REDUCING TRANSACTION COSTS THROUGH INVESTMENT

IN MULTINATIONAL CORPORATIONS

By

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Scope and Method of Study: This study examines the possibility of
    reducing transaction costs through investment in multinational
    corporations (MNCs). It is hypothesized that to attain a level of
    total risk equivalent to the U.S. market, fewer stocks of MNCs
    will be required as compared to stocks of purely domestic
    corporations. The study covers three time periods. The risk
    reduction characteristics of three categories of portfolios are
    analyzed. The first category consists of portfolios made up of
    purely domestic stocks. The second, of portfolios consisting of
    stocks of MNCs. And the third, of portfolios made up of stocks of
    ongoing multinational corporations (OMNCs), i.e., MNCs that
    continued to be MNCs through the entire test period. Total risk
    reduction is measured in terms of the number of stocks required to
    reach the market level of risk. Risk reduction is also analyzed
    in terms of the systematic and unsystematic components of total
    risk. Also, the risk/return performance of the three groups of
    portfolios is compared using the coefficient of variation.

Findings and conclusions: The findings of this study supported
    the primary hypothesis. As few as three stocks of ongoing
    multinational corporations were required to reach the market level
    of risk in one time period. In the same time period, seventy-five
    stocks of domestic corporations had a higher total risk than the
    market. An investor could thus reduce transaction costs by
    investing in a few stocks of multinational corporations, but at
    the same time, have portfolio risk equal to or less than the
    market. In all the time periods, MNC and OMNC portfolios
    consisting of more than 25 stocks had a total risk well below the
    market risk level. The risk reduction pattern of domestic
    portfolios was found to be significantly different from the risk
    reduction patterns of MNC and OMNC portfolios in two time periods.
    There were however, no significant differences in the risk
    reduction patterns of MNC and OMNC portfolios. The risk/return
    performance of domestic portfolios was generally better than MNC
    or OMNC portfolios. These differences, however, were significant
    in only one time period.

ADVISOR'S APPROVAL: _H.H. Brewer_____

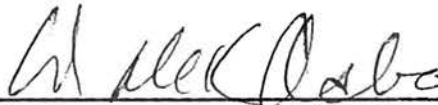REDUCING TRANSACTION COSTS THROUGH INVESTMENT

IN MULTINATIONAL CORPORATIONS

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CHAPTER I

INTRODUCTION

It is now well established that the risk associated with any investment is made up of two components. One component is attributable to overall market fluctuations and has been variously termed market risk or systematic risk or nondiversifiable risk. A second component is due to factors that are unique to the particular investment and is termed unique risk or unsystematic risk or diversifiable risk.

By holding a portfolio of investments, the unique risk associated with each of the investments comprising the portfolio can be reduced. By careful choice of investments, unique risk can be mostly eliminated. Thus, the risk of a well-diversified portfolio can be measured by its market risk. This is a fundamental principle of modern portfolio theory.

Market risk has also been shown to consist of two components. One, called domestic market risk, is associated with the economic environment of a particular country. The other, termed international market risk, is associated with worldwide economic conditions.

The economic conditions of the various countries in the world have been shown to be less than perfectly correlated with each other. Hence, through the process of international diversification, i.e., by holding a portfolio of both foreign and domestic stocks, it is possible for an investor to eliminate a part of the domestic market risk. By doing so, the investor would be left, at least in theory,

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with only the international market risk. This would represent the nondiversifiable risk; no amount of diversification will ensure that a portfolio will not react and move with the changes in the state of the world economy.

Unfortunately, for most individual investors, international diversification is subject to many restrictive and sometimes prohibitive barriers.[1] The investor has to consider the omnipresent foreign exchange risk, as well as the risk of expropriation of foreign holdings by a country. Many stock markets abroad are effectively closed to foreign investors, or are markets in countries from which funds cannot be removed. Also to be considered by the investor are the huge search and monitoring costs involved in international diversification. Timely and accurate information about the movements of foreign stocks is usually not easily obtainable.

If an investor could somehow indirectly obtain the benefits of international diversification without having to face these problems, it would be very beneficial. The finance literature discusses three ways by which a U.S. investor might possibly achieve the benefits of international diversification indirectly:

(a) By holding stocks of foreign corporations traded on U.S. financial markets;

(b) By investing in a mutual fund that holds an international portfolio; and,

(c) By holding a portfolio of stocks of U.S. based multinational corporations (hereafter referred to as MNCs).

This study reviews the literature on each of these three avenues and conducts empirical tests on the MNC avenue to indirect international diversification.

Several researchers in this area have recognized the fact that MNCs achieve greater stability of operations, earnings, etc., due to their operations being spread over several countries. While exporting reduces the variability of only consolidated sales revenues, direct foreign investment provides stability to both consolidated sales and costs of production.

Theoretically, it would seem that portfolios made up of stocks of MNCs (hereafter called multinational portfolios) should not only be able to diversify some of the national market risk, but should also be able to reduce unsystematic risk quicker than purely domestic portfolios (portfolios made up of stocks of corporations with no or insignificant foreign operations).

The logic behind this argument is that the countries in which MNCs operate have economies that are less than perfectly correlated with each other. Consequently, the returns on the stocks of MNCs should not be highly correlated with each other. The mathematics of portfolio variance are such that the lesser the positive correlation between the investments that make up the portfolio, the greater the degree of portfolio diversification. Thus, portfolios consisting of less correlated investments have lesser total risk than portfolios consisting of more highly correlated investments.

With multinational portfolios reducing both unsystematic risk and domestic market risk, it seems possible that a fewer number of MNC stocks would be necessary to achieve the same level of total risk reduction that would result from holding a given number of purely domestic stocks. This project is designed to investigate this possibility.

If the results of the study support the above hypothesis, they would be of value to an individual investor who would benefit by having to hold a portfolio consisting of fewer securities to achieve a given level of risk diversification. This would result in lower transaction costs and lower management costs for the investor, thereby improving the net return from the investment.

CHAPTER II

LITERATURE REVIEW

The past research that has investigated diversification is reviewed below in three sections. The first section reviews the research on portfolio diversification in general; the second section, the research on international diversification; and the third, the research on indirect international diversification.

Portfolio Theory

The elements of modern portfolio theory were developed from a series of propositions concerning rational investor behavior set forth by Markowitz (1952) and later expanded into book form (1959). The central theme of Markowitz's work is that rational investors should conduct themselves in a manner which reflects their inherent aversion to absorbing increased risk without compensation by an adequate increase in expected return. This indicates that for any given expected rate of return, where the expected return is a probability weighted mean, investors will prefer a portfolio containing minimum expected deviation of returns around the mean. Thus, risk was defined by Markowitz as the uncertainty or variability of returns, measured by the standard deviation of expected returns about the mean. This was a pioneering work in the effort to quantify investment risk for portfolio planning purposes.

Building on Markowitz's contribution, Sharpe (1963) suggested that variation in portfolio return could be divided into two components. One, systematic variation, results from the covariation of the returns on the individual investments with the market return. The other, unsystematic variation, is attributable to the peculiarities of the individual investments themselves; i.e., it is that portion of the variation of an investment's return that is not attributable to the variation of the market return. If the covariation between individual investment returns arises solely as a result of their common correlation with the market return, it follows that the reduction in variation of a portfolio return resulting from increased diversification must be entirely a function of the reduction of the unsystematic portion of the total variation.

Evans and Archer (1968) examined the rate at which the variation of returns for randomly selected common stock portfolios is reduced as a function of the number of securities included in the portfolio. They were concerned with obtaining the minimum number of securities to include in a portfolio in order to provide variability comparable to market variability. By determining the minimum number of securities necessary to obtain this goal, one could then avoid the unnecessary transaction costs associated with further diversification.

