

University of Missouri, St. Louis

IRL @ UMSL

UMSL Global

1-1-1976

Domestic Market Structure, International Trade and Excess Capacity

Emilio Pagoulatos

Robert Sorenson
sorensen@umsl.edu

Follow this and additional works at: <https://irl.umsl.edu/cis>



Part of the [International and Area Studies Commons](#)

Recommended Citation

Pagoulatos, Emilio and Sorenson, Robert, "Domestic Market Structure, International Trade and Excess Capacity" (1976). *UMSL Global*. 103.

Available at: <https://irl.umsl.edu/cis/103>

This Article is brought to you for free and open access by IRL @ UMSL. It has been accepted for inclusion in UMSL Global by an authorized administrator of IRL @ UMSL. For more information, please contact marvinh@umsl.edu.

DOMESTIC MARKET STRUCTURE,
INTERNATIONAL TRADE
AND EXCESS CAPACITY

by

Emilio Pagoulatos
and
Robert Sorensen

DOMESTIC MARKET STRUCTURE, INTERNATIONAL TRADE
AND EXCESS CAPACITY

by

Emilio Pagoulatos and Robert Sorensen*

Preliminary Draft - Do not quote.

September 25, 1976

* The authors are respectively: assistant professor of Economics and research associate of the Center for International Studies; and associate professor of Economics at the University of Missouri - St. Louis.

DOMESTIC MARKET STRUCTURE, INTERNATIONAL TRADE
AND EXCESS CAPACITY

by

Emilio Pagoulatos and Robert Sorensen

University of Missouri - St. Louis

I. Introduction

The inability of the U.S. economy to achieve the goals of full employment and price stability in the 1970's has lead many economists to re-examine their assumptions regarding the way in which real industrial markets operate. In particular, two features of the economy have received special attention. The first involves the role of monopoly elements in the economy which are said to distort the efficiency of markets, exacerbate the rate of inflation, and raise the level of unemployment and underutilization of productive capacity. The second relates to the increased interdependence of the U.S. economy to the rest of the world which may hamper the effectiveness of traditional tools of stabilization policy.

One important dimension of any economy is the degree to which productive capacity is utilized. When excess capacity exists, unnecessary unemployment arises. On the other hand when capacity is insufficient to satisfy current demands, inflationary pressures arise. Although the problem of capacity utilization is of great importance, as of yet, no empirical evidence exists which explains variations in utilization rates for U.S. industries. This is unfortunate because if industries chronically maintain capacity in excess of that required to meet current demand resources are idled and unemployment may

arise, while, on the other hand, if productive capacity is insufficient to meet current demand, inflationary pressures arise.

The purpose of this paper is to shed light on a variety of questions regarding the impact of monopoly power and foreign trade on the degree to which industries achieve efficient capacity utilization. Since current capacity utilization is in large part a reflection of past investment decisions on the parts of firms, this study will begin by theoretically investigating what differences can be expected in the investment decision making process in competitive as opposed to monopolistic firms. Next, the theoretical impact of export markets and import competition on both the investment and production level decision will be analyzed. Finally, the theoretical hypotheses concerning monopoly power and foreign trade will be subjected to empirical analysis utilizing multiple regression analysis.

II. Domestic Market Structure and Excess Capacity

The industry's reaction to changes in domestic demand and the expected outcome in terms of excess capacity are well defined in economic theory for the polar cases of perfect competition and monopoly. Firms in competitive markets are expected to overexpand capacity due to the implicit assumption by each firm that its price expectations will be realized. Aggregate industry capacity thus expands causing price expectations not to be realized and consequently industry capacity will exceed quantity demanded at the long-run equilibrium price. The net effect is therefore the presence of excess capacity. Monopoly firms, on the other hand, not faced with the problem of unrealized price expectations, will adjust their capacity smoothly to long-run prices and output. In this case, no excess capacity need arise.

