We do not perform a sensitivity analysis for manufacturing, although the direct impacts of turbulence on prices and productivity are not empirically estimated[1] for this sector. The yearly change in turbulence and its impacts on prices and productivity are shown to be unimportant in manufacturing (Lever, 1997; Lever and Nieuwenhuijsen, 1999). The impacts of exports and imports shares on total factor productivity growth and prices in services are not empirically estimated, too. They are assumed to be not different from manufacturing. We do not present results of a sensitivity analysis with respect to these impacts, because of a

[1] It is calculated from the impact of turbulence on total factor productivity in services, which is empirically estimated (Bosma and Nieuwenhuijsen, 1999).

lack of theoretical arguments why in services the impacts of exports and imports shares of total factor productivity and prices would differ from manufacturing[1].

5 Scanning the future

In this section, we investigate the impact of a competition scenario for the 2001-2005 period on sector performance in this period. Furthermore, we investigate the medium-term effects of increased competition by looking at the sector performance after six years of constant competition from 2006 to 2012.

We assume that the trend in concentration we observe empirically for the 1987-1999 period (table 1b) will proceed. This means that we set the yearly change in concentration equal to the average change in the 1988-1999 period of -0.74 percent points. We assume the yearly change in turbulence to be higher in the 2001-2005 period than the average change in the 1988-1990 period of -0.24, as we assume turbulence to gradually catch up with Germany. We assume that turbulence increases within five years to the level Germany experiences in 1999. As turbulence is 20% in Germany in 1999 and 15% in the Netherlands, this implies that we assume a turbulence increase by 33.3% in the 2001-2005 period. This is 1.0 percent points change per year on average. We assume a more moderate scenario for manufacturing, viz. an increase of 20%, rather than the 33.3% in services. As turbulence in manufacturing is about 11% in 1999, this implies 0.4 percent points change per year on average.

In the simulations for the 2001-2005 period, we exclude the effects changes in concentration and turbulence in the 1988-1999 period have on the performance variables after 2001. Only the effects of (additional) changes in competition in the 2001-2005 period are captured in the results. MOCO is developed to be used for short-term and medium-term forecasting (1-10 years). The difference between 2005 and 1988 is more than 10 years.

The rest of this section is organised as follows. In section 5.1, we present and discuss the effects of increased competition in the 2001-2005 period on average sector performance in this period. In section 5.2, we present and discuss the (medium-term) effects of increased competition in the 2001-2005 period on sector performance in 2012.

5.1 Scanning the influence of competition in period 2001-2005

In the competition scenario for the 2001-2005 period, we assume concentration to change with -0.74 percent points in manufacturing. We assume turbulence to change with 0.40 percent points in manufacturing and with 1 percent point in services. Table 7 gives the scenario and the simulation results of this competition scenario.

[1] Note, however, that a sensitivity analysis would again not change the results qualitatively. The competition-induced changes in imports and export shares are relatively small in services, as the price elasticity of exports and imports is small. Furthermore, competition-induced changes in prices and productivity through changes in imports and export shares are only second-order effects.

Table 7 Effects of increased competition 2001-2005 on sector performance (according to competition scenario)

Variable	Manufacturing	Services
Averages 2001-2005 period		
Growth rate labour productivity		
- turbulence-induced	0.071	0.358
- concentration-induced	-0.005	0.000
Growth rate real value added		
- turbulence-induced	0.061	0.114
- concentration-induced	0.152	0.000
Growth rate employment		
- turbulence-induced	-0.010	-0.244
- concentration-induced	0.157	0.000
Net profit margin		
- turbulence-induced	0.004	0.046
- concentration-induced	-0.382	0.000
Growth rate product price		
- turbulence-induced	-0.028	-0.272
- concentration-induced	-0.201	0.000
Growth rate wages		
- turbulence-induced	-0.004	-0.042
- concentration-induced	-0.112	0.000