Evans and Archer found that much of the unsystematic variation is eliminated by the time the eighth security is added to the portfolio. They found that the addition of one security to a portfolio of size two caused significant reduction at the .05 level in the mean portfolio standard deviation; for portfolios of size eight, the necessary increase for significant reduction was 19 securities; and

for portfolio sizes greater than 19 securities, no significant reduction was possible within 40 additional securities.

Thus, Evans and Archer concluded that the relationship between the number of securities included in a portfolio and the level of portfolio diversification appears to take the form of a rapidly decreasing asymptotic function, with the asymptote approximating the level of systematic variation in the market. They thus raised doubts concerning the economic justification of increasing portfolio size beyond 10 or so securities. Latane and Young (1969) verified Evans and Archer's results, finding that an eight stock portfolio achieves 85 percent of the maximum possible benefits of diversification.

Fisher and Lorie (1970) arrived at a similar conclusion by finding that the opportunity to reduce dispersion through increasing the number of stocks in the portfolio is rapidly exhausted. They observed that approximately 40 percent of achievable reduction is obtained by holding two stocks; 80 percent, by holding eight stocks; and 90 percent, by holding 16 stocks.

Despite the above findings, several studies have questioned whether portfolios of only 10 to 20 securities sufficiently reduce variation. Authors of these latter studies contend that Evans and Archer and others did not measure risk properly. The total risk from holding a portfolio, they maintain, is not just the dispersion of the return of the portfolio around its mean, but also the risk associated with the probability that the mean return on the portfolio will be different from the return on the market.

Lorie (1975) argued that even small departures from perfect diversification create substantial amounts of risk. He showed that a

choice of 50 stocks out of the Standard and Poor's 500 index could
produce annual returns that vary by as much as 4.5 percentage points
from the returns for the entire 500 stocks. Even as large a portfolio
as 100 stocks might differ by as much as three percentage points from
the 500 stock index.

Upson, Jessup and Matsumoto (1975) measured the dispersion of
possible portfolio returns around the market return and found that
opportunities for reduction in the range of possible outcomes remain
even after an eight-stock level. They found that, in comparison with
portfolios containing one stock, portfolios containing eight stocks
provided an average reduction in dispersion of 69 percent. However,
when one holds 128 stocks rather than eight, dispersion is reduced 83
percent. Thus, Upson et al. concluded that since increasing the
number of stocks in a portfolio increases one's confidence of
obtaining the market return, professionally managed common stock
portfolios have a strong case for holding many more than eight, or
even sixteen stocks.

Elton and Gruber (1977) compared the weekly variance of
portfolios of different sizes to the variance of an equally weighted
portfolio of 3290 securities selected from NYSE and AMEX, which they
called the EWPP. The EWPP had the minimum total risk as represented
by a variance of 7.07 percent. The maximum total risk was a variance
of 46.81 percent, the average variance of the outcomes of single
security portfolios. As in other studies, these researchers found
that the major decline in variance occurs at very low levels of
portfolio size. For example, the variance of return for 10 security
portfolios was 11.03 percent, one-fourth of what it was for a single

security. Even though this represents a major decrease, the total risk for the 10 security portfolios was 156 percent of the minimum. For actual total risk to be only 20 percent higher than minimum total risk, 28 securities were required; for 10 percent higher, 60 securities; and for five percent higher, 110 securities. Thus, Elton and Gruber concluded that the gains in decreased risk from adding stocks beyond 15 appeared to be significant.

All the studies reviewed to this point investigated diversification by constructing equally weighted portfolios. A few researchers have attempted to reduce the number of securities needed to achieve a given level of diversification by using unequal, but optimal weights. These studies have produced mixed results.

Johnson and Shannon (1974) found that, compared to equal allocation of securities within portfolios, allocations determined by quadratic programming resulted in superior returns for approximately the same variability. Also, fewer securities were necessary to achieve these results, which meant lower transaction costs. Conversely, Lloyd, Hand and Modani (1981) found that optimal weighting did not significantly improve portfolio efficiency.

Tole (1982) attempted to provide justification for increasing portfolio size beyond 16 or so securities by arguing that investors generally do not randomly select securities. Rather, investors construct portfolios based on the recommendations of brokerage firms or investment journals. Since such portfolios might contain securities that were highly correlated with each other, Tole opined, they require a substantially greater number of securities than portfolios of random selection to attain adequate diversification.

His research supported this hypothesis. Tole concluded that an investor who owns a portfolio of securities that have not been randomly selected must own substantially more than the eight to ten stocks suggested in the previous studies such as Evans and Archer's.

Wagner and Lau (1971) studied the risk-return characteristics of portfolios comprised of several high risk securities versus portfolios comprised of smaller numbers of low risk securities. They found that portfolios consisting of large numbers of higher risk securities may be less risky than portfolios consisting of smaller numbers of low risk securities, yet earn a substantially higher rate of return. They concluded that investors with large portfolios could improve their investment performance by expanding their lists of qualified securities to include higher return, higher risk stocks. The increase in the market related component of risk that would result from such an investment policy would be offset by a substantial reduction in the portfolio's unique risk.

Klemkosky and Martin (1975) examined the relationship between systematic and unsystematic risk, and the significance of that association on the process of diversification. They attempted to assess the practical importance of beta (β), the measure of systematic risk, on portfolio diversification by comparing the unsystematic risk of high and low beta stock portfolios containing from two to twenty five securities. These comparisons indicated that the levels of diversification achieved for high versus low beta portfolios for a given portfolio size were significantly different. High beta portfolios required a substantially larger number of securities to

achieve the same level of diversification as a low beta portfolio. This information, concluded Klemkosky and Martin, would be of particular benefit to the investor who seeks maximum diversification with a limited number of securities.

Most studies that decomposed total risk into its systematic and unsystematic components used the variance of the portfolio as the measure of its total risk. Ben-Horim and Levy (1980) proposed an alternate method for such a decomposition using the standard deviation as the measure of total risk. They argued that by defining the risk measures as portions of variance rather than standard deviation, the beta is squared and loses its sign. On decomposing risk for several time periods using standard deviation instead of variance, Ben-Horim and Levy found that systematic risk formed a larger portion of the total risk than found in earlier studies by Sharpe (1963) and others.

The findings of the above researchers have an important impact on the topic of international diversification. In the next section, it is shown that international diversification across nations reduces national systematic risk. If systematic risk does form a large proportion of total risk, it is only logical that international portfolios must provide lower total risk levels as compared to domestic portfolios.

These findings are also important to the topic of multinational diversification. Researchers have found that MNCs generally have lower betas than purely domestic corporations. Klemkosky and Martin's findings could mean that these lower betas might allow a specified level of diversification with fewer securities.

International Diversification

The first published research on international portfolio diversification appeared in 1968. The pioneering work in this area began with studies of inter-country correlations. Grubel (1968) calculated rates of return for several national equity markets as well as the correlations between them. Using monthly data from 1959 to 1966, he estimated the correlation coefficients between markets in the U.S. and other major stock markets. As Table I (Appendix A) indicates, he found very low correlations. Solnik (1973) found similar estimates of the correlations between stock markets for many countries over the time period 1966 to 1971. Another study of the correlation structure between world stock markets between 1959 and 1973 was conducted by Lessard (1975). Solnik's and Lessard's findings are also given in Table I.

While these three sets of correlation numbers are not in perfect agreement, they do suggest a certain degree of stability in inter-market relationships over the time periods studied. More importantly, they suggest that other major world stock markets are not highly correlated to the U.S. market. This has important implications for international diversification, as the advantages of diversification derive substantially from the imperfect correlations between the components of a portfolio.

Watson (1978) calculated the correlation coefficients of the monthly returns for the period January 1970 to December 1971 between the share market indices of seven major countries. He found that inter-country correlation coefficients generally averaged around +0.55. Maldonado and Saunders (1981) examined the inter-temporal

stability of correlations between monthly returns on a U.S. stock
index and four foreign stock indices from the point of view of U.S.
investors over four different time horizons. They found that in the
very short term of up to two quarters, there was a relatively
predictable relationship between inter-country correlations. However,
beyond two quarters, inter-country correlations were generally
unstable. For annual and biennial horizons, they found that they
could not reject the hypothesis that these correlations follow a
random walk. Maldonado and Saunders thus questioned the potential
size of the gains from international portfolio investment for the U.S.
investor.

