PERFORMANCE AND CONCENTRATION IN A TRANSITION ECONOMY (THE CASE OF BREWING INDUSTRY)

by

Ivan Maryanchyk

A thesis submitted in partial fulfillment
of the requirements for the degree of

Master of Arts in Economics

The National University of

"Kiev-Mohyla Academy"

2000

Approved by _____
Chairperson of Supervisory Committee

_____

_____

_____

Program Authorized
to Offer Degree _____

Date _____

The National University of

"Kiev-Mohyla Academy"

Abstract

PERFORMANCE AND CONCENTRATION IN A TRANSITION ECONOMY (THE CASE OF BREWING INDUSTRY)

by Ivan Maryanchyk

Chairperson of the Supervisory Committee: Professor Anatoliy Voychak
Director of the Christian University

The paper considers the problem of performance-concentration interrelationship in a transition economy. The research concerns the brewing industry and covers all necessary topics accounting for changes in both performance and concentration, and hence the market structure. The time-series model was built based on 37 observations, starting from the 1st quarter 1991 till the 1st quarter 2000. Empirical results indicate that bigger concentration may benefit only the firms that build this concentration, whereas the fringe firms could be harmed and even driven out of the market. The direction of causality is bilateral: concentration causes performance and vice versa.

TABLE OF CONTENTS

ACKNOWLEDGMENTS

The author wishes to thank very much Prof. Hemesath, who helped to define the exact direction of the study and without whose supervision this research could not be completed; Prof. Ellis, who helped very much at the very beginning, Prof. Szyrmer, for valuable methodological advice. I also thank very much the entire stuff of JSK Ukrpivo for data and professional recommendations. Furthermore I am thankful to Vitaly Repey, Oleksiy Isayenko and Alexander Scherbakov for encouragement, moral support and helpful advice.

INTRODUCTION.

Many studies argue that performance and concentration are positively related. However in transition countries this statement is not always true. There is empirical evidence showing monopolists with poor performance. Nevertheless positive correlation is the case in most cases.

In my research I will study the effect of concentration (namely the Herfindahl-Hirschman Index) on the performance of an industry (and separate groups of enterprises in it). For those purposes I used the brewing industry that is among the few having some FDI and developing dynamically in recent years. The period of interest is from the 1st quarter of 1991 until the 1st quarter of 2000 (37 observations are collected). At the starting point the industry began to change; in 2000 there are already a number of outcomes worthy of attention. I test the hypothesis that HHI (the concentration ratio) influences performance (especially of those who have market power). Further I suggest that this influence has simultaneous a nature. This simultaneity is explored with a simultaneous regression model.

By this research I intend to show, that in the actual world of a transition economy the concentration is positively related to performance for those firms that have significant market power, even if the entire industry may suffer due to decreasing market shares and consequent outcomes. The other findings explain the causality problem. The direction of causality between concentration and performance could differ from widely accepted and proved economic models (concentration causes performance). In reality the causality is bilateral, though in the case of the whole-industry model only performance causes concentration (not vice versa). That is, the more profitable the industry becomes – the more attractive this industry becomes for investors.

In the Chapter I the theory is discussed. In the Chapter II the overview of the brewing industry is presented; formulation and specification of the model are discussed. In the Chapter III the empirical implementation of the model is portrayed. Chapter IV gives a number of economic comments and conclusions.

Chapter I.

THEORY.

Performance Measures.

For many years was the rate of return – the measure of how much is earned per dollar of investment - was considered as the most appropriate measure of performance. However many studies have shown that accounting measures like the rate of return may fail to measure the economic profits or costs accurately, especially when long-lived capital assets are present. To avoid the problems with calculating rates of return, many economists use a different measure of performance, the Lerner index or price-cost margin, (p-MC)/p, which is the difference between price, p, and marginal cost, MC, as a fraction of price.

Unfortunately, because the price-cost margin is rarely available, many researchers use the price-average variable cost margin instead of appropriate price-marginal cost margin. This approximation to the price average cost variable is typically calculated as sales revenues minus payroll minus material cost divided by sales.

However the other measures of performance can be practiced. For example in Lee (1986) profit rate is used to describe the profitability. This rate is defined as pretax profit plus interest paid divided by total capital. Also in this paper the other indicator of performance is used - technical efficiency:

$$TE = \frac{VA/(1+EP)}{\overline{w}L + \overline{r}K},$$

where VA and EP denote value added and effective protection rate respectively, and $\overline{w}$ and $\bar{r}$ represent the shadow price of labor and capital respectively. L and K denote respectively the amount of labor and capital actually put into the industry.

The other financial ratios of performance are ROA and ROE.

ROA, the basic measure of profitability, is the return on assets, the net profit after taxes per dollar of assets. The return on assets provides information on how efficiently the enterprises run because it indicates how much profit s are generated by each dollar of assets.

ROE, the other basic measure of profitability, is the return on equity, the net profits after taxes per dollar of equity capital.

Concentration as a Measure of Market Structure.

In general concentration refers to the size distribution of firms that sell a particular product or collection of products (Curry, George, 1983). It is usually regarded as significant dimension of market structure because it plays an important part in determining of market power and hence business behavior and performance.

There are a number of indexes attempting to explain concentration as a measure of market power. Hall and Tideman (1967) suggested the several properties of the desirable measure of concentration:

1. The index should be one-dimensional.

2. Concentration should be independent of the size of the industry.

3. Concentration increases when the share of any firm increases at the expense of the smaller firm.

4. I all firms are divided by some K the concentration index should be reduced by a proportion of 1/K.

5. Concentration is the decreasing function of the number of firms.

The other set of properties was designed by Hannah and Kay (1977):

1. An increase in cumulative share of the ith firm for all I, ranking firms 1,2,…i…N in the descending order of size, implies an increase in concentration.

2. The principle of transfers should hold (#3 in Hall and Tideman's classification).

3. The entry of new firms below some arbitrary significant size should reduce concentration.

4. Mergers should increase concentration.

5. Random brand switching by consumers should reduce concentration.

6. If the s_i is the share of a new firm, then as s_i becomes progressively smaller so should its effect on a concentration index.

7. Random factors in the growth of firms should increase concentration.

Although mentioned axioms are rather convincing, the concentration indexes constructed by researchers do not always fit all the properties.

Indexes.

The oldest and the most commonly used index is the K-firm concentration ratio, defined as the cumulative share of the Kth firm:

$$CRK = \sum_{i=1}^{K} s_i ,$$

where s_i is the share of the i^{th} firm.

It is very simple to calculate; however the choice of K is arbitrary. Miller (1967) introduced the concept of marginal concentration ratio – the combined market shares of fifth to eighth largest firms.

The most popular index is the so-called Herfindahl-Hirschman Index (HHI), defined as the sum of the squared values of firms' shares. This index satisfies all of the above-mentioned axioms, and, unlike the concentration ratio, depends on the share of firms. The squaring of shares means that smaller firms contribute less to the value of the index. The theoretical support for HHI as an index of market concentration is provided by Cowling and Waterson (1976). In their model they have shown that HHI is directly related to price-cost margins. A short summary of this model is given below.

The level of concentration varies among different industries. Many studies have been done in order to determine what defines concentration. Economic theory hypothesizes that inter-industry variations in concentration can be explained by a combination of explanatory variables such as scale economies, barriers to entry and the size of the market. Pashigian (1968) argues that there is a unique optimum number of firms which in turn determines concentration. Almost all researchers agree that scale is one of the most powerful determinants of concentration. A number of studies, Weiss (1963), Strickland and Weiss (1976) and Hart and Clarke (1980) follow the suggestion of

Florence (1933) that a reasonable estimate of the minimum efficient size of plant (MES) is given by the mid point of the first moment distribution of plant sizes, often referred to as the Florence median. The Florence median is a hypothetical plant of a size such that half of an industry's output or employment comes from larger plants and half from the smaller ones. Comanor and Wilson (1967), however, use as a measure of MES, the average size of plants producing more than Florence median. They argue that this measure is more closely related to engineering estimates of MES, which are the most appropriate, but the less accessible.

