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A Test of the Quality of Concentration Indices

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ZEW

Zentrum für Europäische Wirtschaftsforschung GmbH

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Non-technical Summary

Most economic models predict a positive relation between market concentration and profitability. However, in empirical research, this positive link is frequently either only weak, or cannot be estimated, or the relation even turns out to be negative. Schmalensee (1989) concludes: “The relation, if any, between seller concentration and profitability is weak statistically, and the estimated concentration effect is usually small. The estimated relation is unstable over time and space and vanishes in many multivariate studies.”

In this study, we use alternative measures of market structure. First, we use conventional industry-based concentration indices, like the Herfindahl index, C3 and C6 concentration. Second, we further include firm-level questionnaire data about the perceived market environment. The latter includes the number of competitors in a firm’s main market, the average size of the competitors, the intensity of price competition and buyer power.

The results based on the industry classification show no effect on profitability. However, survey information concerning the competitive environment works extremely well in explaining profitability. Apparently, the firms themselves assess the competitive environment much more accurately than the conventional and broadly-used concentration measures based on industry classification. Unlike the firms’ assessment, the aggregate variables are not able to identify the relevant market of the companies.

Nichttechnische Zusammenfassung

Die meisten ökonomischen Modelle finden einen positiven Zusammenhang zwischen Marktkonzentration und Profitabilität. In der empirischen Forschung ist dieser positive Zusammenhang oft schwach, gar nicht vorhanden oder sogar negativ. Schmalensee (1989) fasst zusammen: „The relation, if any, between seller concentration and profitability is weak statistically, and the estimated concentration effect is usually small. The estimated relation is unstable over time and space and vanishes in many multivariate studies."

In dieser Studie verwenden wir verschiedene Maße für die Marktstruktur. Zunächst benutzen wir konventionelle Konzentrationindizes auf Branchenebene, wie den Herfindahl-Index, C3- und C6-Konzentration. In einem zweiten Schritt ziehen wir darüber hinaus auch Daten aus Unternehmensbefragungen hinzu, die die Marktumgebung, wie sie von den Unternehmen wahrgenommen wird, abbildet. Wir sind somit in der Lage Angaben zur Anzahl der Konkurrenten auf dem Hauptabsatzmarkt, der durchschnittlichen Größe der Konkurrenten, der Intensität des Preiswettbewerbs und der Kundenmacht mit in die Analyse einzubeziehen.

Die Ergebnisse, die auf der Branchenklassifizierung beruhen, zeigen keinen Effekt auf die Profitabilität von Unternehmen. Somit findet sich Schmalensees Beobachtung in unseren Daten wieder. Ziehen wir Informationen aus den Befragungen hinzu, finden wir die erwarteten Effekte bzgl. des Zusammenhangs zwischen Wettbewerbsumfeld und Profitabilität. Offensichtlich beurteilen die Unternehmen ihr Wettbewerbsumfeld besser als aggregierte, konventionelle und weit verbreitete Konzentrationsmaße, die sich auf Branchenklassifikationen stützen. Wir interpretieren dieses Ergebnis so, dass über die aggregierten Maße der relevante Markt nicht adäquat abgebildet werden kann, wohingegen Unternehmensbefragungen in der Lage sind, genau diesen relevanten Markt besser darzustellen.

A Test of the Quality of Concentration Indices

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Abstract

Theory predicts a positive relationship between market concentration and profitability in most scenarios. In empirical work, however, this relation is frequently not found or only a weak connection is observed. We compare the performance of concentration and market share variables, which are generated on the basis of the official industry classification, with information collected directly from firms. Information from companies on the number of competitors, their relative size and the intensity of price competition is highly significant in explaining profit levels, while none of the concentration indices performs well. Hence, the poor quality of industry data is responsible for the loose connection that is usually found between concentration and profitability.

Keywords: Concentration Indices, Profitability, Discrete Regression Models
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1 Introduction

Most economic models predict a positive relation between market concentration and profitability. However, in empirical research, this positive link is frequently either only weak, or cannot be estimated, or the relation even turns out to be negative. Schmalensee (1989) concludes: “The relation, if any, between seller concentration and profitability is weak statistically, and the estimated concentration effect is usually small. The estimated relation is unstable over time and space and vanishes in many multivariate studies.”