Lloyd, Goldstien and Rogow (1981) investigated data through 1977
to update previously documented inter-country correlation
coefficients. Their research indicated an increase in inter-country
economic interdependence in the later years. An examination of the
pairwise inter-country correlation coefficients for each of the two
periods (1966 to 1971 and 1971 to 1977) they studied showed that more
than 95 percent of all statistically significant changes in
correlations were in the direction of more positive coefficients.

Lloyd, Goldstien and Rogow concluded that in the past, low
correlations between the markets of different countries might have
made gains from international diversification possible. With the
prospect of a greater number of positive correlations, the gains
realizable through international diversification may be lessened.

Apart from these studies on inter-country correlations, several
researchers have documented the benefits from international
diversification by actually constructing international portfolios.

Solnik (1974) found that in terms of variability of return, an internationally well-diversified portfolio was one-tenth as risky as a typical domestic security, and only half as risky as a well diversified portfolio of U.S. stocks with the same number of holdings. While increasing the size of purely domestic portfolios beyond 20 stocks seemed to achieve only a relatively small incremental reduction in risk, a substantial reduction could still be achieved for an international portfolio of the same size. Even a mutual fund holding 50 different foreign securities was found to benefit from additional holdings.

However, Solnik noted, the advantages of international investment may be somewhat reduced by the possible imposition of exchange controls and capital restrictions on foreign holdings, and the existence of exchange risk, which could be very high in the then current atmosphere of relative monetary instability.

Bergstrom (1975) documented the results of a group of professionally managed pilot portfolios that were internationally diversified. The performance of these portfolios, given in Table II (Appendix A), is quite impressive. The international portfolios achieved returns nearly four times those of the NYSE composite index and also displayed a lower standard deviation.

Levy and Sarnat (1970) demonstrated that a more efficient portfolio could be constructed for an investor who purchases both domestic and foreign stocks rather than just domestic stocks. Lessard (1973), using common stocks from four Latin American countries, showed that international portfolios were superior in a risk/return sense to portfolios that contained stocks from only one country.

Solnik and Noetzlin (1982) found that spreading investments over all major foreign markets decreased risk while enhancing return. Passive diversification along the lines of the Capital International World Stock Index involved less risk than a purely U.S. portfolio and provided a return more than 50 percent higher, even though U.S. stocks made up more than half this index.

Logue (1982) examined the performance of actively and passively managed international portfolios versus the performance of domestic portfolios. His research indicated that active international portfolio management is likely to generate such high transaction costs that any benefits from international diversification would be eclipsed. However, passive international diversification did produce better results than passive investment within the U.S.

Cone and Weaver (1979) contributed to the international portfolio diversification literature by illustrating that there exist not two, but three levels of risk for any security or portfolio. These they termed unsystematic security risk, unsystematic domestic market-related risk, and systematic world market risk.

Cone and Weaver found that the average quarterly wealth relative or holding period return (HPR) of the internationally diversified portfolios ranged between 1.038 and 1.040. Domestically diversified portfolios' average quarterly HPR ranged between 1.029 and 1.031. The average standard deviation of the internationally diversified portfolios ranged between .061 and .065, while for the domestically diversified portfolios the range was between .086 and .090. Cone and Weaver observed that there were three levels of security and portfolio risk, and that the unsystematic world market risk is less than the

unsystematic domestic market-related risk. They wrote that portfolios which are diversified internationally tend to be more efficient in terms of risk and return than are portfolios diversified domestically. Further, "interperiod variation of portfolio returns can be reduced by diversifying internationally without incurring a return penalty. Greater efficiency is realized because what has previously been treated as undiversifiable systematic risk is in fact partially diversifiable at the international level" (Cone and Weaver, pp. 54-55).

Indirect International Diversification

There are several barriers to direct international diversification, especially for individual investors.[2] Several approaches to indirectly obtain the benefits of international diversification have been suggested including:

(1) Investment in foreign securities listed on the home market; (This is to be distinguished from direct international diversification by investing in foreign securities in their respective national markets. The latter involves transactions through the foreign exchange market).

(2) Investment in investment funds with an international orientation; and,

(3) Investment in the stocks of home based multinational corporations (MNCs).

Senchak and Starks (1978) examined the gains in risk reduction and in realized monthly returns from portfolios of foreign securities traded in U.S. markets, as compared to portfolios of domestic stocks. They found that foreign stock portfolios have both an initally lower level of total risk, and a much lower asymptotic level of total risk

than domestic portfolios. It took only a three-stock portfolio of foreign stocks to approximate the same level of total risk as the market portfolio comprised of the entire sample of 212 domestic stocks. However, the portfolio comprised of all the foreign stocks in the sample had a lower geometric mean return per unit of standard deviation than did the domestic stock market portfolio. Conversely, the foreign security portfolios had much lower betas, and a higher return per unit of beta than the domestic portfolios.

Senchak and Starks also measured the rate of variability reduction for the foreign and domestic portfolios. Without Canadian stocks, which seemed to correlate highly with the U.S. market, the foreign portfolios were found to have a considerably higher marginal rate of variability reduction.

Little research has focused on investment funds that hold international portfolios. McDonald (1973) investigated the performance of internationally diversified French mutual funds and found that these funds generally produced superior risk adjusted returns as compared to purely domestic mutual funds. Another study on similar lines was by Farber (1975).

Researchers have shown considerable interest in indirect international diversification through investment in MNCs, perhaps due to the highly practical nature of this approach. MNCs are generally quite large and well established, and their securities can readily be bought and sold. Mixed evidence has been found, however, on whether or not MNCs provide an adequate vehicle for obtaining the benefits of indirect international diversification.

Studies in this latter area are discussed below grouped into four subsections. The first subsection covers allied research which has

contributed to the study of indirect international diversification through MNCs, but which did not make actual comparisons of the portfolio performance of MNCs versus domestic corporations. The second subsection describes studies that have examined only the risk reduction characteristics of multinational and domestic portfolios, without considering the returns from these portfolios. The third subsection covers research that studied both risk and return in this context. The fourth subsection describes a study of the risk reduction of multinational and domestic portfolios as the number of securities is increased.

Allied Research

Kohers (1975) investigated the effect of foreign operations on a firm's cost of capital. He began his study with the assumption that, because of the many added variables to which MNCs are exposed to overseas, the degree of risk typically associated with business operations abroad is higher than that for domestic operations. If this assumption were true it would follow that a company, by entering foreign markets, would have automatically raised its cost of capital. This is a result of the added risk, real or perceived, which is commonly associated with business operations abroad.

Kohers' research, however, indicated that in general, investors do not appear to penalize the stocks of U.S. corporations when their business activities extend beyond U.S. boundaries. A grouping of his results by industry showed that there was no significant difference in the cost of capital to MNCs versus domestic corporations in the same industry. An exception was the Chemical and Allied Products industry, where multinational firms incurred significantly higher costs of capital.

Kohers concluded that companies can continue to invest overseas without fear of being penalized for such action by investors.

Brewer and Miller (1979) examined whether international economic events affect multinational and domestic firms differently. They examined the effect of two events that occured in 1971-72: (a) the change from a fixed exchange rate system to a variable system based on foreign exchange market forces; and (b) the decline in the value of the U.S. dollar in relation to other major currencies.

Their results suggested that international economic events do affect MNCs and domestic firms differently. Investors' perceptions of the riskiness of MNCs, as indicated by beta seemed to have increased, relative to domestic firms, in the post-1973 period. On the other hand, returns to MNCs adjusted upward compared to nationals following the move to floating exchange rates. This finding, Brewer and Miller concluded, lends support to the notion that investors perceive MNCs to be better able than domestic firms to provide positive real returns during periods when the national currency value is deteriorating.