Relation between Market Concentration and Performance.

Industrial economists for many years have been studying the relationship between performance and concentration indexes using the cross-industry samples. The main outcome of those studies can be expressed in one sentence: With few exceptions, market concentration and industry performance are positively correlated (Clarke, Davies, Waterson, 1984).

This interrelation can be shown as follows.

Lets consider the oligopolistic marked consisting of n identical firms that produce a homogenous product. Each firm i chooses its output, q_i to maximize its profits:

$$\boldsymbol{p}_i = p(Q)q_i - mq_i,$$

where m is the constant marginal (and average variable) cost for each firm, and p, the price, is a function of total industry output, $Q=nm_i$.

The firms play Cournot, so each firm's first-order condition - which is obtained by setting the derivative of profits with respect to q_i equal to zero - is that marginal revenue equals marginal cost:

$$MR = p + q_i p' = m = MC,$$

where p' is the derivative of price with respect to Q. This equation can be expressed in terms of the Lerner Index:

$$L \equiv \frac{p-m}{p} = -\frac{p'Q}{p}\frac{q_i}{Q} = -\frac{s_i}{\varepsilon} = -\frac{1}{n\varepsilon},$$

where $s \equiv q_i/Q = 1/n$ is the output share of Firm i and $1/\varepsilon = (p'Q)/p$ is the reciprocal of the elasticity of demand. Because all firms are identical, the last equation holds for every firm in the industry.

As Cowli and Waterson show, the industry average of firms' price-cost margins using share weights is

$$\sum_i s_i \frac{p-m}{p} = -\frac{\sum s_i^2}{\varepsilon} \equiv -\frac{HHI}{\varepsilon},$$

where HHI is the Herfindahl-Hirschman Index. That is, the HHI divided by the absolute value of the market demand elasticity equals the weighted average of the firms' price-cost margin (Carlton, Perloff, 1998).

Theory Testing and Other Influences.

The theory stated above was tested many times. Moreover, as was said earlier in general this relation holds in most cases. However due to the imperfect measures of price-cost margins and due to other influences in the general model, several other aspects of industry structure were included.

The first is advertising. The theory states the strong relation between advertising and product differentiation. The degree of product differentiation in a market is measured by the cross-elasticities of demand and supply that

exists among competing goods. The bigger the advertising, the bigger the product differentiation, and the bigger the market power enjoyed by a firm.

As Comanor and Wilson (1967) argue, advertising is a substantial barrier to entry in a several ways. First, high levels of advertising create additional costs for new entrants, which exist at all levels of output. Because of buyer inertia and loyalty, more advertising messages per prospective customer must be supplied to induce brand switching as compared with repeat buying. This effect of advertising creates an absolute cost advantage for established producers, since they need not incur penetration costs.

If advertising in a particular industry is characterized by economies of scale, an entrant will suffer an additional cost disadvantage if it enters at a relatively small scale. If a new firm enters at a scale sufficient to realize available economies of scale in advertising, however, its actions are likely to influence the price or advertising policies of the established firms. The possible reaction of established firms increases the costs and risks of entry.

Finally, if economies of scale exist either in production or in advertising, the need to obtain funds for advertising will give a rise to capital requirements above those needed for physical plant and equipment. Furthermore, this investment in market penetration will involve a particularly risky use of funds since it does not generally create tangible assets, which can be resold in the event of failure. The required rate of return on such capital will therefore be high.

Advertising costs for existing firms as well as for new entrants after they have become established. It denotes unit-advertising outlays that are required in order to maintain a firm's market position and to preserve a given volume of sales once it has been established. This will depend on both the total level of advertising expenditures and their distribution among established firms, and

therefore, it describes prospective advertising costs for entrants only if existing firms do not react to any loss of market share.

The advertising variable could be expressed in various forms. However the most common form is Advertising-Sales Ratio (Comanor, Wilson, 1967; Guth, 1971; Strickland, Weiss, 1976, et al).

The positive effect of advertising on performance as well as on technical efficiency was shown in Lee (1986). In Gabel (1979) advertising intensity both positively correlates with concentration and performance. However Guth (1971) argues that advertising could negatively effect concentration and performance, although his findings refers to the years of tough government regulations of industries when the pure effect of advertising could not be defined.

The impact of foreign direct investments is not defined yet. Caves (1980) shows that the general hypothesis for FDI causing concentration is not automatically supported in many less developed countries. The direct influence of FDI depends on the good produced, market participated, etc. In his empirical findings FDI negatively influence concentration in export-oriented industries. Hence due to the positive correlation between price-cost margin and concentration FDI may negatively affect performance. Chou (1986) also suggests that more FDI decreases performance via more competition, especially in export-oriented economies. In addition to FDI Research and Development (R&D) also have strong empirical impact. However, in a developing (transition) economy the role of R&D is not that crucial. Due to Helpman (1997) only about 4% of global investments in R&D are performed in developing economies. Thus in such economies the results of R&D are typically imported along with FDI.

Many authors include in their performance-concentration analysis international trade. However here one must take precautions concerning the type of industry – in some business import and export play significant role effecting concentration and market structure as well as performance. For instance Jcaquemin, Ghellinck and Huveneers (1980) devote their work to the determination of the relation between concentration and profitability in A small open economy. Here the ratio of imports to domestic shipments and the ratio of export to total sales are both economically and statistically significant in defining the performance and concentration.

Chou (1986) carries out his research of Taiwan economy using the cross-industrial approach to analyze the effect of trade on profitability and market structure determinants. His findings, although not very strong statistically, show that the intensive import improves profitability and export depreciates performance.

Methodology.

In studying performance-concentration interrelation researchers usually employ econometrics with cross-sectional industrial analysis. A number of economists (Comanor, Wilson (1967), Lee (1986), Clarke, Davies, Waterson (1984)) make use of single-equation model testing it with OLS estimation. However recognizing the simultaneous nature of the performance-concentration interrelation Chou (1986), Geroski (1982), Pagoulatos and Sorensen (1981) apply simultaneous equation models of structure-performance paradigm.

Chapter II.

THE BEER INDUSTRY AND MODEL SPECIFICATION.

Beer Industry: the Process of Transformation.

Brewing is among the most developed and modernized industries in Ukraine. The processes of corporatization, privatization, and investing were comparatively fast and successful. However the overall route of transformation was not smooth and straightforward. There are enough things to consider and, what is the most interesting and challenging, to compare with the same problems in developed countries.

To start with, let's make an overview of the history of the transformation from 1991 until present.

The brewing industry, like any other industry in the former Soviet Union, was centrally planned, directed, and supervised. Hence, the market as we now know it was absent. However to understand the situation one can use the model of the typical cartel for better comprehending the starting point where the industry departed from.

The cartel was a must for all producers. No one could deviate and quit the "agreement". The price was fixed centrally. No advertising was needed. The products were basically homogeneous. The output was fixed and depended only on capacity (the underemployment of capacities could become a concern for a manager). There were no payments between the supplier and consumers of inputs. All settlements were performed via the center. The "market" was geographically divided among producers – in every region (oblast) one or several enterprises produced beer. However no one had a chance to penetrate

the neighbor's market. Hence in one small market only one producer-monopolist could participate. Nevertheless no one could enjoy the monopoly power (price increase or output decrease) since this could violate the rules of the "cartel". The average concentration in terms of HHI for the whole national market was no more than 300-350. If the industry obeys the laws of the market, this structure plus absence of the product differentiation, comparatively low level of barriers to entry (state had enough funds to build new breweries till 1985) could depict many features the perfect competition in general and some features of small monopolies in their local markets.