Industries in the real world, however, are more likely to be organized as monopolistic competition or oligopoly and, therefore, the theory developed for the polar cases of monopoly and competition cannot provide clear guidance in predicting the extent of excess capacity to be found in these industries. Indeed, several alternative hypotheses have been developed concerning the likely excess capacity outcomes for the variety of industry organizations found in real world industrial markets.

In tight oligopolistic industries, (those characterized by high seller concentration, high barriers to entry, and an insignificant competitive fringe) it is expected that collective or collusive behavior will prevail. Under these circumstances the industry is expected to perform as if it were a monopoly and smooth adjustments to changes in demand are likely to prevail. These industries should thus be characterized by full capacity utilization.

Even in tight oligopolistic markets, however, excess capacity may arise. Collective agreements may break down as rivals struggle for market shares. Moreover, in this type of industry in which price competition has been eschewed and therefore sales rest on non-price dimensions, firms may find it in their interest to maintain capacity in excess of that required to meet current demand in order to retain buyer loyalty during periods of unexpected surges in demand. Finally, excess capacity may result due to a conscious collective strategy on the parts of firms within the industry. By maintaining excess capacity established, firms can create barriers to entry through the ability to quickly expand output in response to the threat of entry by potential rivals. Once created, this barrier allows established firms to maintain prices in excess of cost without fear of entry.

In partial oligopolies (those industries characterized by substantial seller concentration, substantial barriers to entry and a significant competitive fringe), the likelihood of collective action is less than in tight oligopolies. Excess capacity may arise, therefore, due to the behavior of either the largest firms or the competitive fringe. To the extent that the largest firms are unable to act collectively increases in industry demand may well lead to over-expansion of productive capacity as each firm, acting independently, attempts to increase its market share. This type of over-reaction is more likely in these industries than tight oligopolies due to the lower degree of sellers concentration. The competitive fringe firms in these industries may also significantly affect the degree of excess capacity. If, for example, these smaller firms behave as would competitive firms, increases in demand and price may lead them to over expansion of capacity due to inaccurate price expectations. On the other hand, if these firms adjust capacity in relationship only to their own increases in sales, then over expansion by the competitive fringe need not arise.

Finally, in atomistic industries (those characterized by moderate to low seller concentration, moderate to low barriers to entry and a large competitive sector) the degree of excess capacity is determined primarily by the behavior of the competitive sector. Excess capacity may arise in these industries due to a number of factors. Since barriers to entry are low, increases in industry demand and price may result in an over-expansion of capacity due to the entry of new firms. Moreover, if firms in these industries behave as perfect competitors, over-expansion may result as the firms adjust capacity in relation to short run prices which are higher than the long run equilibrium price.

As argued earlier, however, competitive firms may adjust capacity in relation to increases in their own sales rather than those of the industry as a whole. Since overall increases in industry demand are not likely to result in

proportionate increases for all, over expansion may not arise. Some firms will experience increases in sales and increase capacity while other firms will not experience sales increases and consequently not adjust capacity. Under this assumption, the overall adjustment of industry capacity to increases in demand may be the appropriate one and excess capacity need not arise.

The arguments presented above suggest that a priori it is impossible to specify the precise relationship between the degree of monopoly power within an industry and the likely excess capacity outcomes. Before any conclusion can be reached it is necessary to have empirical evidence.

III. Excess Capacity and International Trade and Investment

If an economy were closed, the domestic market structure would theoretically be sufficient to describe the major determinants of inter-industry differentials in excess capacity. In an open economy a more complete analysis of industry capacity utilization should account for foreign factors, since industries differ with respect to international trade and investment activity. In particular, attention should be given to the impact of import competition, the availability of export opportunities and the extent of foreign direct investment and multi-national activity.

Foreign direct investment and multi-national activity have received considerable attention in economics but no attempt has been made to examine their influence upon domestic firms' capacity utilization. Foreign investment or multi-national activity may be classified as "horizontal", when it results in firms producing abroad the same or similar products to those produced in the domestic market, and "vertical", if the foreign investment is undertaken in order to produce raw materials or other inputs for the production process

at home. The multi-national expansion of a domestic firm along "vertical" lines should help insure the uninterrupted flow of raw materials and other productive inputs or semi-finished parts to the domestic market thus contributing to a lower degree of excess capacity that may otherwise have materialized as a result of unanticipated raw material and/or input shortages. On the other hand, foreign expansion along "horizontal" lines would make foreign markets for the domestic firm's products more accessible due to the informational and marketing advantages as a result of establishing subsidiaries abroad. In this case one would expect exports to be enhanced and excess capacity reduced.