The effects of increased turbulence turn out to be of equal sign as in the 1988-1999 period. However, the effects are larger in the 2001-2005 period. This is the consequence of the higher average increase in turbulence in the 2001-2005 period (1 percent point change) compared to the 1988-1999 period (0.24 percent points change). The effects of decreased concentration turn out to be of equal sign as in the 1988-1999 period, too, except for the effect on the growth of labour productivity. The opposite sign with respect to this variable is due to the shorter period of five years over 2001-2005 compared to the twelve years over 1988-1999. A shorter time period implies that the cumulative decrease in concentration is smaller. This implies that effects on total factor productivity growth and on the mark-up, averaged over the years, are smaller. It means that the shorter the time period, the larger the negative *substitution effect* on labour productivity compared to the positive *productivity effect* (see section 4 for a discussion of these effects). The shorter time period also explains the smaller effects of concentration on the other performance variables, compared to the 1988-1999 period. When the effects on factor productivity growth and the pressure on prices are smaller, the (indirect) effects of these variables on the performance variables are smaller, too: lower pressure on the mark-up implies a higher net profit margin. A smaller increase in total factor productivity growth implies higher product price and wage inflation. Higher product price inflation implies lower demand growth and, therefore, lower employment growth.

5.2 Short-term versus medium-term effects

It is not realistic that concentration keeps on decreasing and turbulence keeps on increasing. This makes it interesting to distinguish the *short-term* effects of changes in competition from the *medium-term* effects. The short term is characterised by the presence of direct and indirect effects of the subsequent *changes* in competition. In the medium term, there are no direct effects of the subsequent *changes* in turbulence and concentration anymore, and indirect effects have (almost) worked out. Only effects of the increased *level* of competition remain.

We analyse the short-term effects by looking at 2005, as in this year the effects of changes in turbulence and concentration during the 2001-2005 period are maximal[1]. We analyse the medium-term effects by looking at 2012, thus after six years of *constant* turbulence and concentration. The direct effects of changes in turbulence and concentration in the 2001-2005 period are zero in 2012. Furthermore, the indirect effects of these changes have (almost) worked out (effects approximately zero). Only the effects of the different *level* of turbulence and concentration are left.

Table 8 presents the short-term effects (2005) and the medium-term effects (2012) of the increased turbulence and decreased concentration in the 2001-2005 period. By comparing the results in 2012 with the results in 2005, we get insight in whether the medium-term effects on the performance variables are stronger or weaker than the short-term effects. We also present the effects of the increased competition in 2001, which are the *direct* effects of the increased competition in 2001[2]. By comparing these results with the results for 2005, we get an indication of the relative size of the indirect effects compared to the direct effects as well as their sign.

[1] The direct effects are constant during the 2001-2005 period and zero after 2005. The indirect effects increase at least during 2001-2005. Because indirect effects (mainly second-order effects) are smaller than direct effects, the effects of changes in turbulence and concentration are larger in 2005 than in later years.

[2] Note that effects in 2001 are only direct effects.

Table 8 *Short-term* and *medium-term* effects of increased competition in 2001-2005 on sector performance

Variable	Manufacturing	Services
Growth rate labour productivity		
- 2001	0.018	0.111
- 2005	0.117	0.600
- 2012	0.118	0.576
Growth rate real value added		
- 2001	0.119	0.047
- 2005	0.285	0.177
- 2012	0.115	0.126
Growth rate employment		
- 2001	0.101	-0.065
- 2005	0.168	-0.424
- 2012	-0.003	-0.450
Net profit margin		
- 2001	-0.099	0.027
- 2005	-0.671	0.073
- 2012	-0.760	0.046
Growth rate output price		
- 2001	-0.155	-0.080
- 2005	-0.275	-0.464
- 2012	-0.066	-0.463
Growth rate wages		
- 2001	-0.077	-0.040
- 2005	-0.133	-0.043
- 2012	-0.002	-0.002