Wansley, Lane and Yang (1983) attempted to determine whether the U.S. equity markets react to foreign merger bids differently than to domestic merger bids. In the presence of barriers to investors in achieving direct international diversification, they argued, international mergers should benefit the acquiring company's owners by indirectly diversifying internationally. This may result in higher premiums being offered to the acquired company's shareholders. Their research indicated that although foreign acquirers did appear to reward shareholders of U.S. acquired companies with larger premiums

than domestic acquirers, these differences were not statistically significant.

Studies analyzing Risk Reduction

Several researchers have studied the possible benefits of risk reduction from holding portfolios of MNC stocks versus portfolios comprised of purely domestic stocks.

Rugman (1976) found that there was an inverse relationship between profit variability and the percentage of foreign sales in the 1960-1969 period, based on data for the 500 largest U.S. corporations. He regressed the variance of the rate of return on capital against a measure of multinational activity and found a negative relationship which was significant at the .01 level. This, he opined, implied that multinationality reduced profit variance, thus lowering risk.

Rugman concluded from this study that international diversification by otherwise domestic corporations may benefit the risk-averse investor who, because of barriers to free movement in the international capital markets such as the interest equalization tax in the U.S., could not directly diversify internationally.

Aggarwal (1979) extended Rugman's results to 1974. He too, observed a significant relationship between multinationality and risk. This study focused on the systematic component of risk as measured by beta. His results appeared to indicate that, when measured from the domestic investor's point of view, the U.S. capital market in 1974 rewarded an increasing proportion of multinational activity by a reduction in systematic risk and also a proportional increase in the price/earnings ratio for such companies. Aggarwal concluded that

the multinational activities of U.S. companies seem to offer U.S. investors advantages not available to them by investing in purely domestic companies.

Barone (1983) sought to extend Rugman's and Aggarwal's findings to the 1974-1979 period. Barone opined that since the world appears to have changed structurally in the last half of the 1970s, investor perceptions regarding risk and international diversification may have altered significantly. He pointed out three factors to corroborate this view:

(1) On January 1, 1977, the FASB required that all exchange gains and losses be included in the income statement for the period in which the exchange rate changed (FASB No. 8). Prior to this, a MNC could use a reserve to cushion the swings in earnings caused by exchange rate fluctuations. Although this was only a change in accounting practice, Barone argued, the reported earnings of MNCs may have appeared to be more volatile to investors.

(2) By 1979, 28 percent of U.S. foreign direct investment was in less developed countries (LDCs) as opposed to 18 percent in 1974. Political risk in the LDCs is generally recognized to be higher than in developed countries. Thus, the trend toward investment by multinationals in LDCs may have increased investors' risk perceptions.

(3) Increasing economic integration may have raised the correlation between economic swings in world economies in the late 1970s. The energy crisis and rising energy prices, for example, caused sharp industrial production decreases in every major industrialized country in 1974. This was in marked contrast to the mostly countercyclical

nature of the U.S. and European industrial economies prior to that period.

Barone hypothesized that for these reasons, international diversification of U.S. corporations during the 1974-79 period exerted less influence on investor perceived risk. During this period, the positive benefits from international diversification by a MNC may have been outweighed by an increase in the perceived level of absolute risk. His results, however, indicated that over the 1974-79 period taken as a whole, a greater degree of multinational operations was associated with higher price/earnings ratios.

When the data was disaggregated and the analysis performed year by year, the relationship between multinationality and systematic risk appeared to have deteriorated over time. By 1979, there was almost no significant relationship between international diversification and market behavior. Barone thus concluded that increasing international economic integration in the last half of the 1970s may have eroded any risk reduction benefits that multinationals were providing to investors during earlier periods.

Agmon and Lessard (1977) reasoned that there are barriers or costs to portfolio capital flows between countries which are higher than barriers or costs to capital flows from direct investment. Further, the flexibility of the MNC in shifting resources among its operating units suggests that even when the barriers are nominally the same, direct investment flows will be freer than portfolio flows. Agmon and Lessard investigated the existence of a diversification motive for expansion of multinational activities by testing whether investors appeared to recognize the diversification opportunities

provided by MNCs. They studied the relationship between share-price behavior and the extent of foreign involvement and found that the return on portfolios with foreign involvement was highly correlated with the return on a world index. This world index did not include the U.S. market. They also found that the higher the level of foreign involvement, the more significant the correlation of portfolio return with the world index. Agmon and Lessard concluded that the U.S. market recognizes the geographically diversified nature of MNCs as well as the extent of their foreign involvement.

Errunza and Senbet (1981) hypothesized that MNCs have special advantages in the financial sector which are quite analogous to monopoly rents in the real sector. Therefore, if the U.S. market is functioning efficiently, investors must accept a smaller equilibrium expected return on multinational stocks than on otherwise equivalent domestic stocks. They found that: (a) the current degree of international involvement, proxied by the foreign sales percentage, is positively and significantly related to excess market value;[3] (b) the growth in international involvement is also positively related to excess market value but is not a significant variable except in association with the current level of international involvement; and (c) the relationship between international involvement and excess market valuation is stronger during periods characterized by U.S. restrictions on capital flows in comparison to periods devoid of such barriers.

In contrast to the above studies, Jacquillat and Solnik (1978) actually constructed multinational and domestic portfolios to compare their riskiness and examine whether investment in MNCs presents the

same characteristics as international portfolio diversification. They found that the variability of returns, as measured by the standard deviation, of multinational portfolios was usually 90 percent of that of a purely domestic portfolio of the same size. In contrast, international portfolios of similar size had a risk of only 30 to 50 percent of the risk of a domestic portfolio. Further, they observed, the extent of the foreign influence on MNC stock prices appears unexpectedly limited compared to the extent of the MNC's foreign involvement. MNC stock prices, Jacquillat and Solnik reported, do not seem to be extensively affected by foreign factors and behave much like the stock prices of purely domestic firms. They concluded that although multinationals do perform some international diversification for the investor, they are poor substitutes for international portfolio diversification.

Studies that considered Risk and Return

Hughes, Logue and Sweeney (1975) attempted to determine whether the total variability of returns for MNCs is less than, equal to, or greater than the risk of otherwise similar domestic firms in terms of size, product diversification, etc. They also compared MNCs and domestic firms with respect to the systematic and unsystematic components of risk. Further they analyzed the relative performance, on a risk/return basis, of the two types of firms.

Hughes, et al., studied 46 MNCs and 50 domestic firms during the period 1970 to 1973. They found that the returns on MNCs were higher than the returns on purely domestic firms. Similarly, measures of systematic risk for MNCs were significantly lower than the comparable

measures for domestic firms. The distribution of measures of unsystematic risk were also significantly lower for MNCs. Their major findings are summarized as follows: (1) Irrespective of the index used, MNCs have lower systematic risk, lower unsystematic risk, and hence lower total risk; (2) MNCs' average returns were higher than returns on comparable domestic firms; (3) when betas are computed using a domestic market index, the risk-adjusted performance of MNCs exceeded that of comparable domestic firms; and, (4) when betas are computed using a world index, the performance of MNCs and domestic firms was quite similar. Hughes , Logue and Sweeney concluded that investors correctly perceive the diversification benefits of shares of MNCs, and that such firms do indeed provide something for investors.

Kohers (1976) examined the effect of foreign expansion on a company's risk/return performance in various industries. He studied 52 MNCs and 51 domestic corporations for the period 1963-1972. These firms were grouped into seven industries. Kohers' results are shown in Table III (Appendix A). Kohers found that at the .05 significance level, no statistical differences existed in total risk between MNCs and domestic corporations within any industry. An examination of returns revealed that only the MNCs in the Chemical and Allied Products Industry had a significantly higher return than their domestic counterparts. No statistically significant differences existed in the risk/return of any of the other six industries as well as between all MNCs and domestic corporations.