The exploitation of exporting opportunities is another factor that should affect excess capacity. First, it is expected that current export should add to current demand for the product and, thus, increase capacity utilization. Exporting may also reduce excess capacity if it is the result of a strategy that utilizes excess capacity as a barrier to entry. Excess capacity at home may be channeled into increased exports as an attempt to scare off potential rival entrants in the firm's domestic market by demonstrating the ability of established firms to increase output.

Finally the presence of vigorous import competition is expected to be positively related to domestic firms' excess capacity. A number of arguments leads to the above conclusion. Imports compete with local production for domestic demand thus reducing capacity utilization. For example, in high fixed cost industries the effect of increased import competition may be to lower price in an attempt to maintain capacity by established firms. Another possibility is that existing firms may yield part of their market share to foreign competitors which would lead to higher excess capacity.

Furthermore, the presence of foreign suppliers for a sustained period of time may discourage investment by local firms and impede capacity expansion.

On the other hand, the threat of foreign competition may lead local firms to utilize a strategy of expanding facilities to act as a barrier to foreign entry. We can conclude, therefore, that excess capacity should be higher in industries facing the greatest degree of foreign competition.

IV. The Model and Variables

The empirical investigation of the determinants of industrial capacity utilization involves a sample of 35 U. S. manufacturing industries defined at a three and four-digit level of aggregation. The decision as to which industries to include in the analysis was dictated primarily by the availability of capacity utilization data from the McGraw-Hill Economics Research Division. Utilizing linear multiple regression analysis, variations in the degree of capacity utilization (CU) across industries will be explained by variables that capture the effects of domestic monopoly power and international influences. The proposed model can be summarized as follows:

$$(1) \text{ CU} = f(\text{ Domestic Market Variables, Foreign Factors})$$

In the case where only the domestic market structure variables were included we utilized the following formulation of the model:

$$(2) \text{ CU} = f(\text{ CR, (CR)}^2, \text{ GD, PCD, K/O })$$

In the above expression, the primary measure of market structure is the degree of seller concentration, (CR). Tight oligopolies would be characterized by high levels of concentration, while atomistic industries would be characterized by low to moderate levels of concentration. If tight oligopolies do adjust capacity smoother than other industries the concentration variable would be expected to have a negative sign. Since as argued earlier, excess capacity may be more prevalent in partial oligopolies than in tight oligopolies

or atomistic industries, the relationship between excess capacity and seller concentration may be non-linear in nature. In order to account for this possibility the seller concentration variable is also entered into the equation as a squared term. Data for this variable were obtained from the Census of Manufactures, summary statistics.

Included also in the model is a variable to account for differential growth rates in demand across the sample industries, (GD). This variable was calculated as the percentage increase in industry value of shipments between 1963 and 1966. It is expected that, other things equal, industries experiencing greater growth would have less excess capacity. The data for the construction of this variable were also obtained from the Census of Manufactures.

Excess capacity is also expected to differ in producer goods industries as opposed to consumer goods industries. Consumer goods firms expect frequent product variation and thus build capacity which is flexible and adaptable to various types of production activities. Producer goods industries, on the other hand, more often produce to specification and utilize more standard and non-adaptable types of capacity. Moreover, since producer goods industries is standardized, firms may lose customers if they are unable to supply them during periods of peak demand. Thus, these industries have an incentive to maintain capacity in excess of what might be required during normal demand periods. Thus producer goods industries are expected, other things equal, to have higher levels of excess capacity than consumer goods industries. In order to account for this difference a dummy variable taking a value of 1 for producer goods and 0 for consumer goods was entered into the model (PCD).