Then the changes came. After the collapse of the USSR and independence of Ukraine, the new market relationships became a rule and the old set of laws became senseless. Yet only a full understanding of the changes could benefit the firms that tried to use the new circumstances. The first firm to break the rules of the game was Kiev-based brewery Obolon. This producer fully understood the benefits of being the first mover and made this first step toward the market conquest. The strategy of this enterprise consisted of the aggressive marketing advertising company, penetration in neighbor's markets, huge capital investments in equipment modernization etc. The market share of Obolon was increasing over time. The situation could have been named "the first mover advantage". However several other breweries succeeded in duplicating the pioneer's strategy. The "first mover advantage" disappeared. Those were Slavutich from Zaporiggia, Yantar from Mykolayiv, and Rogan from Kharkiv.

For a better understanding of this fact some comments should be made about the change in the ownership structure. The majority of breweries became joint stock companies during privatization for the period of 1994-1997. Privatization of brewery industry in Ukraine is almost complete. However there are also some breweries, where the state's share is less than 1%. Most breweries were privatized through non-competitive methods like leasing with

further buy-out and management/employee buyouts. “Obolon” and “Donetsky” breweries are even now under the control of management and employees. However, some of the largest breweries are mostly controlled by foreign investment groups:

1. Sun-Interbrew: “Desna” brewery at Chernigiv (end of 1996), “Krym” brewery at Simferopil (1998).

2. Baltic Beverage Holding: “Slavutych” in Zaporizhzhia (1996), “Kolos” in Lviv (1999).

3. British “Invesco”: “Yantar” in Mycolayiv (1997), “Chornomor” in Odessa (1997).

The years of acquisition are shown in parentheses. In that way the former inefficient state enterprises in only 2-3 years became the parts of big holdings specializing in brewing. Those new centers became the sources of new technologies, management, funding, and market strategies. Thus seemingly first mover advantage was broken-down under the pressures of powerful shell companies and competition. However Obolon is still the leader and continues to compete successively with others.

Through the years under discussion the market shares of the enterprises change over time. The same did concentration ratio – HHI. As could be seen from the Appendix A, this ratio was relatively stable in 1991-1995. In 1996 the HHI started to rise due to the increased share of the bigger breweries and, in fact, exit from the market by many smaller firms. Also in 1996-1998 the sharp increase in the HHI was caused by substantial acquisition activity of foreign investors. For the overall period form 1991 till the 1st quarter of 2000 the HHI index increased from about 300 to 1325 showing a considerable increase in market power the leaders benefit from. The bright example of the

tremendous difference in market shares development is outfitted at the graph in the Appendix B. Here such breweries as Obolon, Rogan, Donetsk, Slavutich, Yantar were increasing their market shares in the time span whereas Dnipro, initially a leader, fell into decay. This is only one example of failure. All other unlucky breweries that have found themselves without funding have no prospects as well. The bright picture of the difference in dynamics of changes in capacity utilization is shown at the graph in the Appendix C.

There are a number of external factors that led the industry to such a severe misfortune. All those aspects are intrinsic to the state of transition Ukraine experiences even today. The first is the factor of personal income. People having hard times with low incomes drink less beer, decreasing consumption from 23.2 liters per person in 1987 to about 11 liters in 1996. However today consumption equals about 14 liters per person. Hyperinflation in 1993-1994 also harmed producers via financial capital losing value. The permanent devaluation (depreciation) of national currency made it much harder to stay in business and purchase high quality imported inputs. This led to the decrease in beer quality and decline in price-cost margin. In 1995 some brewers even argued that brewing is not profitable.

The other important cause of the industry's reverse was the increased volume of imports. At the graph in the Appendix D. the dynamics of the beer import volumes is shown. In absence of the efficient legal regulation the market was flooded with cheap, foreign beer having bright packaging and low quality. Here some words need to be said about JSC Ukrpivo (Ukrainian Beer). This former soviet planning agency was transformed into the Joint-Stock Company and held a firm place in lobbying for the industry's interests in the Parliament as well as in the Government. In that way, starting from 1991 until 1998 this organization lobbied a number of legal acts mainly imposing tariffs and excise duties on the imported beer. The most powerful one was approved in 1996. By this act the minimal price of the imported beer was fixed above 0.45 cents

per liter. As it is shown at the graph the volume of beer imported fell sharply and continues falling today.

The Model Formulation and Specification.

Traditional large-scale cross-sectional industry studies cannot capture the dynamic, simultaneous nature of the industrial development. This problem becomes much deeper if one wants to study an industry in transition economy where the equilibrium market structure is not attained yet. Thus the goal of the research is to test several hypotheses:

1. Is there any relation between concentration and performance in developing industry; if yes – what is this relation?

2. What other variables influence both concentration and performance; are those influences significant?

3. What possible market structure equilibrium the industry is moving to?

To answer these questions, a times-series model is used. The industry of interest is brewing. The number of observations is 37 (from the 1st quarter of 1991 till the 1st quarter of 2000). In some cases the data is separated in the following way: (i) the data for the whole industry; (ii) the data for the group of successful enterprises (active players). Further the vector of variables is defined.

Performance. As were stated above the best measure for performance is the Lerner price-cost margin. However in the transition economy like Ukraine this index is hard to calculate because of old accounting standards, vagueness of reported data, and ambiguity of legislation. If one uses official data, the measure of performance could be biased. Thus in this research the new aggregate was designed. This aggregate is the capacity utilization (CU). CU is

calculated as the beer produced (sold) during the period of interest divided by the total capacity of producers. CUL denotes the capacity utilization for the group of successful breweries. The best way is to use sales instead of production. Nevertheless due to the specificity of beer produced in Ukraine – mainly short shell-life beer is manufactured – the production is good proxy for sales. Thus: the greater the CU (CUL) the better the performance.

The model has two variants: (i) performance-concentration interrelation for the whole industry (contains CU variable); and (ii) performance-concentration interrelation for the group of leaders described above (contains CU variable). This form of analysis refers to the fact, that the influence of concentration and other variables on performance of different firms or groups of firms may be not the same. In reality when the process of concentration increase takes place a number producers suffer while others benefit. To evaluate the extent to which the change in well-being occur I picked out the data for 9 leaders and generated this CUL variable. The effect on the overall industry will be explored with help of CU variable.

Concentration. One of the possible ways to depict concentration is to calculate the Herfindahl-Hirschman Index (HHI). The general formula of HHI is as follows:

$$HHI = \sum_{i=1}^{n} S_i^2 ,$$

where n – number of firms in the market, S_i – the share of the i^{th} firm in the market.

In the model I used the next way to calculate HHI. The leaders' market shares were raised to the second power and summed (9 top breweries were taken into account). Since about 80 relatively big fringe firms were left, the residual

market share were divided by 80 and squared as the former. Finally the sum of the two was calculated.

Scale economies. Minimum efficient scale (MES) was calculated as the average capacity of the top breweries producing about 50% of the industry's output. Then the ratio MESQ was found as MES divided by the market size. MESQ explains what share of market size currently needed to produce efficiently.

