A Model of Structure, Conduct and Performance in Brazilian Manufacturing

by Larry Willmore

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A MODEL OF STRUCTURE, CONDUCT AND PERFORMANCE IN BRAZILIAN MANUFACTURING

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Summary.--For the first time in Brazil, a simultaneous system of equations is used to analyse market structure, conduct and performance. Simultaneity bias is found to be important in each of the five equations of the system. A major finding is that transnational enterprises are not to blame for high levels of concentration: they are attracted to industries that would be concentrated in any event.

1. INTRODUCTION

The existence of a strong, positive correlation between foreign ownership and industrial concentration in Brazil is well known. 1/ But correlation is not causation; the association of foreign ownership with high concentration does not prove that foreign ownership causes concentration. Factors other than foreign ownership affect concentration, and common variables affect both the extent of foreign ownership and the degree of concentration in an industry, so it is possible that foreigners are attracted to Brazilian industries that would be highly concentrated in any event.

In recent research published in this journal (1989), I found foreign ownership to have a positive association with industrial concentration in Brazil after controlling for other determinants of concentration. Moreover,

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*/ The views expressed are those of the author and do not necessarily reflect those of the United Nations Economic Commission for Latin America and the Caribbean. Decio Fialho provided research assistance in the construction of the data base for this paper.

foreign ownership appeared to have a negative effect on both the size of the suboptimal sector and the entry of firms into the efficiently scaled sector of an industry. While multiple regression represents an improvement over simple correlation, interpretation of these results remain suspect due to the possibility of simultaneity bias. Concentration and foreign ownership are elements of market structure that are jointly determined along with conduct and performance. The present paper allows for such simultaneity by specifying a relatively small model of structure, conduct and performance and estimating it with cross-sectional data for the year 1980. This type of model has been estimated with data for Canada [Caves et al (1980), Saunders (1982), Gupta (1983)], but not for other countries dependent on foreign capital.

2. DATA AND VARIABLES

The model to be estimated contains five endogenous variables defined as follows:

SUBQ = extent of suboptimal capacity, estimated as the proportion of output (value-added) originating in firms smaller than minimum efficient scale (MES).

ENTRY = rate of entry into the efficiently scaled portion of an industry, defined as the contribution of new entrants to "industry" growth, but measured, using cross-sectional 1980 data, as the ratio of MES to the average size of firms larger than MES. 2/ This variable takes values between zero and unity, and can also be regarded as an inverse measure of concentration in the efficiently scaled portion of an industry.

FOR = extent of foreign ownership and control, measured as the share of industry output (value-added) accounted for by firms in which non-residents hold 10% or more of the voting stock.

ADV = advertising intensity, i.e. the ratio of advertising expenditures to domestic sales.

PROFIT = rate of profit, measured as after-tax return on equity.

Two of the endogenous variables refer to structure, two to conduct and one to performance. SUBQ and FOR are important elements of market structure, especially in a semi-industrial, dependent economy like Brazil. ENTRY conceptually refers to conduct, but it is calculated from observed market structure, namely the average size of efficiently scaled firms relative to MES. When entry is unity, the number of efficiently scaled firms in an industry is at a maximum. When entry approaches zero, the number of efficiently scaled firms becomes very small, and those that exist are much larger than required for technical efficiency. ADV represents conduct, the effects of which have been the subject of intense research and debate in industrial countries. Finally, PROFIT is a measure of market performance, a high rate of profit indicating the exercise of monopoly power.

Industrial concentration does not enter the model explicitly because, given some simple yet plausible assumptions underlying a model for the growth of the firm, Davies and Lyons [1982] have demonstrated that the concentration ratio is determined by MES, industry size, ENTRY and SUBQ. There is no theoretical reason to expect either SUBQ or ENTRY to be a function of concentration; on the contrary, it is concentration that is a function of SUBQ and ENTRY. Decreases in the extent of suboptimal capacity and decreases in the rate of entry of new firms both result in increased concentration, but

the welfare implications in each case are quite different: a reduction in the extent of suboptimal capacity brings efficiency gains along with the increased concentration whereas a reduction in the rate of entry does not. 3/

In addition to the five endogenous variables, the model contains a total of ten exogenous variables:

LMES = minimum efficient scale (in natural logs), defined as the smallest size of plant at which unit costs are minimized and measured as one-half the size (value-added) of firm for which the probability of operating a single plant is precisely 0.5. 4/

LQ = industry size (value-added in natural logs).