Recent IO literature has abandoned the empirical approach to link profitability to market concentration. Slade (2004) discusses the shortcomings in detail. One reason is the inability of empiricists to determine causality instead of a correlation. Particularly in cross section analyses, endogeneity problems arise when relating concentration measures to profitability. Another critic is that industry classifications, which are assumed to be the best approximation for the “market”, are based on a too broad definition. Consequently, industries may pool “submarkets” with very different structures. Furthermore, firms are assigned to one industry, their perceived “main industry”, but may operate in several different industries. The basic structure conduct performance paradigm has also been criticized because it is supposedly not derived from models with optimizing agents. However, in her own empirical study Slade (2004) finds strong support for the old fashioned SCP paradigm.

In this study, we use alternative measures of market structure and scrutinize the appropriateness of standard industry-based concentration indices estimating profitability equations for a number of German manufacturing firms. We use conventional industry-based concentration indices, the individual market share - relating firm sales to industry sales - and, in addition, firm-level questionnaire data about the perceived market environment. The latter includes the number of competitors in a firm’s main market, the average size of the competitors, the intensity of price competition and buyer power. The variables describing the competitive situation are used along with other variables to explain profitability. The results based on the industry classification display no effect on profitability. However, direct information concerning the competitive environment works extremely well in explaining profitability. Apparently, the firms themselves assess the competitive environment much more accurately than the conventional and broadly-used concentration measures based on industry classification. Unlike the

firms' assessment, the aggregate variables are not able to identify the relevant market of the companies.

2 General Considerations and Research Strategy

Most oligopoly models like Cournot or Bertrand predict a negative relation between the number of firms active in an industry and profitability, for homogenous and heterogeneous products. If firms active in an industry form a cartel, this hypothesis does not hold, since monopoly profits are generated although the number of firms exceeds one. But, in such a setting, incentives exist to secretly break the agreement or to form an independent fringe[1]. These incentives become more relevant with an increasing number of colluding firms. Consequently, even in industries with cartels, a negative relation between profitability and the number of firms probably exists.

In contrast to this view, it is also hypothesized that the positive association between profitability and concentration is due to efficiency advantages of large firms. If a firm is more efficient than others, it will be able to reduce prices and will gain market share at the expense of the less efficient producers. As a result, concentration indices should be positively correlated with profitability of the larger firms, but not because of collusion.

The predictions from theory have been tested in numerous studies. Usually, concentration measures constructed on a more or less disaggregated industry-level are applied to explain profitability measures. In order to check for possible efficiency differences, the individual market shares are also included. However, the results are mixed. In any case, the empirical relations found between concentration indices and profitability are not very robust.

For our comparison between industry-based and survey-based data we use firm level information from the Mannheim Innovation Panel (MIP). Data collection is carried out by the Centre for European Economic Research (ZEW) on behalf of the Federal Ministry of Education and Research. The MIP has provided annual information on innovative behaviour in the German

[1] Selten (1973), d'Aspremont, Jaquemin, Jaskold-Gabszewicz and Weymark (1983), Martin (2002) chapter 10.

manufacturing sector since 1992. The MIP is also the German contribution to the CIS, the European Community Innovation Survey.

The dependent variable is the profit margin. This variable is sometimes called excess *return on sales* and expresses the following:

$$\frac{\pi_i}{s_i} = \frac{s_i \text{ - labor cost - capital cost - material cost}}{s_i}$$

with π_i denoting profits and s_i being firm (not industry) sales. If firms are in long-run equilibrium and are operating in the range of their production functions with constant returns to scale, the excess profit return on sales will, on average across all products of the firm, equal the Lerner index. With constant returns to scale, marginal cost (*MC*) is equal to average cost (*AC*). One can therefore write:

$$\frac{\pi_i}{s_i} = \frac{pq - ACq}{pq} = \frac{p - MC}{p}$$

with *p* being the price and *q* the quantity produced. Hence, our measure of profitability is the price-cost margin, where the capital costs have been subtracted and need not be taken into account as an explanatory variable (e.g. capital divided by sales) as in other empirical models considering the price-cost margin[2].

Profitability is measured by the categorical variable return on sales, which was included in the MIP surveys of the years 2003 and 2005. The respective categories are depicted in Table 1. The information is available for the years 2001 to 2004 because in both surveys firms were asked to state the return on sales for both years preceding the survey year.