Foreign direct investments. FDI affect both performance and concentration. The first assumption is that FDI is directly correlate with acquisition activities of foreign investors. Once the brewery is acquired, it receives substantial funding for the development of productive capacities. In most cases this event is lagged by 2 periods (about half a year). Thus FDI_{t-2} should influence HHI. The next assumption states that FDI increase performance. This statement is confirmed by the fact that the most FDI in addition to new technologies are accompanied by changes in business strategy and management. The quarterly FDI variable is changed. The lagged FDI of four preceding quarters is summed due to the fact that there is technological grace period: it takes about 1 year to order, purchase and set going the equipment. This variable is depicted as FDIT.

Consumers' purchasing ability. In the developing economy like Ukraine the well-being of any industry producing consumers' goods highly depends on well-being of consumers themselves. Since the income of population decreases, so should the demand for the good. Indeed beer consumption (and production) shrank almost twice. The same did the production. I used the aggregate of relative monetary income (RMI) for the proxy of personal income.

Advertising intensity. Given that advertising is related to (correlates with) two phenomena: barriers to entry and product differentiation, it is also included in the discussion. However the data on advertising activity is secret and it is

rather difficult to find unbiased aggregate to describe differentiation and barrier to entry. To escape the problem of including biased official data (rather aggregated and inaccurate) I tried to incorporate the proxy in the form of quantity of brands quarterly, PD (for product differentiation). The basis for that is that for typical consumer goods industries the level of advertising indicates the level of product differentiation and vice versa. The more brands are in the market the more intensive the advertising strategies the firms conduct. Furthermore, in the PD variable the other important economic activity is embodied. The increase in the quantity of brands usually demands additional investment in R&D. Thus the more brands are present in the market, the greater R&D expenditures of the firms.

International trade. International trade should be considered as a determinant of both performance and concentration. However in many studies the exact nature of correlation between international trade and performance and concentration is not defined yet. In this research I will use the variable of beer imports in the market, IM. This step is based on the fact that until the protection measures were launched the imported beer was a good substitution for the domestic one.

Seasonally. The production of beer strictly follows the demand. However demand is the subject to seasonal fluctuations. I included dummy variables DI, DII, DIII for 1st, 2nd, and 3rd quarters to avoid the oscillation and smooth the trend.

The summary of units of measurement and definitions of the variables is given in the Table I :

Table I.

Variables, units of measurement, definitions.

Variable	Definition and unit of measurement
CU	Total production value divided by total capacity, %
CUL	Production value of 9 leaders divided by their total capacity, %
HHI	Herfindahl-Hirschman Index of concentration in terms of production
MESQ	MES divided by market size, %
FDIT	The sum of foreign direct investments per capacity of the subject of investments for 4 periods before the current observation (sum of four lagged observations), $
FDI_{t-2}	Foreign direct investments per capacity of the subject of investments lagged by 2 periods, $
RMI	Relative monetary income, 1990 rubles

PD	The number of brands
IM	Import of beer, thousand deciliters
DI	Dummy for the first quarter
DII	Dummy for the second quarter
DIII	Dummy for the third quarter

Based on the above specification let's formulate the simultaneous equation model:

(i) $CU = f(\underset{?}{DI}, \underset{?}{DII}, \underset{?}{DIII}, \underset{+}{HHI}, \underset{+}{FDIT}, \underset{-}{IM}, \underset{+}{RMI})$

(ii) $HHI = g(\underset{+}{MESQ}, \underset{+}{PD}, \underset{+}{FDI}_{t-2})$

In the system the first equation explains the behavior of performance in times of transitions. Capacity Utilization positively relates to concentration (the greater the market power, the better the performance); positively relates to FDI in equipment (via increased efficiency); negatively relates to imports (imported beer is a substitute to domestic one); positively relates to real monetary income (the consumption highly depends on disposable income).

The second is the market-structure equation. Here HHI depends on minimum efficient scale. This variable represents both economies of scale and a barrier to entry. Product differentiation indicates the positive relation of concentration to such a barrier to entry as advertising sunk costs and also depicts the market power embodied in heterogeneous products. FDI_{t-2} signals about the moments when the act of acquisition influences the concentration.

The model consists of 2 simultaneous equations with 9 exogenous variables and 2 endogenous. - CU (or CUL) and HHI. Applying the order condition it becomes clear that the equation (i) is overidentified and equation (ii) is also overidentified. That means that both equations have an oversufficiency of information. Therefore the system is as a whole is identified and it is possible to estimate it with Two-Stage Least Squares approach. This method is especially designed for overidentified equations, although it can also be applied to the exactly identified equations. The basic idea behind the 2SLS is to replace the stochastic endogenous explanatory variables by a linear combination of the predetermined variables in the model and use this combination as the explanatory variable instead of the original endogenous variables. OLS approach could not be used in the case of simultaneity since its estimates would be inconsistent.

All the data for the estimation was obtained form the JSC Ukrpivo. The sample consists of 37 quarterly observations starting from the 1st quarter 1991 till the 1st quarter 2000. The summary of the data used in the research is given in Appendix E.

Chapter III.

EMPIRICAL RESULTS.

Performance-Concentration Models

The Table II below shows the 2SLS estimates of two simultaneous equations for leaders' performance-concentration model. Most of the coefficients are significant. All the coefficients have the predicted signs. The performance of the group positively depends on concentration, investments and personal income of consumers. The more beer is imported the less the performance becomes. FDIT has a positive sign meaning that investments in equipment and development increase the performance of the breweries. However this coefficient is not significant statistically. This fact may reflect the situation of capacity underutilization. Nevertheless this variable is significant economically and in case of greater consumption and demand should significantly influence the performance of the enterprises. RMI also has comparatively low level of significance. This may indicate the fact that beer is inelastic in terms of income – people drink beer irrespective of the income and bad economical situation.

The dummy variables representing the seasonality of beer production reflect the natural fact that consumer drink beer mostly in 2nd and 3rd quarters, and winter is the worst period for producers when people switch to other beverages. The DI variable has the smallest level of significance – that is the 1st and the 4th quarters are almost the same for producers. In market structure equation (ii), HHI positively relates to all the variables: the bigger the MESQ, the greater the concentration; the larger the differentiation, the bigger the market power, the larger the HHI; the more active the acquisition commotion, the more funds invested in breweries, and the greater the HHI. Al variables

are statistically and economically significant. R^2 is considerable in both equations.

Table II.

2SLS estimation of leaders' performance-concentration model

Variable	Dependant variable	
	CUL	HHI
Intercept	31.210	-2989.9
	(3.43)[a]	(-3.78)[a]
HHI	0.0191	
	(1.79)[c]	
MESQ		465.642
		(3.7)[a]
FDIT	0.0053	
	(0.56)	
FDI (-2)		1.6909
		(4.23)[a]
RMI	0.3161	
	(0.68)	
PD		2.7081
		(5.36)[a]
IM	-0.0188	
	(-1.99)[b]	
DI	-5.8811	
	(-1.33)[d]	
DII	22.37	
	(4.78)[a]	
DIII	30.2812	
	(6.86)[a]	
R^2	0.81	0.94

t-statistics are given in parentheses. Significance levels of coefficients are a=1%, b=5%, c=10%, d=20%.

The detailed estimation statistics are presented in the in the Appendix F.

Table III.

2SLS estimation of industry's performance-concentration model

Variable	Dependant variable	
	CU	HHI
Intercept	46.231	-2989.9
	(7.30)[a]	(-3.78)[a]
HHI	-0.0179	
	(-2.41)[b]	
MESQ		465.64
		(3.7)[a]
FDIT	0.0058	
	(0.88)	
FDI (-2)		1.6908
		(4.23)[a]
RMI	1.2308	
	(3.80)[a]	
PD		2.7081
		(5.36)[a]
IM	-0.0331	
	(-5.04)[a]	
DI	-1.8152	
	(-0.59)	
DII	23.359	
	(7.16)[a]	
DIII	30.102	
	(9.79)[a]	
R^2	0.92	0.93

t-statistics are given in parentheses. Significance levels of coefficients are a=1%, b=5%, c=10%, d=20%.