LKQ = capital-output ratio (in natural logs), measured as the ratio of financial capital ("soma do permanente") to value-added.

STATE = extent of state ownership and control, measured as the proportion of industry output accounted for by enterprises controlled by the state.

EXPORT = ratio of exports to industry sales.

PROTECT = rate of effective protection in Brazil, measured by observed prices rather than legal tariffs, from Tyler [1985].

GEOCON = geographic concentration of production measured as the sum (over 26 Brazilian states and territories) of the absolute value of the proportion of adult population in the state minus the proportion of shipments originating in the state. The index takes values between zero and two and was calculated from the 1980 industrial census.

CDUM = consumer good dummy equal to one if industry output consists largely of consumer goods and zero otherwise.

CCDUM = convenience good dummy equal to one if the consumer goods are judged to be convenience goods (frequent purchases) and zero otherwise.

DRATIO =debt-equity ratio, i.e. the ratio of total debt to net worth.

These variables, with the exeption of PROTECT, GEOCON, CDUM AND CCDUM, were constructed from a special tabulation of fiscal 1980 income tax returns for nearly fifty thousand firms accounting for well over 95% of Brazil's manufacturing output. From an initial list of 192 industries, 17 were eliminated due to heterogeneity of products or low coverage and another 56 because of inability to estimate MES, leaving 119 usable observations.

3. SPECIFICATION OF THE MODEL

The model consists of five equations, one for each of the endogenous variables. Researchers typically assume the dependent variable to be a linear function of the explanatory variables, i.e.

$$(1) \quad Y_i = \sum_j a_j X_{ij} + u_i,$$

where Y_i is the dependent variable, X_{ij} is the value of the j^{th} explanatory variable for the i^{th} industry and u_i is a random disturbance assumed to be independently distributed with constant variance and zero mean.

A problem in applying this simple linear equation (1) to the present data is that four of the five dependent variables are bounded by zero and unity, but there is nothing to insure that their estimated values fall within these bounds. With a logit transformation of these dependent variables, it is possible to contrain the estimates to their proper bounds, yet retain a linear equation, i.e.

$$(2) \quad \log [Y_i/(1-Y_i)] = \sum_j b_j X_{ij} + v_i$$

where v_i is a random disturbance. This "linear logit" equation was used in Willmore (1989), and it represents an improvement over the simple linear equation in that meaningless estimates can not be generated, but the least squares solution inadvertantly places a large weight on values of Y that are close to zero or unity. Moreover, when Y happens to equal zero or unity, its logit is not defined, so the observation must be deleted from the sample or an arbitrarily low or high value must be entered for Y.

A third specification is the intrinsically non-linear logistic function,

$$(3) \quad Y_i = \{1 \,/\, [1 + \exp\,(-\sum_j b_j X_{ij}\,)]\} + w_i \,,$$

where w_i is another random disturbance. Equation (3) can be derived from equation (2) if there is no disturbance term in either equation, i.e. $v_i=w_i=0$ for all observations. In general, however, the fit of the equation is far from perfect, so the least squares parameter estimates for regression (3) will differ from those of regression (2).

The parameters of the linear logit regression (2) were estimated for each of the four equations with bounded dependent variables (SUBQ, ENTRY, FOR and ADV) first by ordinary least squares (OLS), ignoring simultaneity bias, and secondly by two-stage least squares (2SLS), which allows for simultaneity. A maximum likelihood technique was used to estimate the OLS and 2SLS parameters of the non-linear logistic function (3) for the same four equations. PROFIT can take any positive or negative value, so it was assumed to be a simple linear function of the explanatory variables in both the OLS and 2SLS regressions.