Direct versus indirect effects

The effects in 2001 appear to be of equal sign as the effects in 2005. The effects are smaller in absolute terms, because the effects in 2005 include *indirect* effects of changes in turbulence and concentration in preceding years. Changes in the imports share, the exports share and in production costs work through on prices and productivity growth with a time lag. Furthermore, 2005 includes the effects of the cumulative change in turbulence and concentration in preceding years. Higher turbulence and lower concentration in 2005 compared to 2001 imply that factor productivity growth is higher in 2005 than in 2001 and the mark-up is lower in 2005 than in 2001. The effects in 2005 on the performance variables, induced by a higher factor productivity growth and a lower mark-up, are, therefore, also higher in 2005 than in 2001.

For the growth rate of real value added, the growth rate of employment (for manufacturing), the net profit margin (for services), the growth rate of output price (for manufacturing) and the growth rate of wages, indirect effects are of opposite sign as the direct effects. In the other cases, the indirect effects are of equal sign as the direct effects. The large differences in effects between 2005 and 2001 that we observe for labour productivity growth

and the growth rate of product price in services, is due to the large effect of cumulative TFP growth on these variables in 2005.

Short-term versus medium-term effects

In the medium term, direct effects of *changes* in turbulence and concentration on the mark-up are absent, and indirect effects of these changes have worked out. The effects of increased competition in the 2001-2005 period in the medium term are fully the effects of the resulting higher *level* of competition. The increased competition in the 2001-2005 period implies that in 2012, total factor productivity growth is higher and a mark-up is lower compared to the situation without increased competition[1]. As total factor productivity growth is higher in the medium term than in the short term (see note), effects induced by higher productivity growth are also relatively large in the medium term compared to the short term. As the mark-up is lower in the medium term than in the short term, effects induced by a lower mark-up are relatively large in the medium term. The yearly *change* in the mark-up is relatively small in the medium term, as after 2005, turbulence and concentration are constant. This implies that effects, which are induced by *changes* in the mark-up, are relatively small at the medium term compared to the short term. Below we discuss the results.

The medium-term effect on nominal labour productivity growth is positive in both sectors and of equal sign as the short-term effect. The positive effect is due to the positive effect of the higher level of competition on total factor productivity, which is even higher in the medium term compared to the short term. In services, the positive effect of the higher level of competition on labour productivity is smaller in 2012 than in 2005, although total factor productivity increases throughout the 2006-2012 period. This is explained by the lower inflation in 2012, due to the higher factor productivity growth.

The medium-term effect on the growth of real value added is positive in both sectors and of equal sign as the short-term effect. Demand increases through lower inflation induced by higher productivity growth. The effect of the increased level of competition in 2001-2005 on the growth of real value added is smaller in 2012 than in 2005. This is explained by the absence of the effect of *changes* in turbulence and concentration on the mark-up and, therefore, on demand and real value added.

The medium-term effect on employment growth is negative in both sectors, while the short-term effect is positive in manufacturing. The pressure on the mark-up does not increase much anymore when concentration and turbulence do not change, which implies a lower demand growth and faster labour substitution. Employment growth declines. Substitution of labour by capital and intermediate goods is accelerated as the relative price of labour increases (faster) during the 2006-2012 period. This is because the pressure on the mark-up and, therefore, on wages, originates only indirectly, viz. from the higher growth in the exports share in the 2006-2012 period, induced by the higher productivity growth and, therefore, lower inflation.

[1] Note that total factor productivity growth is not constant during the 2006-2012 period, even though turbulence and concentration are constant. It increases further in this period because of multiplier effects. Higher factor productivity growth induces higher growth of the exports share, which induces a further increase in factor productivity growth. The mark-up decreases also further in the 2006-2012 period. A lower mark-up induces higher growth of the exports and imports shares, which induce further pressure on the mark-up. The medium-term effects on the performance variables concern the effects of the higher factor productivity growth and lower mark-up in 2012 on the performance variables.