The Table III shows the 2SLS estimates of two simultaneous equations for entire industry performance-concentration model. Most of the coefficients are significant. The significance of FDIT and RMI is still low as in the previous model. However, the sign of the coefficient before HHI is 'minus'. This fact rejects the theory and predicted sign. Nonetheless, this outcome is not surprising. The sign 'minus' means that the industry as a whole does not benefit form the increased market power of some of the participants. While

some firms increase their market shares, others lose those shares. Consequently the increase in the concentration occurs at the expense of the fringe firms. The detailed estimation statistics is presented in the in the Appendix G.

Causality Testing.

The other goal of the empirical research is to test the direction of causality between concentration and performance. For this purpose the Granger causality test is used. To find out how HHI causes CU (CUL) is to see how much of the current CU can be explained by past values of HHI and then to see whether adding lagged values of HHI can improve the explanation.

Table IV.

Granger causality test.

	Lag 1	Lag2	Lag 3	Lag 4
HHI Granger causes CU	True	False	False	False
CU Granger causes HHI	False	True	True	True
HHI Granger causes CUL	True	True	True	True
CUL Granger causes HHI	False	True	True	True

The level of significance is 5%.

In the Table IV the outcome of Granger test is shown. As it is seen from the results concentration does not Granger cause performance of the whole industry, however the reverse direction is true: the performance Granger cause concentration. However in the model of the leading group the causality is in both directions.

Chapter IV.

ECONOMICAL COMMENTS AND CONCLUSIONS.

This study shows, firstly, that the theory of performance-concentration interrelation is true in general (at least for the Ukrainian brewing industry). However, in transition economies there could be a number of exceptions:

1. The increase in concentration and, consequently, in market power of some enterprises usually hurts the firms that do not participate actively in the process of concentration. Since the share of those firms is still big in transition brewing industry, the overall effect of greater concentration on performance could be negative, as it is shown in the research.

2. The direction of causality between concentration and performance could differ from model that have been tested and found valid in the past (concentration causes performance). In reality, the causality is bilateral, though in the case of the whole-industry model only performance causes concentration (not vice versa).

3. Some other variables should be included in the model: foreign direct investments and personal income. Those variables help to depict the additional influence on the indexes under interest.

Taking into account empirical results and statistical data I suggest that the brewing industry moves to the more concentrated market structure. The market power is focused in the small group of breweries. More and more barriers to entry arise in the industry: advertising expenditures increase, the minimum efficient scale (and consequently capital requirements) also rises.

The other (fringe) breweries are condemned to quit the market unless the funding for investments purposes will be obtained. The market structure equilibrium sooner or latter will be set. What this equilibrium can look like depends on the position of the state. If the Government intends to save jobs and competition to the detriment of efficiency, the market may look like a monopolistic competition. However, if the industry will be allowed to take its course, the most probable market structure is oligopoly, consisting of few enterprises that produce efficiently and enjoy considerable market power. This means that producers would have the ability to price profitably above the marginal cost, which according to the microeconomic theory, leads to dead-weight losses for the society. The most appropriate thing the government should do in such circumstances is to choose the so-called second-best optimum – the most suitable outcome. That is the government using this strategy can increase the welfare of the society to the highest possible level without subsidizing the industry. Only one concern still remains: the beer market tends to become highly differentiated in terms of products which makes it difficult for the government to achieve effectively this second-best optimum.

BIBLIOGRAPHY

Carlton, D.W., Perloff, J.M., 2000, *Modern Industrial Organization* (Addison Wesley Longman, New York).

Caves, R.E., 1980, *Multinational Enterprise and economic analysis* (Cambridge University Press, Cambridge).

Chou, T.Ch., 1986, Concentration, Profitability and Trade in Simultaneous Analysis: The Case of Taiwan, *Journal of Industrial Economics*, 34, pp. 429-443.

Clarke, R., Davies, S., Waterson, M., 1984, The Profitability-Concentration Relation: Market Power or Efficiency?, *Journal of Industrial Economics*, 32, pp. 435-450.

Comanor, W.S. and Wilson, T.A., 1967, Advertising Market Structure and Performance, *The Review of Economics and Statistics*, 49, pp. 423-440.

Cowling, K. and Waterson, M., 1976, Price-Cost Margins and Market Structure, *Economic*, 43, pp. 767-74.

Curry, B. and George, K.D., 1983, Industrial Structure and Price-cost Margins, *Econometrica*, 49(195), pp 277-287.

Forsund, F.R. and Hjalmarsson, L., 1983, Technical Progress and Structural Change in the Swedish Cement Industry 1955-1979, *Econometrica*, 51, pp. 1449-1468.

Gabel, H.L., 1979, A Simultaneous Equation Analysis of the Structure and Performance of the United States Petroleum Refining Industry, *Journal of Industrial Economics*, 28, pp. 89-104.

Geroski, P.A., 1982, Interpreting a Correlation between Market Structure and Performance, *Journal of Industrial Economics*, 3, pp. 319-326.

Guth, L.S., 1971, Advertising and Market Structure Revisited, *Journal of Industrial Economics*, 19, pp 179-98.

Hall, M. and Tideman, L., 1967, Measures of Concentration, *Journal of the American Statistical Association*, 62, pp. 162-68.

Hannah, L. and Kay, J.A., 1977, *Concentration in Modern Industry*,

Theory, Measurement and the U.K. Experience, (Mcmillan, London).

Hart, P.E. and Clarke, R., 1980 *Concentration in British Industry 1935-75*, (N.I.E.S.R. Cambridge).

Helpman, E., 1997, R&D and Productivity: The International Connection, Harvard Institute of Economic Research Working Paper: RePEc:fth:harver:1798.

Jacquemin, A., Ghellinch, E. de, and Huveneers, C., Concentration and Profitability in Small Open Economy, *Journal of Industrial Economics*, 29, pp. 131-144.

Lee, J., 1986, Market Performance in an Open Developing Economy: Technical and Allocative Efficiencies of Korean Industries, *Journal of Industrial Economics*, 35, pp. 81-96.

Masson, F.G., 1955, Structure and Performance in the Titanium Industry, *Journal of Industrial Economics*, 3,3, pp. 222-240.