(a) Determinants of Suboptimal Capacity (SUBQ)

It is difficult for inefficient firms to survive in a competitive environment. Therefore one expects SUBQ to be higher, the more protected an

industry is from foreign competition (PROTECT), and lower, the more export-oriented the industry (EXPORT). Similarly, geographically disperse industries give natural protection to small firms located far from the main centres of population, so GEOCON is expected to have a negative effect on SUBQ.

Scale economies combined with limited market size are believed to result in barriers to the entry of efficiently scaled firms. This is often modelled as MES divided by industry size, but in this case the two variables are entered separately, i.e. LMES, with a positive coefficient, and LQ, with a negative coefficient. Capital intensity (LKQ) is included as a proxy for the cost disadvantage of small scale plants, so a negative coefficient is expected for this variable. Transnational and state enterprises are likely to operate plants larger than MES, so FOR and STATE are both expected to have a negative effect on SUBQ. In addition, the presence of foreign-owned plants may exert a competitive influence on local firms, causing them to operate larger plants or leave the industry.

In sum, the specification of the SUBQ equation is:

SUBQ=SUBQ(FOR,LMES,LQ,LKQ,STATE,EXPORT,PROTECT,GEOCON).

Positive coefficients are expected for LMES and PROTECT, whereas the coefficients of the remaining variables are expected to be negative.

(b) Determinants of the Rate of Entry (ENTRY)

SUBQ is an obvious candidate for the determination of inter-industry differences of ENTRY, for suboptimal firms need only to grow to MES in order to enter the efficiently scaled sector of an industry. Foreign or state ownership (FOR and STATE) might be expected to deter such entry, as will oligopolistic rivalry reflected in ADV and barriers to entry measured by the

variables LMES and LKQ. LQ is included as a control variable on the assumption that it is MES relative to market size that is relevant, not MES in itself.

The ENTRY equation is thus specified as:

ENTRY=ENTRY(SUBQ,FOR,ADV,LMES,LQ,LKQ,STATE).

The coefficients of SUBQ and LQ are expected to be positive, while those of the remaining variables are expected to be negative.

(c) Determinants of Foreign Ownership (FOR)

Transnational enterprises are apt to be attracted to industries where the rate of entry is otherwise low, and where there is intense advertising (ADV) and substantial capital requirements for a plant of minimum efficient scale. Capital requirements for an MES plant (in natural logs) are simply LMES plus LKQ, so these two variables can be entered separately with an expected positive coefficient for each. Protection from imports (PROTECT) might be expected to encourage foreigners to jump Brazil's tariff wall by establishing or purchasing local production facilities, while state ownership might well discourage such action.

The specification of the FOR equation is thus

FOR=FOR(ENTRY,ADV,LMES,LKQ,PROTECT,STATE).

The coefficients of ENTRY and STATE are expected to be negative, and positive coefficients are expected for the other explanatory variables.

(d) Determinants of Advertising Intensity (ADV)

Foreign ownership (FOR) can be expected to have a positive effect on advertising both because foreign-owned firms advertise more than their

domestic counterparts [Willmore (1986)] and because of "spillover" effects that cause local firms to imitate the behaviour of their foreign rivals.

Profitability (PROFIT) may have a positive effect on ADV because a profitable firm has both an incentive to increase sales through advertising and the means to do so. Also, advertising is higher for consumer goods than for capital and intermediate goods [Caves et al(1980, pp. 130-131)] and, within the category of consumer goods, higher for convenience goods than for goods purchased irregularly (ibid., pp. 94-98).

The advertising equation thus becomes

ADV=ADV(FOR,PROFIT,CDUM,CCDUM).

The expected sign for the coefficient of each variable is unambiguously positive.