Finally, cross industry differentials in excess capacity are likely to be related to differentials in capital intensities. In capital intensive industries investment is likely to be "lumpy" and the capital stock may need to be expanded by an amount greater than necessary to meet current demand requirements. Furthermore, it may be necessary in these industries to construct capacity ahead of demand due to the time required to construct additional capacity. Finally, once the capacity is in place it is difficult to reduce it quickly when demand declines. For these reasons, one would expect a positive relationship between excess capacity and capital intensity.

On the other hand, because capital intensive firms have very high ratios of fixed cost to variable cost it is imperative for them to maintain as low a degree of excess capacity as possible. Firms in these industries are thus more likely to adjust prices more quickly to changes in demand in order to maintain adequate levels of sales. Under this assumption capital intensity would be expected to be negatively related to excess capacity.

In order to account for differing capital intensities across the sample industries the capital output ratio was included in the regression model (K/O). The data for this variable were obtained from the Annual Survey of Manufactures published by the Bureau of the Census.

The expectation on the signs of the coefficients of the domestic market structure variables based on the hypotheses developed in the previous sections may be summarized as follows:

concentration ratio (CR)	> 0
squared concentration (CR) ²	< 0
growth in output (GD)	< 0
producer-consumer dummy (PCD)	> 0
capital-output ratio (K/O)	

In addition to investigating the role of domestic market factors in affecting the extent of capacity utilization in U.S. manufacturing industry the role of a number of international factors was also considered. The effect of foreign factors on excess capacity was examined by adding alternative combinations of foreign variables to the basic model expressed in equation (2). The variables designed to capture the influence of international factors on industry capacity utilization are:

MN = index of multinational activity. A measure based on data for Fortune's 500 largest industrial corporations that estimates the percentage foreign component of total economic activity for the largest firms within an industry. Foreign content was measured by either one or a combination of the following factors: sales, earnings, employment, or production abroad.

M/INP = index of input import dependence. Indicates imported inputs as a percent of total industry input requirements, and was obtained from the U. S. input-output table.

DX, DM = indicate the rate of growth of exports and imports respectively.

X/VS = the ratio of exports to domestic value of shipments indicating the extent to which an industry has been exploiting exporting opportunities.

M/VS = the ratio of current imports to domestic value of shipments, introduced as a proxy for the degree of foreign competition.

T = the nominal tariff rate.

NTB = a non-tariff barrier proxy defined as the percent of commodities subject to non-tariff barriers within each industry commodity category.

DXVS, DMVS = is the rate of growth of the export share (X/VS) and import share (M/VS) respectively.

V. Statistical Results

The results of statistical estimation of various regression equations relating the degree of excess capacity to alternative combinations of independent variables is presented in Table 1. Equations (1) and (2) include only domestic structure variables, while equation (3) through (6) contain additional variables which represent various formulations of the foreign factors. For each of the equations estimated the variable coefficient is presented along with the "t" statistic associated with it in the parenthesis below. The associated coefficient of determination (R^2) and the F statistic for each equation is also presented.

Inspection of Table 1 indicates that the coefficients for the domestic market structure variables generally possess the hypothesized signs, and in most cases are significant at the 10% level or better. Perhaps most interesting is the significance of the concentration variables and the negative sign associated with the squared concentration term. The significance of the squared term suggests that the relationship between market structure and excess capacity is indeed one of a quadratic nature. More specifically, the negative sign associated with this variable implies that a greater degree of excess capacity arises in industries which have moderate to substantial concentration: the so called partial oligopolies. Lower levels of excess capacity are seen to exist in atomistic and tight oligopoly industries. Solving equation (1) for its maximum value can provide an indication of the critical level of seller concentration. The solution to this problem yields a critical level of seller concentration equal to 47%. When concentration exceeds 47%, further increases in CR tend to decrease excess capacity, while when concentration falls short of 47%, increases in concentration tend to increase excess capacity.