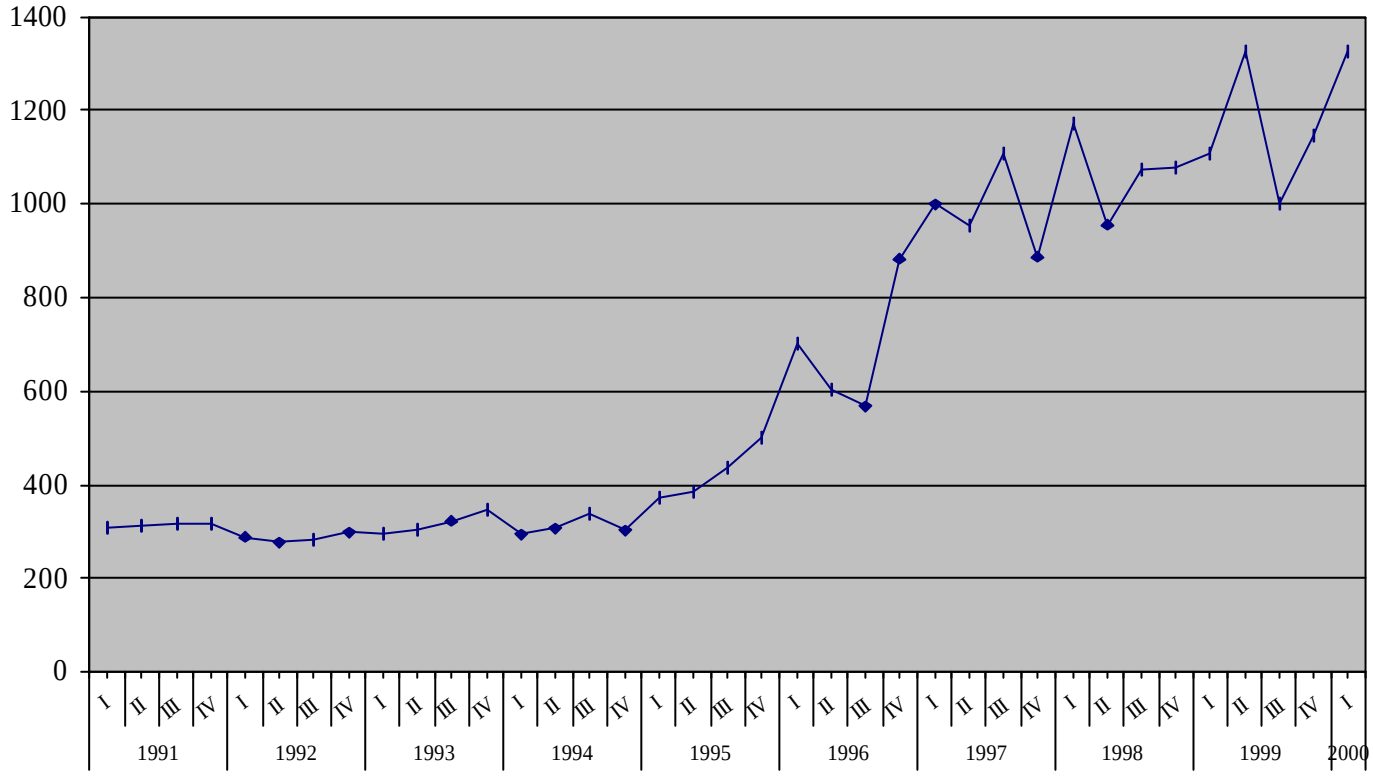
Pagoulatos, E. and Sorensen, R., 1981, A Simultaneous Equation Analysis of Advertising, Concentration, and Profitability, *Southern Economic Journal*, 47(3), pp. 728-741.

Pashigian, B.P., 1968, Market Concentration in the United States and Great Britain, *Journal of Law and Economics*, 11, pp. 299-319.

Strickland, A.D. and Weiss, L.W., 1976, Advertising, Competition, and Price-Cost Margins, *Journal of Political Economy*, 84,5, pp. 1109-21.

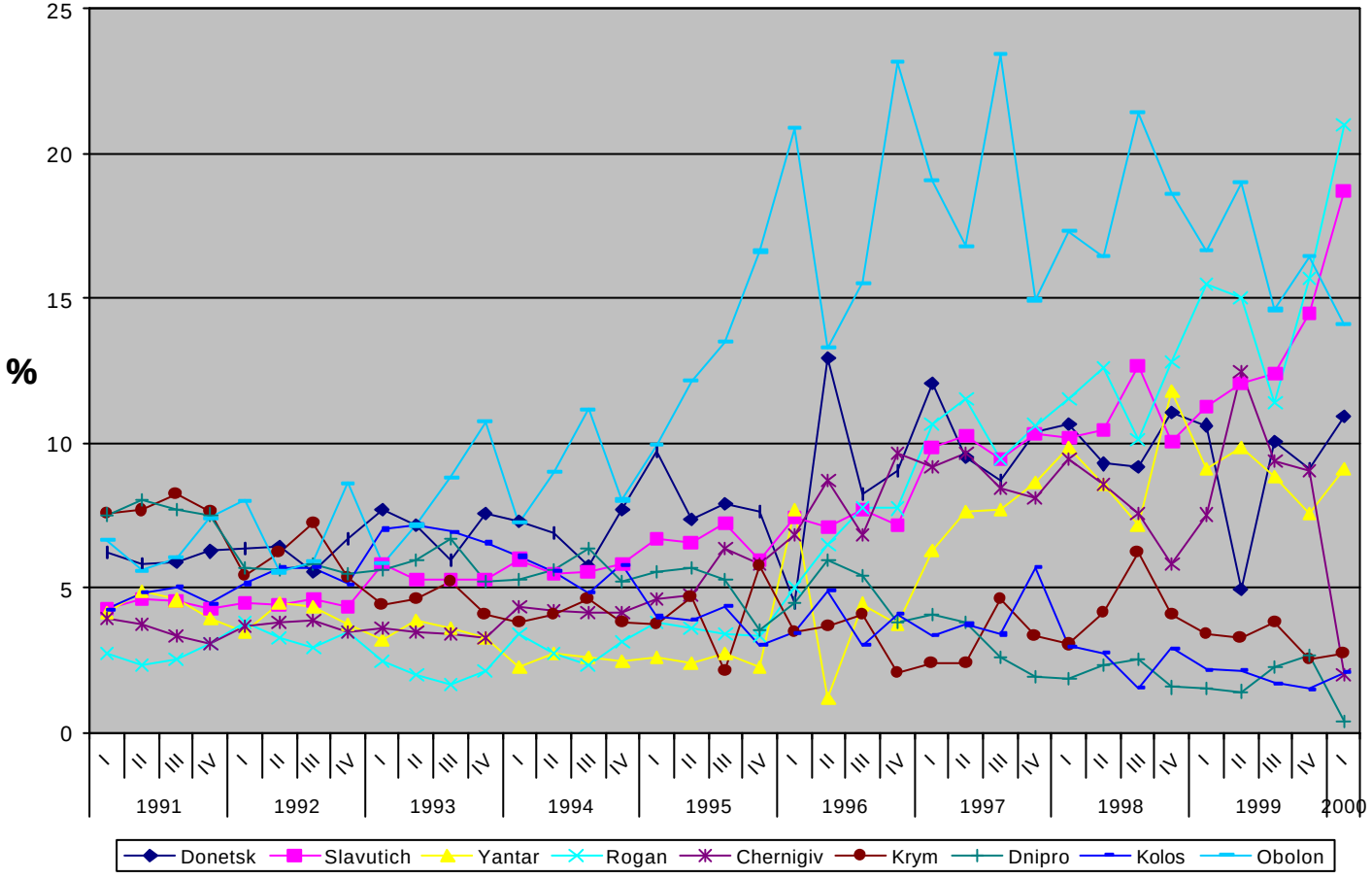
Weiss, L.W., 1963, Factors in Changing Concentration, *Review of Economics and Statistics*, 45, pp. 70-7.