The medium-term effect on the net profit margin is negative in manufacturing and positive in services, and of equal sign as the short-term effect. The lower net profit margin is the consequence of the lower mark-up. The net profit margin has decreased gradually since 2005. This is explained by the increased pressure on the mark-up through higher growth in the exports share, induced by the higher total factor productivity growth.
The medium-term effect on product and factor price inflation is negative in both sectors, and of equal sign as the short-term effect. This is mainly the consequence of the higher factor productivity growth. The medium-term negative effect on wage and price inflation is, however, lower compared to the short-term negative effect. In the short term, also *changes* in turbulence and concentration increase the pressure on the prices in the product and labour market.

Bijlage I Appendix Assumptions and elasticities in MOCO

Table I.1 Change of total domestic demand, prices of capital, intermediate goods and competing products

Variable	Yearly growth (%)
Total domestic demand*	2.5
Price of capital**	2.0
Price of intermediate goods**	2.0
Price of foreign products*	0.7

* Source CPB/CEP (2000; appendices pp. 192-195).
** Assumptions according to PRISMA (EIM, 2000).

Table I.2 Base-year values (1987)

Variable	Symbol	Manufacturing	Services
Price employment*	PEMP	1.00	1.00
Own product price*	OPP	1.00	1.00
Volume of capital**	CAP	26,543	109,340
Volume of employment**	EMP	52,765	163,955
Volume of intermediate deliveries**	IMG	178,599	134,084
Volume of exports**	EXP	122,119	42,734
Volume of domestic sales**	DOS	135,788	364,645
Volume domestic demand	TDD	242,613	388,000

* Normalized.
** Source: National Accounts (CBS).

Table I.3 Elasticities exports and imports equation

Variable	Manufacturing	Services
Exports equation		
Word trade (WTR)	1.10	0.41
Own product price (OPP)	-0.97	-0.36
Foreign product price (FPP)	0.97	0.36
Imports equation		
Domestic demand (TDD)	0.70	0.25
Own product price (OPP)	0.25	0.10
Foreign product price (FPP)	0.25	0.10

Source: PRISMA (EIM, 2000).

Table I.4 Output elasticities

Variable	Manufacturing	Services
Elasticity of capital*	0.10	0.27
Elasticity of labour*	0.20	0.40
Elasticity of intermediate goods*	0.69	0.33

* Based on cost shares in total production according to National Accounts.

Bijlage II Literature

Appelbaum, E. (1982), The estimation of the degree of oligopoly power. *Journal of Econometrics,* 19, pp. 287-299.

Bartelsman, Eric J., George van Leeuwen and Henry R. Nieuwenhuijsen (1998), Adoption of Advanced Manufacturing Technology and Firm Performance in the Netherlands, *Economics of Innovation and New Technology*, Vol. 6, pp. 291-312.

Campbell, J.R. (1998), Entry, Exit, Embodied Technology, and Business Cycles, *Review of Economic Dynamics* 1 (2), 371-408.

Hindriks, F.A. (1999), *Non-competitive rents in Dutch manufacturing*, EIM Research Report 9905/E, Zoetermeer.

Lever, M.H.C. (1997), *The impact of competition on prices and wages in Dutch manufacturing industries,* Research Report 9702/E, EIM, Zoetermeer.

Lever, M.H.C., and H.R. Nieuwenhuijsen (1999), The impact of competition on productivity in Dutch manufacturing. In: Audretsch, D.B., and R. Thurik (ed.), *Innovation, Industry Evolution and Employment*, Cambridge University Press.

Mueller, D.C. (1986), *Profits in the long run,* Cambridge University Press.

Nieuwenhuijsen, H.R., J.S. Bais, N.H. Bosma, J.M.P. de Kok, E.A. van Noort and J.A.C. Vollebregt (1999), *Bedrijvendynamiek en economische prestaties*, EIM, in opdracht van Ministerie van Economische Zaken, Zoetermeer/Den Haag.

Nieuwenhuijsen, H.R., and G.H. de Wit (1999), *Modelling Competition and Regulation; State of the art, Feasibility and Research Agenda,* SCALES Paper 9903, EIM, Zoetermeer.