Kohers concluded that expansions into foreign markets did not appear to have any negative impact on the risk/return performance of corporations. Consequently, he suggested that investors in MNCs need not fear that overseas operations will have a negative effect on the

MNCs' risk/return composition.

Mikhail and Shawky (1979) compared the returns and the risk-adjusted return of multinational portfolios to the S&P 500 index. They found that, measured only by return, MNCs outperformed the average market (proxied by the S&P 500 index) 69 percent of the time. Of the thirty-two quarters Mikhail and Shawky studied, MNC returns exceeded those of the S&P 500 index in twenty-two. They also examined the variability of the returns of both the MNC sample and the S&P index as measured by the standard deviation and the coefficient of variation. Their results are given in Table IV (Appendix A). From Table IV, it can be observed that though the mean return for the MNCs are consistently higher than the S&P means returns, the coefficient of variation as a measure of relative dispersion is not systematically higher for MNCs than for the S&P 500 index. This is surprising, Mikhail and Shawky noted, since theory suggests that if returns for MNCs are consistently higher than the S&P index, their risks should also be consistently higher than the S&P index. They concluded that the risk-adjusted performance of MNC stocks is somewhat superior to the performance of the average market.

Brewer's (1981) study not only supported the conclusions of Jacquillat and Solnik (1978), but also challenged previous findings that MNCs' performance was superior to that of domestic corporations in a risk/return sense. Brewer hypothesized that there is no difference in the risk-adjusted performance of MNC and domestic stocks. His empirical tests, involving stocks of 151 MNCs and 137 domestic corporations, failed to disprove his hypothesis. There was no statistically significant difference in the risk-adjusted

performance of MNC and domestic stocks. He thus concluded that MNCs provided no discernible advantage over domestic firms with respect to an investor's quest for the risk/return benefits of international portfolio diversification.

Logue (1982) studied active and passive portfolio management using stocks of the 50 largest U.S. based MNCs, foreign stocks, and the NYSE index. He compared the portfolio performance of actively managed multinational portfolios with the performance of portfolios made up of foreign stocks bought in their national markets (direct international diversification). From a risk/return point of view, the actively managed portfolios of MNC stocks performed slightly better than the actively managed portfolios of foreign stocks. Moreover, the international and MNC portfolios both dominated passive investment in the NYSE index.

Logue pointed out that most portfolios are actively managed. In his study, the active management of international portfolios often resulted in frequent movement of capital across country borders. This strategy would generate transaction costs so high that any advantages to international diversification might be eliminated. Thus, Logue argued, if portfolios are to be actively managed, multinational stocks provide better investments than even foreign stocks.

Studies of the Speed of Diversification

A study by Senchak and Beedles (1980) examined the speed and extent of diversification benefits from MNCs compared to randomly selected domestic firms. Senchak and Beedles studied 240 industrial MNCs during the period 1973-1976. For comparison, they selected random samples of firms from the CRSP tapes, excluding their list of

multinationals. Their study revealed that while the average return on multinational and domestic portfolios was virtually the same, the standard deviation of the fully diversified multinational portfolio was larger than the standard deviation of a portfolio of domestic securities of equal size and systematic risk.

Senchak and Beedles also found that for portfolio sizes greater than 5, beta equivalent domestic portfolios generally had a lower level of total risk as compared to multinational portfolios. They also found that as portfolio size increased, domestic portfolios diversified unsystematic risk faster than multinational portfolios. Senchak and Beedles concluded that MNC stocks do not appear to provide diversification benefits comparable to those provided by domestic stocks.

To summarize, Brewer (1981) found no significant difference in the performance of multinational and domestic portfolios. Senchak and Beedles (1980) found that though the return on multinational and domestic portfolios was approximately the same, multinational portfolios had a higher standard deviation than beta-equivalent domestic portfolios. Other researchers, including Hughes, Logue and Sweeney (1975), Mikhail and Shawky (1979), and Logue (1982) claim that the performance of multinational portfolios is superior to that of domestic portfolios. The fact whether MNCs provide an indirect vehicle to international diversification therefore continues to remain controversial.

Even if multinational portfolios do not perform any better than domestic portfolios, there may exist yet another reason to invest in MNC stocks. If MNCs can provide a given level of diversification with

fewer stocks as compared to domestic corporations, investment in MNCs could mean a reduction in transaction and management costs. This in turn, means a higher net return on investment. It is this dimension of multinational diversification that this study seeks to explore.

CHAPTER III

METHODOLOGY

Purpose of this Study

The present study examines the degree of diversification of multinational portfolios compared to domestic portfolios in the same vein as Solnik's (1974) study involving international portfolios. The degree of diversification is measured in terms of the number of stocks required to reach the U.S. market level of risk. Risk reduction, as the number of securities in a portfolio increases, is also examined in terms of the systematic and unsystematic components of risk.

Hypothesis

It is hypothesized that to reduce portfolio risk to the level of risk of the U.S. market, fewer stocks of multinational corporations will be required as compared to stocks of domestic corporations.

Definitions

Multinational Corporation

Past studies have used varying definitions of a MNC as delineated below.

Logue (1982) chose the 50 largest MNCs in the U.S. for his study, based on a listing in Forbes magazine. Forbes lists the largest 125

MNCs in the U.S. on the basis of the dollar amount of their foreign sales.

Vaupel and Curhan (1973) identified 187 MNCs using the following criteria: (1) a MNC must hold equity interests in manufacturing firms located in six or more countries outside the U.S. Such equity interest should amount to at least 25 percent of the total equity of the firm; and (2) a MNC must not be a subsidiary of some other corporation.

Bruck and Lees (1968) classified firms with foreign operations in the following manner: (1) MNCs are defined as corporations with more than 50 percent of their business, i.e., sales, earnings, employment, or production outside the U.S.; (2) internationally oriented companies are defined as those with 25 to 50 percent of their business overseas; and (3) firms with significant foreign operations are defined as those with 10 to 24 percent of business overseas.

It appears that most researchers have used foreign sales as a proxy for measuring the degree of international involvement. The proportion of foreign sales that makes a firm multinational, however, has differed from study to study.

Errunza and Senbet(1981) found that foreign assets or earnings were insignificant as proxies for current international involvement. This, they explain, is due to the fact that the reported foreign net asset and net earnings figures are outcomes of the home and host country accounting conventions, translation procedures used by the MNC, and inter-company allocations. Thus, net asset and earnings figures are somewhat arbitrary, and may not even be comparable across the subsidiaries of a MNC.

For the purposes of this study, a multinational corporation is defined as a firm whose foreign sales constitute at least 20 percent of its total sales. The 20 percent cut off point was chosen arbitrarily, keeping in view the fact that any higher percentage requirement would have reduced the already small sample sizes of MNCs. This definition of a MNC is justified by the fact that most researchers have tended to use a foreign sales requirement between 15 and 50 percent. Also, there has been no study to determine what proportion of a MNC's sales should be abroad to have a significant effect on its common stock returns.

Ongoing Multinational Corporation

Previous researchers, with the exception of Logue (1982), have generally not ensured that the MNCs in their samples remained MNCs through the period they studied. Logue screened his sample of MNCs to ascertain that they remained multinationals all through the decade in which he examined them.

It is possible that the continuing multinationality of a MNC may affect the risk reduction characteristics of its common stock. To determine whether this factor is of any significance, multinational and domestic portfolios are compared in this study to portfolios made up of firms that were MNCs throughout the study period. The MNCs that are multinationals through the study period are hereafter referred to as ongoing multinationals (OMNCs).

Domestic Corporation

Domestic corporations are defined as firms with no or insignificant foreign operations. The procedure adopted to obtain a

list of purely domestic corporations is detailed in the Data Sources section of this chapter.

Data

Time Periods

International economic conditions change over time. Brewer and Miller (1979) found that international economic events affect MNCs and domestic corporations differently. Previous studies on indirect international diversification such as Hughes, Logue and Sweeney (1975); Jacquillat and Solnik (1978); Senchak and Beedles (1980), and Brewer (1981), however, have tended to concentrate on a single time period.