(e) Determinants of Profitability (PROFIT)

In modelling inter-industry differences in the return on investment, profitability is typically specified as a positive function of seller concentration. In lieu of the concentration ratio, two of its components--SUBQ and ENTRY-- are included as explanatory variables and each is expected to have a negative effect on the rate of profit. Advertising might be expected to create an entry barrier, hence increased profits, but holding ENTRY constant, the variable ADV can be expected to have a negative coefficient. STATE is included as a control variable, with a negative coefficient expected in view of the fact that state enterprises often operate at a loss in Brazil. A negative coefficient is also expected for FOR, but for different reasons: transnational enterprises may act as a competitive force in an industry, reducing overall profits, and they may manipulate transfer prices to repatriate profits, lowering the recorded return on

equity. A positive coefficient is expected for the debt-equity ratio (DRATIO) because debtors were in a privileged position in 1980: as an anti-inflationary measure, monetary correction was held to 50.8% while price inflation exceeded 100%.

The profitability equation is thus specified as

PROFIT=PROFIT(SUBQ,ENTRY,FOR,ADV,STATE,DRATIO,GEOCON).

Four of the six explanatory variables are endogenous to the system. A positive coefficient is predicted for DRATIO, and negative coefficients for the other variables.

4. EMPIRICAL RESULTS

Tables 1 through 5 present the ordinary least squares (OLS) and two stage least squares (2SLS) estimates of the parameters of the model. Each equation satisfies the rank and order conditions for identification. The model is a simultaneous system of equations, so all the parameter estimates are biased, but the 2SLS estimates are consistent, i.e. asymptotically unbiased. The observations total 119 four-digit industries, which is large for this type of study. The logit of SUBQ was undefined for one industry, and that of FOR was undefined for 15 industries, so these observations were deleted for the linear logit regressions.

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(a) The Suboptimal Capacity Equation

In the OLS regressions reported in table 1, the coefficients of foreign control, minimum efficient scale, capital intensity, state ownership, export intensity and geographic concentration all bear the predicted sign and are statistically significant at the 10% level or higher. The 2SLS coefficients,

and their statistical significance, are very similar to the OLS coefficients, with one important exception. The coefficient of FOR is highly significant in the OLS regressions, but fails to reach statistical significance at any customary level of confidence in the 2SLS regressions.

(b) The Rate of Entry Equation

The ENTRY equation is less successful than the SUBQ equation. The coefficients of minimum efficient scale (LMES) and industry size (LQ) carry large t-ratios (see Table 2), but their signs are opposite those expected if economies of scale act as a barrier to entry. This is no doubt attributable to the fact that MES is estimated with considerable error. ENTRY, the dependent variable, is MES divided by the average size of efficiently scaled firms. The positive coefficient of LMES could thus be spurious correlation with the numerator of the dependent variable, and the negative coefficient for industry size may reflect a positive association between industry size and the average size of efficiently scaled firms.

The coefficients of SUBQ, FOR, STATE and, to a lesser extent, ADV are statistically significant and carry the expected sign in the OLS regressions, but only the coefficients of SUBQ and STATE remain significant in the 2SLS regressions. When simultaneity is taken into account, there is no evidence that foreign control or advertising discourages entry into the efficiently scaled position of Brazilian industries. 5/

The coefficient of the capital intensity (LKQ) variable carries the wrong sign and, in a two-tailed test, does not differ significantly from zero in any of the regressions reported in Table 2. This finding contrasts sharply with the significantly negative effect of capital intensity on suboptimal capacity. Capital intensity is apparently a good proxy for the

cost disadvantage of a suboptimal plant in Brazil, but it has no effect on new entry by firms larger than minimum efficient scale.

(c) Foreign Ownership Equation

In this key equation of the model, ENTRY is a highly significant explanatory variable. (See Table 3.) It is noteworthy that the 2SLS point estimates for the coefficient of ENTRY are, in each case, nearly twice the OLS estimates. The point estimates for the coefficient of ENTRY of -10 imply, at the mean of FOR (0.259), that an increase of one percentage point in the rate of entry results in a decrease of two percentage points in foreign control of industry output. In contrast, the coefficients of FOR in the ENTRY equations of Table 2 are very small and, once simultaneity is taken into account, not significantly different from zero. Low rates of entry thus attract forign investment, but the presence of foreign firms does not discourage new entry into an industry.