Table 1: Regression Equations Relating Excess Capacity to Domestic
Market Variables and Foreign Factors

Equation	Intercept	CR	(CR) ²	GD	PCD	K/O	MN	M/INP	DX	DM	X/VS	M/VS	τ	NTB	DNVS	DMVS	R ²	F
(1)	-6.55 (1.15)	.653 (2.52) ***	-.007 (2.70) ***														.195	3.88
(2)	-4.53 (.749)	.668 (2.41) **	-.007 (2.59) ***	-.067 (1.46) *	2.67 (1.41) *	-.019 (1.28)											.283	2.28
(3)	-2.14 (.347)	.590 (2.07) **	-.006 (2.17) **	-.045 (.678)	2.68 (1.35) *	-.013 (.809)	-.148 (1.34) *	.042 (.312)	-.027 (1.61) *	-.0029 (.195)							.382	1.71
(4)	-4.75 (.768)	.654 (2.28) **	-.007 (2.39) **	-.019 (.357)	3.81 (1.80) **	-.099 (1.35) *	-.075 (.680)	.023 (.145)			-.300 (1.54) *	.131 (.495)					.385	1.74
(5)	.334 (.0426)	.499 (1.58) *	-.005 (1.68) *	-.029 (.525)	3.96 (1.87) **	-.024 (1.47) *	-.110 (.982)	.084 (.627)			-.292 (1.48) *	-.146 (1.07)	.026 (.715)				.416	1.71
(6)	-2.22 (.358)	.585 (2.05) **	-.006 (2.16) **	-.073 (1.31) *	2.83 (1.42) *	-.012 (.753)	-.152 (1.37) *	.048 (.361)							-.033 (1.58) *	-.002 (.113)	.380	1.70

The other domestic structure variables perform as expected. Excess capacity is negatively related to growth in demand and positively related to producer as opposed to consumer goods. Both of these coefficients are significant at a 10% level or better. The capital-output ratio displays a negative sign, but it is rarely statistically significant. This negative sign, nonetheless, suggests that industries with high fixed to variable cost ratios attempt to minimize under utilization of capacity.

Table 1 also indicates that foreign factors provide substantial influence on the degree to which industries achieve full capacity utilization. The coefficients for the multi-national variable are negative, as hypothesized, as in most cases significant at the 10% level or better. This suggests that "vertical" and or "horizontal" investment provide firms with the earlier indicated advantages in achieving full capacity utilization.

The various formulations of the exporting opportunities variable and the import competition variable also appear to be significant in explaining industry differentials in excess capacity. The export share variable and the growth rate in exports variable both display negative signs and are significant at the 10% level or better. Exporting, thus, does appear to provide additional demand which allows firms to more fully utilize capacity. The results for the import competition variables were not as impressive. Although the import share variable has the hypothesize positive sign it is not statistically significant. The growth rate in imports variable even has an unexpected negative sign, but it is not statistically significant. The poor performance of the import variables may be explained by the time period over which this study was conducted. During the earlier 1960's import competition for most industries in the U. S. was much less than that experienced today. For example, imports amounted to roughly 5% of Gross National Product during this time period. Today imports amount to close to 10% of Gross National

Product. The impact of import competition on excess capacity is thus probably more significant than is indicated by the regression results presented.

VI, Conclusion

This paper has investigated the role of international trade and multinational investment along with traditional market structure variables on domestic industry excess capacity. The results obtained, based on a sample of U. S. manufacturing industries, provide considerable support for the hypothesis that domestic market structure influences industry excess capacity. In particular, we observe that a greater degree of excess capacity arises in industries which have moderate to substantial concentration (partial oligopolies), that experience slow growth of demand, that sell mainly producer goods and that are characterized by high fixed to variable cost ratios.

When we turn to the influence of international factors, the evidence indicates that the exploitation of exporting opportunities and the multinational expansion of domestic firms effectively reduce excess capacity while no definite conclusion can be reached regarding the role of potential or actual foreign competition in affecting capacity utilization of local firms with the data at hand.