Varian, Hal R. (1984), *Microeconomic Analysis*, 2nd edition, W.W. Norton & Company, New York/London.

De Wit, G., A.J. van Stel and A. Kwaak (2000), PRISMA 2000, Policy Research Instrument for Size-aspects in Macro-economic Analysis, forthcoming.

List of Research Reports

Order no	Title
H9301	The intertemporal stability of the concentration-margins relationship in Dutch and U.S. manufacturing; Yvonne Prince and Roy Thurik
H9302	Persistence of profits and competitiveness in Dutch manufacturing; Aad Kleijweg
H9303	Small-store presence in Japan; Martin A. Carree, Jeroen C.A. Potjes and A. Roy Thurik
intern	Multi-factorial risk analysis and the sensitivity concept; Erik M. Vermeulen, Jaap Spronk and Nico van der Wijst
H9304	Do small firms' price-cost margins follow those of large firms? First empirical results; Yvonne Prince and Roy Thurik
H9305	Export success of SMEs: an empirical study; Cinzia Mancini and Yvonne Prince
H9306	Het aandeel van het midden- en kleinbedrijf in de Nederlandse industrie; Kees Bakker en Roy Thurik
H9307	Multi-factorial risk analysis applied to firm evaluation; Erik M. Vermeulen, Jaap Spronk and Nico van der Wijst
H9308	Visualizing interfirm comparison; Erik M. Vermeulen, Jaap Spronk and Nico van der Wijst
H9309	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
H9401	Employment during the business cycle: evidence from Dutch manufacturing; Marcel H.C. Lever and Wilbert H.M. van der Hoeven
H9402	De Nederlandse industrie in internationaal perspectief: arbeidsproduktiviteit, lonen en concurrentiepositie; Aad Kleijweg en Sjaak Vollebregt
H9403	A micro-econometric analysis of interrelated factor demand; René Huigen, Aad Kleijweg, George van Leeuwen and Kees Zeelenberg
H9404	Between economies of scale and entrepreneurship; Roy Thurik
H9405	L'évolution structurelle du commerce de gros français; Luuk Klomp et Eugène Rebers
intern	Basisinkomen: een inventarisatie van argumenten; Bob van Dijk
H9406	Interfirm performance evaluation under uncertainty, a multi-dimensional frame-work; Jaap Spronk and Erik M. Vermeulen
H9407	Indicatoren voor de dynamiek van de Nederlandse economie: een sectorale analyse; Garmt Dijksterhuis, Hendrik-Jan Heeres en Aad Kleijweg
H9408	Entry and exit in Dutch manufacturing industries; Aad Kleijweg and Marcel Lever
intern	Labour productivity in Europe: differences in firm-size, countries and industries; Garmt Dijksterhuis
H9409	Verslag van de derde mondiale workshop Small Business Economics; Tinbergen Instituut, Rotterdam, 26-27 augustus 1994; M.A. Carree en M.H.C. Lever
H9410	Internal and external forces in sectoral wage formation: evidence from the Netherlands; Johan J. Graafland and Marcel H.C. Lever

H9411 Selectie van leveranciers: een kwestie van produkt, profijt en partnerschap?; F. Pleijster

intern Grafische weergave van tabellen; Garmt Dijksterhuis

H9501 Over de toepassing van de financieringstheorie in het midden- en kleinbedrijf; Erik M. Vermeulen

H9502 Insider power, market power, firm size and wages: evidence from Dutch manufacturing industries; Marcel H.C. Lever and Jolanda M. van Werkhooven

H9503 Export performance of SMEs; Yvonne M. Prince

H9504 Strategic Niches and Profitability: A First Report; David B. Audretsch, Yvonne M. Prince and A. Roy Thurik

H9505 Meer over winkelopenstellingstijden; H.J. Gianotten en H.J. Heeres

intern Interstratos; een onderzoek naar de mogelijkheden van de Interstratos-dataset; Jan de Kok