Table 1: Surveyed categories of the return on sales

Return on sales	Class	Return on sales	Class	Return on sales	Class
< 0 %	0	(4 – 7%]	3	> 15%	6
(0 – 2%]	1	(7-10%]	4	don't know	7
(2 – 4%]	2	(10 – 15%]	5		

[2] The usual way to estimate price-cost margins was introduced by Collins and Preston (1969). There are numerous studies that follow the same methodology.

As can be seen in the descriptive statistics depicted in Table 2 the average firm generates between 2 and 7 % *return on sales* as the mean is 2.4 and represents the average category.

In this paper we compare the performance of different measures reflecting the competitive environment of firms. To do this, we use different data sources: first, publicly available, conventional measures of market concentration, and second, variables from the questionnaire-based survey displaying firms' assessment of their competitive situation. We suppose that in general a firm's own evaluation of the competitive situation is more accurate than conventional industry-level concentration indices. This is because the industry-level data based on NACE codes may not exactly capture the relevant market, whereas in survey data the firms answer for their perceived market environment.

The publicly available variables are C3 and C6 concentration indices[3], a Herfindahl concentration index and industry sales. We use the latter to construct the firms' market shares by relating the individual sales to industry sales. These industry-level competition variables are gathered using information published in the biennial reports of the German Monopolies Commission, which provides the relevant information at the three-digit NACE level. It is possible that more disaggregated data would be more suited to describe the relevant market. However, quite a number of studies which investigate the effects of market structure rely on three digit industry data, so a comparison with our survey-based variables seems to be appropriate and meaningful.

Our approach is to use information about the competitive situation reported by the firms surveyed in the MIP. Firms were asked to evaluate how many main competitors they have. The options proposed for their assessments were "none", "1 to 5", "6 to 15" and "more than 15". We compute a dummy variable called *intermediate competition*, which has unit value, if the firm chooses the option "6 to 15" and secondly a dummy variable called *intensive competition* if the firm chooses the option "more than 15". Over 13 % of the firms are exposed to *intensive competition,* in that they face more than 15 competitors. Almost a third of the firms experience *intermediate competition,* competing with 6 to 15 firms. Next, we take into account the

[3] The C3 (C6) concentration index indicates the fraction of industry sales generated by the three (six) largest firms.

size structure of the competitors. We use a dummy variable called *competitors size,* which has unit value, if a firm expresses that the competitors are predominantly larger than itself. This is the case for more than 35 % of the firms. We also have information on the importance of price competition. Firms were asked to rank the importance of several characteristics of their competitive environment (product quality, technical advancement, service, product variety, advertising and price). We create a dummy variable with unit value if the option "price" was given highest priority. Almost half of the firms are exposed to *strong price competition*.

Aside from supplier conditions, profitability may also be affected by buyer power. If a firm only sells to a few buyers, it is possible that these buyers exert so-called buyer power, which leads to price cuts. The concentration of buyer power is considered in the questionnaire by means of a question asking what share of the firm's sales is due to the three most important buyers. The possible answers were "100%", "50-99%", "20-49%" and "below 20%". We use the dummy variables *strong buyer power* when the alternative "100%" is chosen, *quite strong buyer power* if the buyer concentration ranges between 50 and 99%. 1.7 % of the firms reported that all sales were generated by their three most important customers (*strong buyer power*). More than a quarter generated over 50 % of sales from their three most important buyers (*quite strong buyer power*). The competition and buyer power variables were only included in the 2005 questionnaire and represent the competitive situation in 2004. We conjecture that neither competition nor buyer power changes much in the short-run. Therefore, we hold these variables constant over time for the observation period of 2001 to 2004.

Another important factor that impacts on profitability and is also linked to consumers is the market potential. Market potential is often reflected by the lagged market *demand growth,* proxied by the growth of sales at the three-digit industry level. This is calculated as follows:

$$market\ demand_{st} = \frac{S_{st} - S_{s,t-1}}{S_{s,t-1}}$$

where the market demand in sector *s* at time *t* depends on the change in sales (*S*).