To eliminate any possible bias in the performance of MNCs due to worldwide economic conditions prevailing in any one time period, it was decided to examine the data from three different time periods for this study.

Three five-year periods--1966 to 1970, 1972 to 1976, and 1977 to 1981--were chosen to ensure an adequate number of monthly data points for regression analysis. The choice of the actual years was based on the availability of data regarding MNC classification. A list of MNCs as of January 1, 1967, was not available to provide contiguity among the three time periods studied.

Industrial Corporations

As the section on data sources for this study will explain, the sample of domestic corporations was obtained by eliminating companies with foreign operations from the list of firms on the University of

Chicago's Center for Research on Security Prices (CRSP) tape. Since there are no MNC utilities, such a process of elimination might result in a disproportionate number of utilities in the lists of domestic corporations. To avoid any bias due to the presence of these low-beta utilities in the domestic firms samples, it was decided to restrict the samples of MNCs and domestic corporations to industrial, non-financial corporations only. This was done by eliminating companies with a Standard Industrial Classification (SIC) code greater than 3990.

Market Index

The standard deviation of multinational and domestic portfolios is compared to the standard deviation of the market portfolio to measure the degree of risk diversification. This study uses the CRSP monthly index, which consists of all the stocks traded on the New York Stock Exchange. The monthly index used in this study is equally-weighted, and includes all distributions.

There exists a controversy as to whether it is appropriate to measure systematic risk using a domestic or international index [Logue and Rogalski, (1979)]. This study, however, is focused on indirect international diversification only, and all the stocks utilized here are from U.S. financial markets. It is hence considered appropriate to use the CRSP domestic index.

Data Sources

Monthly Returns Data

In consonance with other studies, [Mikhail and Shawky (1979);
Brewer (1981); and Logue (1982)] monthly returns are used to compute
the various risk and return measures. The monthly returns for the
individual stocks and the index are from the CRSP monthly returns
file. The CRSP returns include capital gains plus dividends and other
distributions, all divided by the stock's base price.

Samples of Multinational Corporations

1966-1970. For this time period, the list of MNCs as of January
1, 1966, given in the study by Bruck and Lees (1968) was utilized.

1972-1976. A list of MNCs as of January 1, 1972, was published
in Standard and Poor's Outlook.[4] This list, which was based on the
1971 operations of these companies, was the source for this time
period.

1977-1981. The list of MNCs as of January 1, 1977, was also
obtained from Standard and Poor's Outlook.[5] This list is based on the
companies' 1976 operations.

From the above sources, the MNC samples used in the study were
obtained in the following manner. First, corporations with less than
20 percent foreign sales were eliminated. Then, MNCs for which
monthly returns data was not available on the CRSP tape for the
required time periods were deleted. The remaining corporations were
checked to ensure that their SIC code was below 3990.

This process resulted in a sample of 47 MNCs for the 1966-70
period; 110 MNCs for the 1972-76 period; and 131 MNCs for the 1977-81
period.

Samples of Ongoing Multinational Corporations

1966-1970. The 1966 list of MNCs was compared to a list of MNCs
as of January 1, 1971, which appeared in the Standard and Poor's
Outlook.[6] Thirty-five of the 45 MNCs on the 1966 list appeared on the
1970 list. These MNCs formed the OMNC sample for the 1966-70 period.

1972-1976. The 1972 list of MNCs was checked against the 1977
list of MNCs. Of the 110 MNCs on the 1972 list, 63 appeared on the
1977 list and formed the OMNC sample for this period.

1977-1981. The 1977 list of MNCs was compared with a list of
MNCs as of January 1, 1981, obtained from Forbes.[7] Of the 131 MNCs on
the 1977 list, 59 appeared on the 1981 list and made up the sample of
OMNCs for the 1977-81 period.

It should be noted that the sources from which the different
lists of MNCs were obtained were not always the same. This is due to
the lack of a regular, yearly listing of multinationals from any
single source. Different publications use different criteria in
listing multinationals and often report only the largest 100-125 MNCs
based on dollar overseas sales, percent foreign operations, or foreign
assets. Also, changes in the reporting methods of the corporations
themselves affect their listing as multinationals. Thus, although
not all the MNCs appeared on lists at the beginning and the end of a
time period and were classified as OMNCs, one cannot conclude that the
others gave up or decreased their foreign involvement.

Finally, the lists of OMNCs are made up of MNCs that had at least
20 percent foreign sales at the beginning and at the end of a time
period. Annual lists of MNCs were not available during the periods

studied. No check could thus be made on the overseas operations of the MNCs year to year.

Samples of Domestic Corporations

The samples of purely domestic corporations were obtained in the following manner:

(1) The CRSP monthly returns file contains data for 2934 corporations. Companies that did not have returns data for the required time period were first deleted.

(2) The SIC codes for the remaining corporations were checked and those with SIC codes above 3990 were eliminated.

(3) Those remaining were checked against the lists of MNCs to remove multinational corporations.

(4) This listing was then checked against the Directory of American Firms Operating in Foreign Countries [8] and firms with any foreign operations were removed.

(5) Finally, for the remaining firms, Annual Reports and 10K Reports for the year 1981 were checked for any reported foreign sales.

This screening produced 75 domestic corporations for the 1966-70 period; 108 for the 1972-76 period; and 119 for the 1977-81 period.

These samples of domestic corporations are different from those used by other researchers [Hughes, Logue and Sweeney (1975); Senchak and Beedles (1980)] in that they contain only corporations which are purely domestic, i.e., with no foreign involvement at all.

Specific Procedures

Portfolio Construction

Using a uniform random number generator and the monthly return data, 130 portfolios were constructed for each of the 3 samples in each of the 3 time periods. The random selection of securities for portfolio construction was done with replacement. These 130 portfolios for each sample consisted of 10 portfolios each of sizes 2 through 10, 15, 20, 25 and 30. It is assumed in constructing these portfolios that equal dollar amounts are invested in each security in a portfolio.

For each sample, besides the 130 portfolios mentioned above, one more portfolio was constructed which included all the stocks in that sample.

Johnson and Shannon (1974) have shown that equal weighting of stocks does not produce the best portfolio performance. The purpose of this project, however, is to determine if it requires fewer MNC stocks than domestic stocks for an investor to reach the market level of risk, thereby resulting in reduced management and transaction costs. Techniques such as quadratic programming, which are used to determine optimal weights for better portfolio performance, increase management costs. Optimizing with respect to proportionate investments in securities may be undesirable when transaction costs are considered. Investors may rationally choose to devote more attention to the selection of securities rather than to the particular proportions in which to hold them when both transaction costs and taxes dictate infrequent revisions. Equal weighting of stocks is therefore justified for purposes of this study.

Measuring Portfolio Performance

The portfolio construction method resulted in 10 portfolios of each size for each of the domestic, MNC and OMNC categories. For each portfolio, the arithmetic mean monthly return over the 60 month test period and the standard deviation were computed. Grand means of the 10 mean returns and means of the 10 standard deviations for each portfolio size were then calculated. These results were used as the mean return and standard deviation for each portfolio size. This procedure was adopted to smooth out any deviations caused by the random selection of securities.

The monthly portfolio returns for each of the 130 portfolios in the domestic, MNC and OMNC categories were regressed against the CRSP monthly index returns to determine the beta and the coefficient of determination (R^2). The mean of the betas and R^2s for the 10 portfolios of each size gave the beta and R^2 for that size. The mean, standard deviation, beta, and R^2 were also computed for the all-stock portfolios in each sample.

Arithmetic Mean. For all the computations involving the mean, the arithmetic mean was used in this study rather than the geometric mean. The justification for this is as follows. The mean return of a portfolio is essentially its expected rate of return. As Sharpe (1970) observed, "to predict the future, possible outcomes are assigned weights on the basis of their probabilities of occurence. To summarize the past, outcomes are assigned weights on the basis of their relative frequencies of occurence. The expected rate of return is found by multiplying every possible rate of return by its relative frequency of occurence."[9] The arithmetic mean is thus the logical

measure to calculate the expected return of a portfolio.