H9506 Union coverage and sectoral wages: evidence from the Netherlands; Marcel H.C. Lever and Wessel A. Marquering

H9507 Ontwikkeling van de grootteklassenverdeling in de Nederlandse Industrie; Sjaak Vollebregt

H9508 Firm size and employment determination in Dutch manufacturing industries; Marcel H.C. Lever

H9509 Entrepreneurship: visies en benaderingen; Bob van Dijk en Roy Thurik

H9510 De toegevoegde waarde van de detailhandel; enkele verklarende theorieën tegen de achtergrond van ontwikkelingen in distributiekolom, technologie en externe omgeving; J.T. Nienhuis en H.J. Gianotten

H9511 Haalbaarheidsonderzoek MANAGEMENT-model; onderzoek naar de mogelijk-heden voor een simulatiemodel van het bedrijfsleven, gebaseerd op gedetailleerde branche- en bedrijfsgegevens; Aad Kleijweg, Sander Wennekers, Ton Kwaak en Nico van der Wijst

H9512 Chippen in binnen- en buitenland; De elektronische portemonnee in kaart gebracht; een verkenning van toepassingen, mogelijkheden en consequenties van de chipcard als elektronische portemonnee in binnen- en buitenland; drs. J. Roorda en drs. W.J.P. Vogelesang

H9601 Omzetprognoses voor de detailhandel; Pieter Fris, Aad Kleijweg en Jan de Kok

H9602 Flexibiliteit in de Nederlandse Industrie; N.J. Reincke

H9603 The Decision between Internal and External R&D; David B. Audretsch, Albert J. Menkveld and A. Roy Thurik

H9604 Job creation by size class: measurement and empirical investigation; Aad Kleijweg and Henry Nieuwenhuijsen

H9605 Het effect van een beursnotering; drs. K.R. Jonkheer

H9606 Een Micro-werkgelegenheidsmodel voor de Detailhandel; drs. P. Fris

H9607 Demand for and wages of high- and low-skilled labour in the Netherlands; M.H.C. Lever and A.S.R. van der Linden

H9701 Arbeidsomstandigheden en bedrijfsgrootte. Een verkenning met de LISREL-methode; drs. L.H.M. Bosch en drs. J.M.P. de Kok

H9702 The impact of competition on prices and wages in Dutch manufacturing industries; Marcel H.C. Lever

H9703 FAMOS, een financieringsmodel naar grootteklassen; drs. W.H.J. Verhoeven

H9704 Banencreatie door MKB en GB; Pieter Fris, Henry Nieuwenhuijsen en Sjaak Vollebregt

H9705 Naar een bedrijfstypenmodel van het Nederlandse bedrijfsleven; drs. W.H.M. van der Hoeven, drs. J.M.P. de Kok en drs. A. Kwaak

H9801 The Knowledge Society, Entrepreneurship and Unemployment; David B. Audretsch and A. Roy Thurik

H9802 Firm Failure and Industrial Dynamics in the Netherlands; David B. Audretsch, Patrick Houweling and A. Roy Thurik

H9803 The determinants of employment in Europe, the USA and Japan; André van Stel

H9804 PRISMA'98: Policy Research Instrument for Size-aspects in Macro-economic Analysis; Ton Kwaak

H9805 Banencreatie bij het Klein-, Midden- en Grootbedrijf; Henry Nieuwenhuijsen, Ben van der Eijken en Ron van Dijk

H9806 Milieumodel; drs. K.L. Bangma

H9807 Barriers for hiring personnel; Jacques Niehof

H9808 Methodiek kosten en baten Arbowetgeving; drs. K.M.P. Brouwers, dr. B.I. van der Burg, drs. A.F.M. Nijsen en ir. H.C. Visee

H9809 Business Ownership and Economic Growth; An Empirical Investigation; Martin Carree, André van Stel, Roy Thurik and Sander Wennekers