Table 2: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
RETURN ON SALES	2.3514	1.7231	0	6
*HERFINDAHL**	0.0313	0.0420	0.0032	0.2507
*C3 CONCENTRATION**	0.1915	0.1370	0.0578	0.8452
*C6 CONCENTRATION**	0.2709	0.1664	0.0838	0.9534
*SHARE**	0.0051	0.0152	0	0.1640
INTENSIVE COMPETITION	0.1313	0.3378	0	1
INTERMEDIATE COMPETITION	0.2400	0.4272	0	1
COMPETITORS SIZE	0.3551	0.4786	0	1
STONG PRICE COMPETITION	0.4867	0.4999	0	1
STRONG BUYER POWER	0.0170	0.1291	0	1
QUITE STRONG BUYER POWER	0.2566	0.4369	0	1
*DEMAND GROWTH**	0.0003	0.0744	-0.6243	0.3389
*SHARE**	0.0051	0.0152	0	0.1640
EXPORT	0.2386	0.2521	0	0.9190
IMPORT	0.2499	0.1345	0.0598	0.7116
KAPINT	0.0977	0.1529	0.0004	1.9558
Log(EMPLOYEES)	4.3887	1.5368	1.6094	10.8808
EAST	0.3408	0.4740	0	1

* Lagged values.

More conventional control variables are the share of sales *export*ed, industry imports divided by the sum of industry imports and industry production (*import*) and the capital intensity *kapint* (fixed and working capital/number of employees). Clearly, all three variables are also used to represent the competitive environment of a firm and the industry. Information on exports and capital intensity is taken from the MIP survey. The import variable is taken from OECD data and reflects industry imports at the two-digit NACE level. *East* is a dummy variable, which indicates that the firm is situated in the eastern part of Germany (the former GDR). Finally, we add industry and time dummies as other specific circumstances in an industry and/or cyclical factors, which perhaps are not reflected by our other variables, but may affect the returns.

3 Estimation Results

In order to test the appropriateness of standard concentration indices and firm's assessment of the competitive setting on profitability, we estimate an ordered probit for return on sales which is measured categorically as described in Table 1. As usual in the context of discrete choice, the model is based on a latent variable *y** (here: profitability) being explained in a linear manner by $x'\beta$. Since the latent variable is unobserved we rely on its surveyed categorical values. The econometric model can be written as:

$$y_i^* = x_i'\beta + \varepsilon_i \text{ with } i = 1,...,N$$

$$y = \begin{cases} 0 \text{ if } y_i^* \le \mu_0 \\ 1 \text{ if } \mu_0 < y_i^* \le \mu_1 \\ \vdots \\ 6 \text{ if } y_i^* > \mu_5 \end{cases}$$

As opposed to the usual ordered probit case, the cut-off points μ_k are known (see Table 1). Thus, there is no need to estimate the thresholds. Furthermore, by using the true threshold values we are able to identify the variance and interpret the estimated coefficients as in a linear regression model, i.e. as marginal effects of the latent model (see Czarnitzki and Kraft (2004a,b) and Verbeek (2000) p. 192-195 for an example).

Since heteroscedasticity will lead to inconsistent estimates we account for groupwise multiplicative heteroscedasticity of the form $\sigma_i = \sigma \exp(z_i\alpha)$ where z is a vector of variables suspected to cause heteroscedasticity. If heteroscedasticity is an issue in the ordered probit, α are additional coefficients to be estimated. In order to test if heteroscedasticity is an issue in our estimation, we perform LR tests. Heteroscedasticity is modelled by industry and time dummies, by the east dummy and by firm size dummies. The LR tests show that that assumption of homoscedasticity has to be rejected. Thus, we interpret the heteroscedastic version of the models.

According to Table 3, neither of the aggregate industry-based concentration indices is significant. Hence, the results presented in Table 3 support Schmalensee's conclusion: the impact of concentration is statistically weak, the coefficients have unstable signs, and lose significance,

if the specification is altered. On the basis of these results we could reject the hypothesis that there is a relation between market structure and profitability.

The conclusion concerning the effect of imperfect competition is, however, totally reversed if the variables are considered which have been computed using the questionnaire information (Table 4 displays the results for the industry- and questionnaire-based variables). The number of competitors has a strong negative impact on profits as predicted by theory. In addition, if the competitors are larger, profits of a firm are significantly smaller. Intensive price competition also reduces profits. Hence, all competition variables generated on the basis of the survey work excellently. In contrast, the variables based on the official industry classification are now all insignificant – except for the case where all conventional concentration indices are included; then C6 concentration is significant but still negative – and clearly dominated by the survey-based variables. We interpret these results as evidence that the official industry classification does not reflect the relevant markets well. If information on the relevant market is available – as perceived by the firms – the expected relation clearly emerges. Hence, the quality of the industry classification and concentration variables calculated on the basis of this information is questionable, as measure for firms' product markets.