APPENDIX A: HHI DYNAMICS



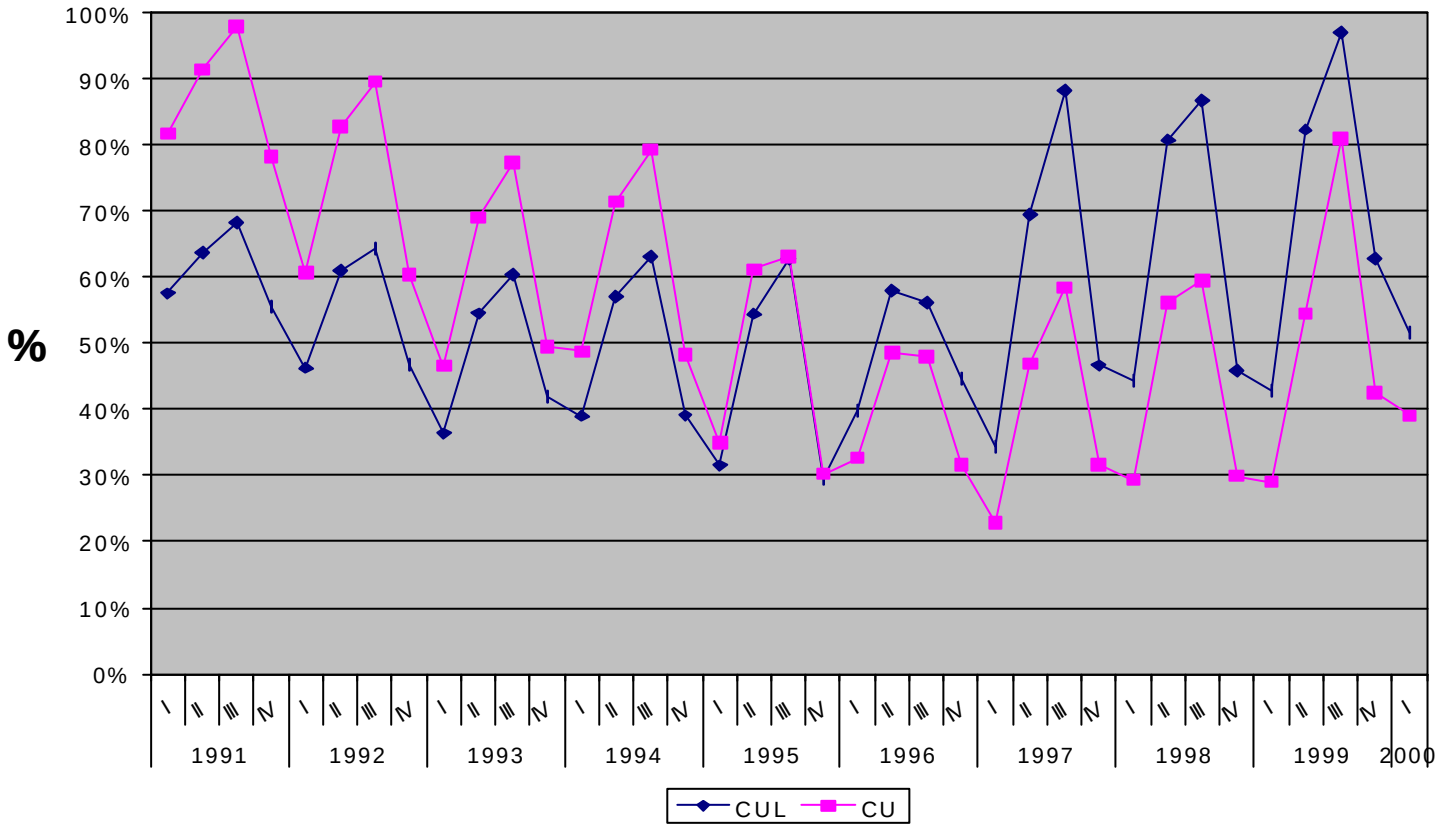
SOURCE: *Author's calculations based on JSC Ukrpivo data.*

APPENDIX B: DYNAMICS OF MARKET SHARES



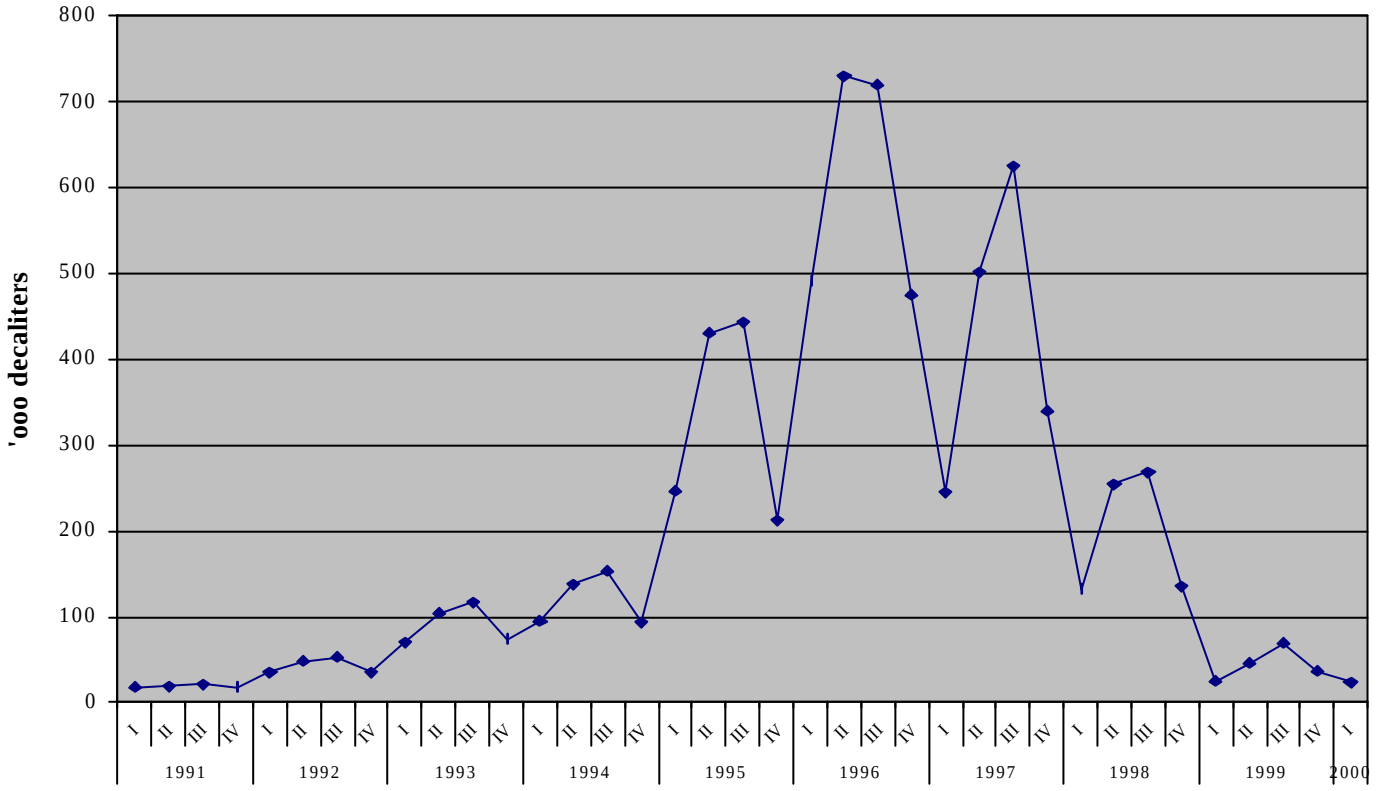
SOURCE: *Author's calculations based on JSC Ukrpivo data.*

APPENDIX C: CAPACITY UTILIZATION OF THE WHOLE INDUSTRY (CU) AND OF THE GROUP OF LEADERS (CUL)



SOURCE: *Author's calculations based on JSC Ukrpivo data.*

APPENDIX D: BEER IMPORT



SOURCE: *Author's calculations based on JSC Ukrpivo data.*

APPENDIX E: THE DATA.