H9810 The Degree of Collusion in Construction; M.H.C. Lever, H.R. Nieuwenhuijsen and A.J. van Stel

H9811 Self-employment in 23 OECD countries; Ralph E. Wildeman, Geert Hofstede, Niels G. Noorderhaven, A. Roy Thurik, Wim H.J. Verhoeven and Alexander R.M. Wennekers

H9812 SICLASS: Forecasting the European enterprise sector by industry and size class; Niels Bosma and Ton Kwaak

H9901 Scanning the Future of Entrepreneurship; drs. N.S. Bosma, drs. A.R.M. Wennekers and drs. W.S. Zwinkels

H9902 Are Small Firms Really Sub-optimal? Compensating Factor Differentials in Small Dutch Manufacturing Firms; David B. Audretsch, George van Leeuwen, Bert Menkveld and Roy Thurik

H9903 FAMOS; A size-class based financial analysis model; W.H.J. Verhoeven and E.A. van Noort

H9904 Conduct and Performance in Dutch Manufacturing; An Application of Appelbaum 1982 with a Plausibility-Check; Frank A. Hindriks, Henry R. Nieuwenhuijsen and Adriaan J. van Stel

H9905 Non-competitive Rents in Dutch Manufacturing; Conduct and Performance in the New Empirical Industrial Organization; Frank A. Hindriks

H9906 A human-resource-based theory of the small firm; Charlotte Koch and Jan de Kok

H9907 Van werknemer naar ondernemer; Een hybride of directe start?; ir. H.C. Visee en drs. W.S. Zwinkels

H9908 Modelling returns to R&D: an application on size effects; Peter Brouwer and Henry Nieuwenhuijsen

H9909 Turbulence and productivity in the Netherlands; Niels Bosma and Henry Nieuwenhuijsen

H9910 Start-up capital: Differences between male and female entrepreneurs. 'Does gender matter?'; Ingrid Verheul and Roy Thurik

H9911 Modelling Business Ownership in the Netherlands; Niels Bosma, Sander Wennekers, Gerrit de Wit and Wim Zwinkels

H9912 Measuring innovative intensity: Scale construction; J.P.J. de Jong

H9913 Determinants of firm size; Y. Bernardt and R. Muller

H0001 Strategies, uncertainty and performance of small business start-ups; Marco van Gelderen, Michael Frese and Roy Thurik

H0002 Determinants of Successful Entrepreneurship; Niels Bosma, Mirjam van Praag and Gerrit de Wit

H0003 Comparative Advantages in Estimating Mark-ups; Frank A. Hindriks, Henry R. Nieuwenhuijsen and Gerrit de Wit

H0004 The ARKO labour-cost model: Characteristics and application; G.Th. Elsendoorn and A.H. Nieuwland

H0005 The impact of contestability on prices in manufacturing industries; Frank Bosman

H0006 Estimating missing data within an accounting and aggregation framework; Ton Kwaak and Niels Bosma

H0007 Kennis-spillovers en economische groei; Henry Nieuwenhuijsen en André van Stel

H0008 KTO2000; Een sectormodel naar grootteklasse voor de analyse en prognose van Korte Termijn Ontwikkelingen; drs. K.L. Bangma en drs. W.H.J. Verhoeven

H0009 Making sense of the new economy; Joris Meijaard

H0010 Determinants of innovative ability; An empirical test of a causal model; J.P.J. de Jong, R. Kemp and C. Snel

H0011 The effects of transaction costs and human capital on firm size: a simulation model approach; Frank den Butter, Edwin van Gameren and Jan de Kok

H0012 An eclectic theory of entrepreneurship: policies, institutions and culture; Ingrid Verheul, Sander Wennekers, David Audretsch and Roy Thurik

H0013 Setting up a Business in the Netherlands: Who starts, who gives up, who is still trying?; Marco van Gelderen, Niels Bosma and Roy Thurik

H0101 Measuring economic effects of stimulating business R&D; Ton Kwaak, Henry Nieuwenhuijsen and Gerrit de Wit