The total risk of a portfolio, measured by its variance, or the square root of variance, standard deviation, is made up of systematic and unsystematic components. The following formula represents this composition:

$$\sigma_P^2 = \sigma_m^2 \beta_P^2 + \overline{RVAR} \qquad (1)$$

where σ_P^2 is the variance of the portfolio, β_P the beta of the portfolio, σ_m^2 the variance of the market and $\overline{RVAR}$ the residual variance. $\sigma_m^2 \beta_P^2$ represents the systematic risk of the portfolio and $\overline{RVAR}$ the unsystematic risk. Using this formula, the risk of the portfolios of each size for all the samples was decomposed into its parts. For other tests in this study, standard deviation was used as a measure of total risk instead of variance.

Risk/Return Analysis

The coefficient of variation (CV) is used as a measure of relative dispersion in this study to compare the risk/return performance of domestic, MNC and OMNC portfolios. Admittedly, the CV is a crude measure of relative risk. However, it is also a simple and an intuitive measure, and will suffice in this instance for broad comparisons of the performance of the three categories during the three test periods. The CV is computed using the following formula:

$$CV = \frac{\sigma_P}{Y} \qquad (2)$$

where σ_P is the standard deviation of the portfolio and Y the return on the portfolio.

CHAPTER IV

RESULTS AND ANALYSIS

The primary objective of this study was to determine whether, to
reduce total portfolio risk to the level of the U.S. market risk,
fewer MNC stocks would be required as compared to stocks of domestic
corporations. Total risk is measured by the standard deviation of
returns over the test period. Tables V, VI and VII (Appendix A)
contain the findings of this study in this context.

During the 1966-70 period, a portfolio with only 3 OMNC stocks
attained the same level of total risk as the market portfolio, as
represented by the standard deviation of all the firm contained in the
CRSP index. Six MNC stocks were needed to reach this risk level.
Beyond the 6-stock level, the total risk of MNC and OMNC portfolios
was less than the total risk of the market portfolio. The entire
sample of 75 domestic stocks, however, still had a standard deviation
higher than that of the market portfolio.

Five OMNC stocks were required to attain the market risk level in
the 1972-76 period. It took 7 MNC stocks to reduce portfolio standard
deviation to that level. The portfolio consisting of all 109 domestic
stocks was not able to reduce its risk to the level of the market
portfolio.

During the 1977-81 period, 6 stocks of OMNCs were needed to reach
the market risk level. Twenty MNC stocks were required before this
level was reached. Once again, the entire sample of 119 domestic
stocks had a standard deviation higher than that of the market portfolio.

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These results support the hypothesis that fewer MNC stocks are needed, as compared to domestic stocks, to reach the level of total risk given by the market portfolio. This finding can be explained as follows; the systematic risk of an investment or portfolio has been shown to consist of components based on national and world markets. MNCs, due to their operations in several nations, may be diversifying away some of the national market risk. This would result in lower total risk as compared to domestic corporations. Also, the economies that various MNCs operate in are not perfectly correlated with each other. Thus the returns on the stocks of MNCs should not be highly correlated to each other. Since portfolios consisting of less correlated investments have lower total risk as compared to portfolios consisting of more highly correlated investments, it is logical that MNC portfolios should have lower total risk than domestic portfolios of comparable size.

Continuing Multinationality

The OMNC samples were used in this study to determine whether the continuing multinationality of a MNC had any effect on the risk characteristics of its stock. Continuting multinationality does seem to be of some importance for risk reduction, as indicated by the results given in Tables V, VI and VII (Appendix A).

Fewer OMNC stocks were required as compared to MNC stocks to attain a given total risk level. For example, in the 1966-70 period, 25 MNC stocks had a standard deviation that was 20 percent below the standard deviation of the market portfolio. Only 6 OMNC stocks were needed to achieve this level. In 1972-76, 10 MNC stocks were needed to

attain a risk level 15 percent below that of the market portfolio.
Only 7 OMNC stocks were required to achieve this level of
diversification. During 1977-81, a portfolio with 25 MNC stocks had a
total risk 10 percent below the risk of the market portfolio. Only 10
OMNC stocks were needed to achieve this risk level.

The reasons why MNC portfolios have provided lower total risk
levels as compared to domestic portfolios were outlined above. The
same arguments can be extended to explain why OMNC portfolios
provided lower total risk levels as compared to MNC portfolios. OMNCs
are MNCs that were MNCs through the test period. This means that over
the test period, OMNCs had a more consistent, if not greater, foreign
involvement as compared to MNCs. International operations being the
reason for the lower total risk provided by MNC portfolios as compared
to domestic portfolios, it follows that a greater degree of
international operations should result in greater risk reduction
benefits. The lower total risk provided by OMNC portfolios as
compared to MNC portfolios is therefore not surprising.

Time Periods

The risk reduction performance of domestic, MNC and OMNC stocks
is compared in this study during three different time periods to
ascertain if there were any changes in the risk reduction
characteristics of these categories over time. The results shown in
Tables V, VI and VII indicate that some changes have occured. For
example, only 6 MNC stocks were required to reach the level of risk of
the market portfolio during 1966-70. Seven MNC stocks were needed to
do the same in 1972-76, and this number rose to 20 in 1977-81.

The increasing economic integration of world economies [Barone (1983)] during the late 1970s could have resulted in an increase in the correlations between MNC stocks. Hence the increase in the number of securities needed to reach the risk level of the market portfolio between the first and the last test period.

OMNC portfolios almost always had a lower risk than both domestic and MNC portfolios of the same size. However, the difference between the risk of the OMNC and MNC portfolios of similar size was greater in the 1977-81 period compared to other periods. This greater difference was attributable to an increase in the risk of MNCs relative to OMNCs. This seems to suggest that the influence of multinationality on the risk characteristics of MNC stocks was greater during 1977-81 than in 1966-70 or 1972-76.

The increasing economic integration of world economies could also have been the cause for this finding. The degree of foreign involvement of an MNC is obviously important to the risk reduction benefits of its stocks as evidenced by the lower risk levels produced by OMNC portfolios as compared to MNC portfolios. Given the decrease in overall risk reduction benefits from international involvement in 1977-81, a greater degree of international involvement may have been needed to produce the same level of risk reduction benefits as in the earlier two test periods. Thus the widened gap in the risk levels of MNC and OMNC portfolios in the last test period.

Graphical Analysis

Portfolio standard deviation is plotted against portfolio size in Figures 1, 2 and 3 (Appendix B). An interesting comparison can be

made at this juncture to Solnik's (1974) study on international
portfolio diversification. Solnik found that the total risk of an
international portfolio was much lower than that of a domestic
portfolio of the same size. The same relationship was found in this
study for both MNC and OMNC portfolios compared to domestic
portfolios. MNC and OMNC portfolios always had a lower total risk
than domestic portfolios of the same size.

Solnik also observed that while increasing the size of a domestic
portfolio beyond 20 stocks seemed to achieve only a relatively small
incremental reduction in risk, a substantial reduction could still be
achieved for an international portfolio of the same size. This
finding of Solnik, however, was not observed for the MNC and OMNC
portfolios in this study. Beyond the 20-stock level, incremental
reductions in risk were small for all portfolios, domestic, MNC and OMNC.
For instance, the addition of 80 stocks to a 30-stock portfolio of
MNCs during 1972-76 resulted in a reduction of risk of only 4
percentage points (Table VI, Appendix A). Further, the portfolios
consisting of all sample stocks for each of the three categories
during each of the three time periods had total risk of only a few
percentage points less than the respective 30-stock portfolios.