Furthermore, firms' profitability is strengthened if barriers to entry exist, represented by other proxy variables. We measure barriers to entry by firms' capital intensity and find a positive effect on profitability. Moreover, the market potential is a crucial factor for firm profitability; *demand growth* has a significant positive effect on return on sales. Profitability decreases with firm size, which is in accordance with earlier results (Neumann, Böbel and Haid 1979, 1981). Finally, *export*s generate higher return on sales. Finally, we do not find any evidence that buyer power affects firm profitability.

Table 3: Results for conventional concentration indices (homo- and heteroscedastic ordered probits with known thresholds)

	Homosc.	Heterosc.	Homosc.	Heterosc.	Homosc.	Heterosc.	Homosc.	Heterosc.
	Coef. (Std.Err.)	**Coef. (Std.Err.)**	**Coef. (Std.Err.)**	**Coef. (Std.Err.)**	**Coef. (Std.Err.)**	**Coef. (Std.Err.)**	**Coef. (Std.Err.)**	**Coef. (Std.Err.)**
Herfindahl[a]	0.167	0.164	0.067	0.047				
	(0.121)	(0.121)	(0.043)	(0.043)				
C3 concontration[a]	0.071	0.059			0.006	0.001		
	(0.086)	(0.085)			(0.012)	(0.012)		
C6 concentration[a]	-0.091*	-0.086					-0.002	-0.005
	(0.055)	(0.053)					(0.010)	(0.010)
demand growth[a]	0.040***	0.038***	0.038**	0.037***	0.043***	0.041***	0.045***	0.043***
	(0.015)	(0.014)	(0.015)	(0.014)	(0.015)	(0.014)	(0.015)	(0.014)
market share	0.106	0.126	0.049	0.066	0.059	0.078	0.070	0.090
	(0.090)	(0.085)	(0.088)	(0.083)	(0.089)	(0.084)	(0.090)	(0.084)
import	-0.005	-0.005	-0.011	-0.011	-0.001	-0.003	0.004	0.001
	(0.017)	(0.016)	(0.017)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
export	0.018***	0.017**	0.017**	0.016**	0.017**	0.016**	0.017***	0.016**
	(0.007)	(0.006)	(0.007)	(0.006)	(0.007)	(0.006)	(0.007)	(0.006)
log(employees)	-0.002	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
capital intensity	0.013	0.016*	0.013	0.016*	0.013	0.016*	0.013	0.016*
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
east	-0.001	-0.000	-0.001	-0.000	-0.001	-0.000	-0.001	-0.000
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
constant	0.046***	0.045***	0.036***	0.035***	0.036***	0.035***	0.037***	0.037***
	(0.010)	(0.010)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
industry dummies	included	included	included	included	included	included	included	included
time dummies	included	included	included	included	included	included	included	included
sigma	0.052***	0.053***	0.052***	0.053***	0.052***	0.053***	0.052***	0.053***
	(0.001)	(0.004)	(0.001)	(0.004)	(0.001)	(0.004)	(0.001)	(0.004)
log likelihood	-5708.74	-5681.56	-5714.43	-5687.34	-5715.96	-5688.23	-5716.08	-5688.04
joint sign.[b]	91.85***	98.35***	86.26***	92.08***	83.90***	90.22***	83.10***	90.03***
LR-test(het.)[c]		54.34***		54.18***		55.46***		56.08***
joint sig.(het.)[d]		26.87**		26.68**		27.38**		27.70**
number of obs.	3008	3008	3008	3008	3008	3008	3008	3008

Notes: *** (**, *) indicate significance at 1 % (5 % , 10 %) level, [a] Lagged variables, [b] test of joint significance of all variables, [c] LR-test of heteroscedasticity, [d] test of significance of variables determining heteroscedasticity.

Table 4: Results for firms'assessment of competitive situation (homo- and heteroscedastic ordered probits with known thresholds)