The coefficient of advertising intensity is positive and statistically significant in one of the OLS regressions, lending some support to the thesis that transnational enterprises are attracted to industries with intensive advertising, perhaps because they are well equipped to engage in that type of rivalry. Once simultaneity is taken into account, the ADV coefficients change sign and lose significance. Caves et al (1980, pp. 85-86) report the same finding for Canada, but Saunders (1982) and Gupta (1983) found the coefficient of advertising intensity to retain its positive sign and statistical significance with 2SLS.

Minimum efficient scale is an important and statistically significant variable, implying that foreign ownership is attracted to industries where minimum efficient scale is large. Capital intensity has the expected

positive sign, but is not statistically significant; nonetheless, the results suggest that large capital requirements for an MES plant attracts foreign investment, for the coefficients of LMES and LKQ sum to a significantly positive number. The coefficient of PROTECT is positive and statistically significant in each 2SLS regression. This is evidence that protection encourages transnational enterprises to "jump" the tariff wall and produce locally for the Brazilian market.

The coefficient of state ownership is negative as expected and statistically significant. Most interestingly, its absolute value in the 2SLS regressions implies that state ownership not only discourages, but completely displaces foreign ownership. At the mean of FOR (0.259), an increase of one percentage point in the state share of industry output results in a decrease of more than one percentage point in both the linear and the non-linear 2SLS regressions.

(d) The Advertising Intensity Equation

For this equation, the linear and non-linear estimation procedures produce coefficients that are markedly different. This is a reflection of the fact that advertising ratios are close to zero in many industries (the minimum value for ADV is 0.0003), so these industries are weighted heavily in the linear regression. For the record, Table 4 reports both the linear and the non-linear regression results, but statistical inferences are based solely on the latter.

Simultaneity bias is not important in the case of three of the four explanatory variables of the advertising equation. The coefficients of FOR, CDUM and CCDUM are positive as expected and significant at the 5% level or higher with both OLS and 2SLS. These results support the hypothesis that the

positive sign, but is not statistically significant; nonetheless, the results suggest that large capital requirements for an MES plant attracts foreign investment, for the coefficients of LMES and LKQ sum to a significantly positive number. The coefficient of PROTECT is positive and statistically significant in each 2SLS regression. This is evidence that protection encourages transnational enterprises to "jump" the tariff wall and produce locally for the Brazilian market.

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Simultaneity bias is not important in the case of three of the four explanatory variables of the advertising equation. The coefficients of FOR, CDUM and CCDUM are positive as expected and significant at the 5% level or higher with both OLS and 2SLS. These results support the hypothesis that the

presence of foreign-owned firms results in increased advertising, even though there is no evidence, when simultaneity is taken into account, that industries with intense advertising are particularly attractive to transnationals.

Simultaneity bias is extremely important in estimation of the coefficient of PROFIT. This coefficient is negative, contrary to expectations, with OLS, but is positive and highly significant with 2SLS.

(e) The Profitability Equation

Few variables prove to be significant determinants of reported inter-industry differences in return on investment. The extent of suboptimal capacity appears to be highly significant, with the expected negative sign, in the OLS regression, but the coefficient does not come close to statistical significance with 2SLS. (See Table 5.) The coefficient of FOR carries the expected negative sign and is highly significant in the OLS regression, but not in 2SLS, which takes into account simultaneity in the system. The negative coefficient for state ownership does, however, retain its significance at the 10% level with 2SLS. A high debt-equity ratio is associated with a high return on equity, reflecting Brazil's extremely low, negative real interest rates in 1980.

5. CONCLUSIONS

The model estimated in this paper consists of five equations with suboptimal capacity, rate of entry, foreign control, advertising intensity and profitability, respectively, as dependent variables. It represents an attempt to endogenize some important aspects of industrial structure, conduct and performance. A comparison of 2SLS with the OLS regressions shows that

simultaneity bias cannot be ignored, for it is important in the estimation of one or more key coefficients in each equation.