Year	Quarter	RMI	D-I	D-II	D-III	HHI	CUL	CU	IM	FDI	MESQ	PD
1991	I	30.550	1	0	0	308.104	0.576	0.816	17.867	0.000	6.543	67
	II	34.850	0	1	0	311.563	0.636	0.914	19.622	0.000	6.543	71
	III	22.870	0	0	1	316.496	0.682	0.979	21.344	0.000	6.543	78
	IV	20.870	0	0	0	316.103	0.555	0.782	17.389	0.000	6.543	78
1992	I	14.060	1	0	0	289.581	0.462	0.606	35.378	0.000	6.543	80
	II	18.250	0	1	0	277.586	0.609	0.827	48.256	0.000	6.543	84
	III	18.770	0	0	1	284.513	0.643	0.895	52.956	0.000	6.543	84
	IV	18.900	0	0	0	297.775	0.468	0.603	35.211	0.000	6.543	85
1993	I	13.450	1	0	0	294.710	0.364	0.466	70.444	0.000	6.543	85
	II	11.330	0	1	0	305.537	0.544	0.690	103.833	0.000	6.543	89
	III	12.280	0	0	1	322.933	0.603	0.773	116.556	0.000	6.543	89
	IV	8.760	0	0	0	346.472	0.419	0.495	73.989	0.000	6.543	90
1994	I	6.510	1	0	0	293.730	0.390	0.487	94.778	0.000	6.543	92
	II	7.490	0	1	0	306.734	0.571	0.713	138.244	0.000	6.543	115
	III	9.080	0	0	1	338.471	0.630	0.792	153.589	0.000	6.543	124
	IV	7.650	0	0	0	302.774	0.391	0.482	93.256	0.000	6.543	129
1995	I	5.790	1	0	0	372.309	0.315	0.349	245.800	0.000	6.543	130
	II	7.110	0	1	0	385.937	0.544	0.612	430.756	0.000	6.543	154
	III	8.240	0	0	1	435.497	0.626	0.630	443.711	0.000	6.543	171
	IV	7.730	0	0	0	501.954	0.295	0.302	213.122	0.000	6.543	176
1996	I	6.290	1	0	0	702.187	0.398	0.327	490.578	140.000	6.543	178
	II	6.520	0	1	0	602.165	0.579	0.486	729.744	140.000	6.543	186
	III	9.630	0	0	1	567.768	0.560	0.479	719.444	140.000	6.543	198

SOURCE: *Author's calculations based on JSC Ukrpivo data.*

APPENDIX E: THE DATA – Continued.

Year	Quarter	RMI	D-I	D-II	D-III	HHI	CUL	CU	IM	FDI	MESQ	PD
	IV	7.050	0	0	0	883.084	0.446	0.316	474.289	140.000	6.543	201
1997	I	6.540	1	0	0	999.483	0.344	0.228	244.644	144.262	6.670	203
	II	7.320	0	1	0	953.653	0.695	0.469	501.356	144.262	6.670	209
	III	8.650	0	0	1	1107.217	0.882	0.584	625.300	144.262	6.670	215
	IV	7.770	0	0	0	887.157	0.466	0.317	339.522	144.262	6.670	217
1998	I	6.810	1	0	0	1170.771	0.443	0.293	132.422	89.514	6.814	224
	II	7.190	0	1	0	955.889	0.808	0.561	254.044	89.514	6.814	238
	III	7.840	0	0	1	1074.293	0.867	0.594	268.278	89.514	6.814	245
	IV	7.970	0	0	0	1077.041	0.458	0.299	135.400	89.514	6.814	249
1999	I	5.720	1	0	0	1107.303	0.428	0.290	24.889	80.049	7.046	251
	II	6.520	0	1	0	1326.108	0.822	0.544	46.411	80.049	7.134	254
	III	7.260	0	0	1	1001.741	1.107	0.809	69.322	211.412	7.134	257
	IV	7.580	0	0	0	1147.556	0.628	0.425	36.056	211.412	7.134	260
2000	I	7.690	1	0	0	1325.259	0.516	0.390	23.711	198.486	7.156	261

SOURCE: *Author's calculations based on JSC Ukrpivo data.*

APPENDIX F: 2SLS ESTIMATION OF LEADERS' PERFORMANCE-CONCENTRATION MODEL

System: SYS01
Estimation Method: Two-Stage Least Squares
Date: 05/23/00 Time: 23:06

Sample: 1991:1 2000:1
Instruments: MESQ PD DI DII DIII IM FDI(-2) RMI FDIT C

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-2989.941	789.9788	-3.784838	0.0004
C(2)	465.6428	125.7779	3.702102	0.0005
C(3)	2.708110	0.504693	5.365861	0.0000
C(4)	1.690842	0.399162	4.235980	0.0001
C(5)	31.21097	9.085008	3.435437	0.0011
C(6)	-5.881132	4.408940	-1.333911	0.1874
C(7)	22.37810	4.680123	4.781521	0.0000
C(8)	30.28128	4.408792	6.868385	0.0000
C(9)	0.316128	0.464649	0.680358	0.4990
C(10)	0.019085	0.010647	1.792511	0.0783
C(11)	-0.018811	0.009428	-1.995238	0.0507
C(12)	0.005362	0.009479	0.565733	0.5738
Determinant residual covariance		482422.9		

Equation: HHI=C(1)+C(2)*MESQ+C(3)*PD+C(4)*FDI(-2)
Observations: 35

R-squared	0.938844	Mean dependent var	653.6510
Adjusted R-squared	0.932925	S.D. dependent var	369.2609
S.E. of regression	95.63409	Sum squared resid	283522.3
Durbin-Watson stat	2.230022		

Equation: CUL=C(5)+C(6)*DI+C(7)*DII+C(8)*DIII+C(9)*RMI +C(10)*HHI+C(11)*IM
+C(12)*FDIT
Observations: 35

R-squared	0.808425	Mean dependent var	55.88328
Adjusted R-squared	0.758758	S.D. dependent var	17.88990
S.E. of regression	8.786878	Sum squared resid	2084.649
Durbin-Watson stat	1.954278		

APPENDIX G: 2SLS ESTIMATION OF INDUSTRY'S PERFORMANCE-CONCENTRATION MODEL

System: SYS01
Estimation Method: Two-Stage Least Squares
Date: 05/23/00 Time: 23:09

Sample: 1991:1 2000:1
Instruments: MESQ PD DI DII DIII IM FDI(-2) RMI FDIT C

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-2989.941	789.9788	-3.784838	0.0004
C(2)	465.6428	125.7779	3.702102	0.0005
C(3)	2.708110	0.504693	5.365861	0.0000
C(4)	1.690842	0.399162	4.235980	0.0001
C(5)	46.23100	6.331439	7.301816	0.0000
C(6)	-1.815233	3.072637	-0.590773	0.5570
C(7)	23.35915	3.261627	7.161809	0.0000
C(8)	30.10218	3.072534	9.797184	0.0000
C(9)	1.230866	0.323819	3.801092	0.0003
C(10)	-0.017929	0.007420	-2.416294	0.0188
C(11)	-0.033159	0.006570	-5.046690	0.0000
C(12)	0.005824	0.006606	0.881615	0.3816
Determinant residual covariance		231446.7		

Equation: HHI=C(1)+C(2)*MESQ+C(3)*PD+C(4)*FDI(-2)
Observations: 35

R-squared	0.938844	Mean dependent var	653.6510
Adjusted R-squared	0.932925	S.D. dependent var	369.2609
S.E. of regression	95.63409	Sum squared resid	283522.3
Durbin-Watson stat	2.230022		

Equation: CU=C(5)+C(6)*DI+C(7)*DII+C(8)*DIII+C(9)*RMI +C(10)*HHI+C(11)*IM

+C(12)*FDIT
Observations: 35

R-squared	0.922514	Mean dependent var	53.98378
Adjusted R-squared	0.902425	S.D. dependent var	19.60393
S.E. of regression	6.123669	Sum squared resid	1012.482
Durbin-Watson stat	1.911704		