References

1. Blattner, N., "Domestic Competition and Foreign Trade: The Case of the Excess Capacity Barrier to Entry", Zeitschrift für Nationalökonomie, Vol. 33, No. 3-4, 1973, 403-412.
2. Cooper, R. A., Hartley, K. and Harvey, C.R.M., Export Performance and the Pressure of Demand- A Study of Firms, Allen & Unwin, London, 1971.
3. Peacock, A. T., and Wiseman, J., eds. Export Performance and the Pressure of Demand, Allen & Unwin, London, 1970.
4. Wenders, J. T., "Excess Capacity as a Barrier to Entry", The Journal of Industrial Economics, Vol. 20, No. 1, November 1971, 14-19.
5. Winston, G. C., "Capital Utilization in Economic Development", The Economic Journal, Vol. 81, No. 321, March 1971, 36-60.
6. Winston, G. C., "The Theory of Capital Utilization and Idleness", Journal of Economic Literature, Vol. 12, No. 4, December 1974, 1301-1320.
7. Winston, G. C., "The Reasons for Idle Capital", Research Memorandum No. 52, Center for Development Economics, Williams College, May 1971.
8. Phillips, A., "Measuring Industrial Capacity and Capacity Utilization in Less Developed Countries", U. N. Industrialization and Productivity Bulletin, No. 15, 1970, 16-21.
9. Merhav, M., "Excess Capacity-Measurement, Causes and Uses", U. N. Industrialization and Productivity Bulletin, No. 15, 1970, 22-48.
10. ErSelcuk, M., "Case Studies of the Causes of Excess Capacity in Industry", U. N. Industrialization and Productivity Bulletin, No. 15, 1970, 49-53.

APPENDIX

OPERATING RATE AT END OF YEAR

<u>SLC #</u>		<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>Preferred Rate At End of Year 1965</u>	<u># of Companies</u>
002	Dairy	76%	80%	83%	81%	81%	88%	6
003	Canning	82	84	88	85	79	87	8
008	Beverages	79	83	85	89	85	94	12
025	Knitting Mills	85	85	87	90	92	89	9
043	Millwork Veneer Plywood	82	94	90	87	85	94	7
025	Structural Clay Products	70	75	78	84	78	92	15
043	Heating Apparatus	74	76	85	86	90	94	9
053	Construction & Mining Machy.	77	83	89	92	79	97	17
058	Service Industry Machinery	83	87	88	89	92	93	6
063	Household Appliances	74	79	80	84	90	88	9
074	Railroad Equipment	68	73	81	94	96	97	8
091	Jewelry	76	82	76	85	93	94	5
001	Meat Products	81	83	90	80	81	92	7
004	Grain Products	84	82	84	85	82	97	6
005	Baking Products	73	81	76	80	83	91	6
006	Sugar	83	79	89	85	90	95	5
007	Confectionary	78	93	92	88	83	88	5
027	Floor Covering Mills	76	89	91	93	89	96	5
051	Household Furniture	77	83	85	88	82	91	10
083	Drugs	87	80	82	86	89	90	12
014	Footwear	88	85	87	89	89	93	6
024	Cement	75	74	80	87	82	87	8
027	Concrete & Gypsum	75	75	78	84	78	92	15
031	Blast Furnaces & Steel	80	76	94	80	83	96	16

C #.		1962	1963	1964	1965	1966	Preferred Rate at End of Year 1965	# of Companies
1	Metal Cans	84	90	90	86	85	90	5
1	Engines & Turbines	73	73	80	96	95	95	8
2	Farm Machinery	67	77	74	89	90	94	7
4	Metalworking Machinery	78	81	87	90	93	92	28
7	Office Computing & Acctg. Machinery	87	84	90	95	96	94	8
5	Radio, T.V. & Phonograph	82	89	90	84	89	90	15
3	Ship & Boat Building	51	59	64	68	78	90	9
1	Cigarettes	85	88	92	91	80	95	7
1	Petroleum Refining	91	90	91	94	94	98	21
1	Tires (rubber)	95	92	96	96	95	93	7
1	Motor Vehicles & Equip.	88	89	95	96	90	99	14