The main purpose of this research was to answer the question "Does the presence of foreign-owned establishments cause Brazilian industries to be more concentrated than would otherwise be the case?" The answer provided by single-equation models is "yes," for foreign control appears to have a negative effect on both the extent of suboptimal capacity (hence the number of small firms) and the rate of entry into the efficiently-scaled position of an industry (hence the number of "large" firms). The answer provided by a five-equation model that allows for the simultaneous determination of endogenous variables is "no," for the relevant coefficients, though negative, are not significantly different from zero at any customary level of confidence. 6/

In Brazil, as in other countries, there is a high correlation between foreign control and industrial concentration. The findings of this paper suggest strongly that foreign investors are attracted to concentrated industries with low rates of entry, but foreign control does not significantly discourage new entry into an industry. In other words, Brazilian industries dominated by transnationals tend to be concentrated industries, but they are industries that would be concentrated in any event.

NOTES

1. See Willmore (1987) and the references cited therein.

2. The rate of entry can be inferred from cross-sectional data provided the size distribution of firms can be approximated by the Pareto curve. See Davies and Lyons (1982) and Willmore (1989).

3. For details, see Willmore (1989).

4. The construction of this variable is explained in Willmore (1989, pp. 1602-1604).

5. According to Porter (1976), intense advertising can be expected to create an entry barrier only in convenience-good industries, but the coefficient of the interaction term ADV*CCDUM, while negative, was not significantly different from zero in any regression equation.

6. This conclusion does not depend on the use of the variables SUBQ and ENTRY, which are components of concentration, in lieu of an index of concentration. If the four-firm concentration ratio or the Herfindahl index of concentration is regressed on FOR and other variables, the coefficient of FOR is highly significant with ordinary least squares, but loses all statistical significance once simultaneity is taken into account.

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Table 1. Determinants of suboptimal capacity (SUBQ) (t-ratios in parentheses)

Variable	Ordinary Least Squares		Two-Stage Least Squares	
	Linear	Non-Linear	Linear	Non-Linear
Constant	-10.246	-7.700	-9.112	-7.542
	(-4.48)	(-3.77)	(-3.04)	(-2.48)
FOR (-)	-2.864***	-2.023***	-1.466	-1.816
	(-7.32)	(-5.05)	(-0.66)	(-1.02)
LMES (+)	0.687***	0.435***	0.704***	0.461***
	(5.77)	(3.99)	(5.47)	(3.50)
LQ (-)	-0.095	0.001	-0.162	-0.030
	(-0.93)	(0.01)	(-1.08)	(-0.27)
LKQ (-)	-0.266*	-3.341**	-0.295*	-0.336**
	(-1.41)	(-2.10)	(-1.45)	(-1.89)
STATE (-)	-5.156***	-3.975**	-4.685***	-4.336*
	(-5.71)	(-2.27)	(-3.88)	(-1.59)
EXPORT (-)	-2.624**	-2.325**	-3.247**	-2.254**
	(-2.05)	(-2.15)	(-1.95)	(-1.93)
PROTECT (+)	0.117	0.021	0.053	0.009
	(0.92)	(0.21)	(0.31)	(0.07)
GEOCON (-)	-0.830**	-0.803***	-1.040**	-0.808**
	(-2.03)	(-2.51)	(-1.91)	(-1.95)
R^2	.539	.453	.485	.450
No. of obs.	118	119	118	119

Significance levels: *10%, **5%, *** 1% or higher.

The expected sign of each coefficient is shown in parentheses after each variable.

The dependent variable in the linear specification is log [SUBQ/(1-SUBQ)], so the R^2 is not comparable to that of the non-linear logistic specification.