	Homosc.	Heterosc.	Homosc.	Heterosc.	Homosc.	Heterosc.	Homosc.	Heterosc.	Homosc.	Heterosc.
	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)
Herfindahl[a]	0.126	0.127	0.048	0.028						
	(0.119)	(0.118)	(0.042)	(0.041)						
C3 concontration[a]	0.078	0.061			0.002	-0.003				
	(0.086)	(0.084)			(0.013)	(0.012)				
C6 concentration[a]	-0.091*	-0.084					-0.005	-0.008		
	(0.054)	(0.053)					(0.010)	(0.010)		
intensive comp.	-0.008**	-0.009***	-0.009**	-0.010***	-0.009**	-0.010***	-0.009**	-0.010***	-0.009**	-0.010***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
intermediate comp.	-0.008**	-0.007**	-0.008***	-0.008**	-0.008***	-0.008**	-0.008***	-0.008**	-0.008***	-0.008**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
comp. size	-0.007**	-0.006**	-0.007**	-0.006**	-0.007**	-0.006**	-0.007**	-0.006**	-0.007**	-0.006**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
strong buyer power	-0.002	-0.002	-0.003	-0.003	-0.003	-0.002	-0.003	-0.002	-0.003	-0.002
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
quite strong buyer power	0.003	0.003	0.002	0.003	0.002	0.003	0.002	0.003	0.002	0.003
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
demand growth[a]	0.039***	0.038***	0.037**	0.037***	0.041***	0.040***	0.043***	0.042***	0.041***	0.040***
	(0.015)	(0.014)	(0.015)	(0.014)	(0.015)	(0.014)	(0.015)	(0.014)	(0.014)	(0.014)
market share	0.121	0.134	0.068	0.078	0.078	0.090	0.089	0.103	0.080	0.086
	(0.093)	(0.087)	(0.092)	(0.085)	(0.093)	(0.086)	(0.093)	(0.086)	(0.090)	(0.083)
strong price comp.	-0.013***	-0.014***	-0.013***	-0.014***	-0.013***	-0.014***	-0.013***	-0.014***	-0.013***	-0.014***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
import	-0.004	-0.005	-0.011	-0.011	-0.002	-0.004	0.002	-0.000	-0.001	-0.006
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.015)	(0.015)
export	0.015**	0.015**	0.015**	0.014**	0.015**	0.014**	0.015**	0.014**	0.015**	0.014**
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
log(employees)	-0.002*	-0.002	-0.002	-0.001	-0.002	-0.001	-0.002	-0.001	-0.002	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
capital intensity	0.013	0.016*	0.013	0.016*	0.013	0.016*	0.013	0.016*	0.013	0.016*
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
east	-0.000	0.000	-0.001	0.000	-0.001	0.001	-0.000	0.001	-0.000	0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
constant	0.058***	0.057***	0.050***	0.048***	0.050***	0.049***	0.051***	0.050***	0.050***	0.048***
	(0.010)	(0.010)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
industry dummies	included	included	included	included	included	included	included	included	included	included
time dummies	included	included	included	included	included	included	included	included	included	included
sigma	0.051***	0.053***	0.051***	0.054***	0.051***	0.054***	0.051***	0.054***	0.051***	0.054***
	(0.001)	(0.004)	(0.001)	(0.004)	(0.001)	(0.004)	(0.001)	(0.004)	(0.001)	(0.004)
log likelihood	-5672.08	-5642.28	-5677.15	-5647.49	-5677.10	-5647.76	-5677.86	-5647.31	-5678.02	-5647.81
joint sign.[b]	129.39***	140.40***	123.426***	133.24***	121.60***	132.18***	121.21***	132.58***	121.13***	132.11***
LR-test(het.)[c]		59.59***		59.32***		60.48***		61.10***		60.42***
joint sig.(het.)[d]		29.04***		28.62***		29.23***		29.56***		29.24***
number of obs.	3008	3008	3008	3008	3008	3008	3008	3008	3008	3008

***Notes*:** [a] Lagged variables, [b] test of joint significance of all variables, [c] LR-test of heteroscedasticity, [d] test of significance of variables determining heteroscedasticity.

4 Conclusions

This paper reports the results of a study which employs rarely available variables. We compare the performance of variables which are computed using the official industry classification with the effect of variables generated on the basis of information gathered from the firms themselves. The industry-based variables are concentration indices and the market share. The variables based on the survey information are the number of competitors, the size of the competitors, the relevance of price competition and the number of customers.

Our own data clearly outperforms the industry-based variables. While our competition variables have a strong impact on profitability, no relation is found for the industry-based variables. We think that it is not appropriate to use the officially determined three digit industry as the relevant market. The information is too noisy, with the result that no significant relation can be estimated. However, the use of information supplied by the firms themselves can be very useful in explaining profit levels.

While the result with respect to the use of industry data is rather negative, it is quite supportive of theoretical predictions. Profits fall if competitive pressure increases.

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