Table 2. Determinants of the rate of entry (ENTRY) (t-ratios in parentheses)

Variable	Ordinary Least Squares		Two-Stage Least Squares	
	Linear	Non-Linear	Linear	Non-Linear
Constant	-3.668	-1.729	-2.603	-2.478
	(-3.07)	(-1.69)	(-1.22)	(-1.52)
SUBQ (+)	2.239***	1.910***	3.189**	1.655**
	(7.51)	(7.73)	(2.20)	(1.88)
FOR (-)	-0.699***	-0.295*	0.333	-0.396
	(-2.87)	(-1.28)	(0.25)	(-0.44)
ADV (-)	-4.441*	-3.558	-1.738	-1.134
	(-1.39)	(-1.02)	(-0.23)	(-0.20)
LMES (-)	0.325	0.212	0.288	0.268
	(4.98)	(3.51)	(2.64)	(2.99)
LQ (+)	-0.171	-0.158	-0.213	-0.169
	(-3.16)	(-3.46)	(-2.74)	(-3.10)
LKQ (-)	0.111	0.085	0.169	0.087
	(1.15)	(1.05)	(1.32)	(0.92)
STATE (-)	-2.443***	-2.175**	-1.648*	-2.250*
	(-4.73)	(-2.01)	(-1.37)	(-1.60)
R^2	.689	.638	.627	.630
No. of obs.	119	119	119	119

Significance levels: *10%, **5%, *** 1% or higher.

The expected sign of each coefficient is shown in parentheses after each variable.

The dependent variable in the linear specification is log [ENTRY/(1-ENTRY)] so the R^2 is not comparable to that of the non-linear logistic specification.

Table 3. Determinants of the foreign share of industry output (FOR)

(t-ratios in parentheses)

Variable	Ordinary Least Squares		Two-Stage Least Squares	
	Linear	Non-Linear	Linear	Non-Linear
Constant	-6.128	-6.190	-8.280	-9.138
	(-1.87)	(-2.69)	(-1.75)	(-2.13)
ENTRY (-)	-5.495***	-5.594***	-10.246***	-10.019***
	(-4.13)	(-5.09)	(-2.63)	(-2.58)
ADV (+)	11.468	11.315**	-12.456	-11.162
	(1.20)	(1.80)	(-0.51)	(-0.55)
LMES (+)	0.325**	0.344***	0.525**	0.567**
	(1.82)	(2.74)	(1.82)	(2.15)
LKQ (+)	0.266	0.087	0.302	0.188
	(0.87)	(0.40)	(0.91)	(0.67)
PROTECT (+)	0.421**	0.152	0.479**	0.391*
	(1.81)	(1.01)	(1.68)	(1.62)
STATE (-)	-5.364***	-4.223**	-7.744***	-6.611**
	(-3.45)	(-1.87)	(-3.25)	(-1.83)
R^2	.250	.320	.123	.184
No. of obs.	104	119	104	119

Significance levels: *10%, **5%, *** 1% or higher.

The expected sign of each coefficient is shown in parentheses after each variable.

The dependent variable in the linear specification is log [FOR/(1-FOR)] so the R^2 is not comparable to that of the non-linear logistic specification.

Table 4. Determinants of advertising intensity (ADV)

(t-ratios in parentheses)

Variable	Ordinary Least Squares		Two-Stage Least Squares	
	Linear	Non-Linear	Linear	Non-Linear
Constant	-6.029	-5.503	-6.626	-5.871
	(-35.26)	(-15.64)	(-21.26)	(-11.68)
FOR (+)	0.857***	1.373***	2.603***	1.547**
	(2.53)	(4.29)	(2.61)	(1.94)
PROFIT (+)	0.292	-1.483	1.160	1.560***
	(0.54)	(-1.79)	(0.93)	(2.37)
CDUM (+)	1.197***	0.745**	1.342***	0.920**
	(5.51)	(1.86)	(5.30)	(2.19)
CCDUM (+)	0.297	0.665***	0.185	0.499**
	(1.11)	(2.35)	(0.58)	(1.65)
R^2	.355	.273	.201	.197
No. of obs.	119	119	119	119

Significance levels: *10%, **5%, *** 1% or higher.

The expected sign of each coefficient is shown in parentheses after each variable.

The dependent variable in the linear specification is log [ADV/(1-ADV)] so the R^2 is not comparable to that of the non-linear logistic specification.

Table 5. Determinants of the rate of profit (PROFIT)

(t-ratios in parentheses)

Variable	Ordinary Least Squares	Two-Stage Least Squares
Constant	0.159 (3.47)	0.131 (1.14)
SUBQ (-)	-0.229*** (-2.38)	-0.113 (-0.45)
ENTRY (-)	0.104 (0.74)	-0.010 (-0.03)
FOR (-)	-0.187*** (-3.15)	-0.046 (-0.28)
ADV (-)	-0.576 (-0.71)	-1.969 (-1.05)
STATE (-)	-0.245** (-2.02)	-0.227* (-1.33)
DRATIO (+)	0.045*** (5.58)	0.047*** (5.20)
R^2	.297	.244
No. of observations	119	119

Significance levels: *10%, **5%, *** 1% or higher.

The expected sign of each coefficient is shown in parentheses after the variable.

The dependent variable is not bounded, so a simple linear specification was employed for this regression equation.

NOTE: Justification of footnote 6 -- Not for publication.

BRAZIL: DETERMINANTS OF INDUSTRIAL CONCENTRATION

(t-ratios in parentheses)

VARIABLE	ORDINARY LEAST SQUARES		TWO-STAGE LEAST SQUARES	
	CR4	HERFINDAHL	CR4	HERFINDAHL
Constant	2.834 (7.36)	1.393 (-3.77)	2.756 (5.78)	1.190 (3.26)
FOR (+)	0.430*** (6.23)	0.231*** (4.52)	0.470 (1.27)	0.076 (0.27)
ADV (+)	1.480* (1.42)	2.125*** (2.75)	4.308* (1.50)	4.921** (2.24)
LMES (+)	0.023 (1.18)	0.018 (1.24)	0.034* (1.40)	0.024 (1.28)
LQ (-)	-0.131*** (-7.51)	-0.076*** (-5.85)	-0.137*** (-5.26)	-0.072*** (-3.60)
LKQ (+)	0.031 (0.95)	0.027 (1.13)	0.031 (0.90)	0.033 (1.24)
STATE (+)	0.916*** (5.93)	0.747*** (6.53)	0.963*** (4.77)	0.730*** (4.72)
EXPORT (+)	0.569*** (2.57)	0.191 (1.16)	0.627** (2.19)	0.330* (1.51)
PROTECT (-)	-0.012 (-0.53)	0.010 (0.63)	-0.029 (-0.90)	0.003 (0.11)
GEOCON (+)	0.973* (1.42)	0.044 (0.86)	0.081 (0.82)	0.063 (0.84)
R^2	.539	.481	.500	.397
No. of obs.	119	119	119	119

Significance levels: *10%, **5%, *** 1% or higher.

The expected sign of each coefficient is shown in parentheses after each variable. Each equation is linear, with no transformation of the dependent variable.

BRAZIL: DETERMINANTS OF FOREIGN CONTROL (FOR)

(t-ratios in parentheses)

VARIABLE	ORDINARY LEAST SQUARES		TWO-STAGE LEAST SQUARES	
Constant	-0.807 (-1.87)	-0.511 (-1.17)	-0.069 (-0.11)	0.067 (0.12)
CR4 (+)	0.435*** (4.77)		0.024 (0.13)	
HERFINDAHL (+)		0.512*** (3.53)		-0.185 -(0.54)
ADV (+)	3.082** (2.33)	2.790** (1.97)	0.745 (0.20)	1.148 (0.29)
LMES (+)	0.043** (1.95)	0.035* (1.56)	0.015 (0.55)	0.010 (0.34)
LKQ (+)	0.028 (0.68)	0.019 (0.44)	0.020 (0.45)	0.020 (0.43)
PROTECT (+)	0.032 (1.11)	0.025 (0.83)	0.054* (1.42)	0.069* (1.45)
STATE (+)	-0.520*** (2.52)	-0.555*** (2.48)	-0.303 (-1.22)	-0.184 (-0.60)
R^2	.260	.199	.082	.015
No. of obs.	119	119	119	119

Significance levels: *10%, **5%, *** 1% or higher.

The expected sign of each coefficient is shown in parentheses after each variable. Each equation is linear, with no transformation of the dependent variable.