MNC and OMNC portfolios had an initially lower level of total
risk as compared to domestic portfolios. For instance, at the 2-stock
level during 1966-70, domestic portfolios had a standard deviation
equivalent to 229 percent of the market portfolio. The comparable
figures for MNC and OMNC portfolios at the 2-stock level were 133
percent and 108 percent respectively. Due to this initial low level
of total risk, MNC and OMNC portfolios were able to reduce risk with

fewer stocks than required by domestic portfolios. MNC and OMNC
portfolios reached the level of risk of the market portfolio with
fewer securities as compared to domestic portfolios in all three test
periods.

Given the initial risk level at portfolio size 2, however,
domestic stocks had a steeper slope of risk reduction. That is,
domestic portfolios had a higher rate of risk reduction between
portfolio sizes 2 and 30. Still however, total risk of domestic
portfolios was higher than MNC and OMNC portfolios for every portfolio
size.

Rate of Risk Reduction

To measure the rate of risk reduction between portfolio sizes 2
and 30, the following equation was fitted:

$$\sigma_p = \alpha + \gamma n + \tilde{e} \qquad (3)$$

where n is the number of stocks in the portfolio, α the intercept
term, γ the rate of risk reduction and $\tilde{e}$ the error term. γ has a
negative sign in all cases because total risk is reduced as the number
of stocks in a portfolio is increased. The absolute magnitude of γ
measures the rate of risk reduction between portfolio sizes 2 and 30;
the higher this magnitude, the greater is the rate of risk reduction.

Table VIII (Appendix A) gives the γ coefficients for the three
types of portfolios during the three test periods. These coefficients
seem to indicate that in all three time periods, the rate of risk
reduction for domestic portfolios was greater between portfolio sizes
2 and 30 as compared to MNC and OMNC portfolios.

Chow Test

A Chow test [10] was performed to test whether the differences in the intial levels of risk and the rate of risk reduction of domestic, MNC and OMNC portfolios were statistically significant. The Chow test examines the slopes and intercepts of the three regression lines [Figures 1, 2 and 3 (Appendix B)] in each time period for statistically significant differences.

The Chow test indicated that at the .05 significance level, the slope and intercept of the domestic portfolios was significantly different from MNC and OMNC portfolios during 1966-70 and 1977-81. During 1972-76, the risk reduction pattern of domestic portfolios was significantly different at the .05 level from OMNC portfolios but not MNC portfolios. There were no statistically significant differences at the .05 level in the slopes and intercepts of MNC and OMNC portfolios during any time period.

Systematic and Unsystematic Risk

Beta Coefficients

The average beta for domestic portfolios for all three time periods was 1.03. MNC portfolios had an average beta of 0.81 and OMNC portfolios an average beta of 0.75 . The fact that MNC and OMNC portfolios had lower betas than domestic portfolios, when a domestic market index was used, is in agreement with the findings of several previous researchers [Hughes, Logue and Sweeney (1975); Aggarwal (1979); and Mikhail and Shawky (1979)].

Proportions of Systematic and Unsystematic Risk

Tables IX, X and XI (Appendix A) give the percentages of systematic and unsystematic risk to the total risk of the portfolio as portfolio size increases. Here, total risk is measured by σ^2, systematic risk by $\sigma_m^2 \beta_p^2$, and unsystematic risk by $\overline{RVAR}$ as shown in equation (1).

Just as portfolio theory hypothesizes, unsystematic risk is reduced as the number of stocks in the portfolio increases. For each of the three types of portfolios, unsystematic risk is reduced from approximately 50 percent of total risk at the 2-stock level to about 15 percent of total risk at the 30-stock level.

A comparison of the percentages of systematic and unsystematic risk between the three categories of portfolios reveals that domestic portfolios have lower levels of unsystematic risk at the 30-stock level than MNC and OMNC portfolios. In 1966-70, at the 30-stock level, the total risk of a domestic portfolio consisted of 88 percent systematic and 12 percent unsystematic risk. The comparable figures for MNC portfolios were 79 percent systematic and 21 percent unsystematic risk. OMNC portfolios had 76 percent systematic and 24 percent unsystematic risk at the 30-stock level. Tables IX, X and XI give similar data for 1972-76 and 1977-81.

The market rewards only the systematic risk of a security or portfolio, since unsystematic risk can be diversified away. Thus portfolio diversification can be said to be efficient if a portfolio has a very small proportion of unsystematic risk. Using this definition of portfolio efficiency, together with a domestic index, it can be said that domestic portfolios diversified risk more efficiently

than MNC or OMNC portfolios.

Risk/Return Performance

The mean monthly return, standard deviation and coefficient of variation (CV) for domestic, MNC and OMNC portfolios are given in Tables XII through XX (Appendix A). CV is a measure of relative risk, i.e., it measures the units of risk per unit of return. The lower the CV of a portfolio, the better is its total risk/return performance.

T-tests were performed for each time period to examine whether the average CVs of domestic, MNC and OMNC portfolios statistically differed from each other. The t-tests indicated that during 1966-70, the mean CVs of domestic and MNC portfolios and MNC and OMNC portfolios were not significantly different. The mean CV of the OMNC portfolios, however, was significantly different at the .05 level from the mean CV of domestic portfolios, with the OMNC portfolios having a lower CV. This means that OMNC portfolios performed better than domestic portfolios in a total risk/return sense during 1966-70.

During 1972-76, none of the mean CVs were significantly different from each other. The performance of MNC and OMNC portfolios was thus not statistically different from each other or from domestic portfolios.

In the 1977-81 period, the mean CVs of domestic, MNC and OMNC portfolios were significantly different from each other at the .01 level. The mean CV of domestic portfolios was lower than that of MNC and OMNC portfolios. This means that domestic portfolios performed better in a total risk/return sense in 1977-81. Also, MNC portfolios had a lower CV than OMNC portfolios, which indicates that MNC

portfolios performed better than OMNC portfolios. During the 1977-81 period, therefore, multinationality seems to have had a negative impact on performance. The reason for this finding merits further investigation. It can be said, however, that the rising value of the dollar against several international currencies during the late 1970s and early 1980s could have resulted in lower profitability and hence lower returns on MNC stocks. [11]

Comparison with previous findings

The results of this study supported the findings of Klemkosky and Martin (1975) regarding beta's effect on portfolio diversification. The high beta domestic portfolios required a greater number of securities to attain a given level of diversification as compared to the low beta MNC and OMNC portfolios.

Jacquillat and Solnik (1978) reported that the standard deviation of MNC portfolios was usually 90 percent of that of purely domestic portfolios of the same size. In this study, MNC portfolios had a standard deviation approximately 70 percent of that of domestic portfolios of the same size over all the three time periods. This percentage varied from 64 in 1966-70 to 78 in 1972-76 and 67 in 1977-81. The OMNC portfolios had a even lower percentage; 62 overall, 55 during 1966-70, 73 during 1972-76 and 57 during 1977-81.

Hughes, Logue and Sweeney (1975) found that MNC portfolios had lower levels of systematic, unsystematic and total risk as compared to domestic portfolios, regardless of the index used. The findings of this research support Hughes, et al.'s observations in that MNC and OMNC portfolios had lower levels of systematic, unsystematic and

total risk as compared to domestic portfolios.

From a risk/return point of view, however, it appears that the results of this study are inconclusive. Mikhail and Shawky (1979) and Logue (1982) used standard deviation as the measure of risk and found that MNC portfolios performed better than either domestic portfolios or a domestic index. During 1966-70, the OMNC portfolios in this study performed better than domestic portfolios in a risk/return sense; risk was also measured by standard deviation for this purpose in this study. In none of the other time periods, however, did the MNC and OMNC portfolios perform significantly better than domestic portfolios in this study. In contrast, domestic portfolios performed significantly better than MNC and OMNC portfolios during 1977-81. The findings on risk/return performance in this study cannot be compared to several other studies [Hughes, Logue and Sweeney (1975); Senchak and Beedles (1980) and Brewer (1981)] due to differences in either the measure of risk used or the methodology employed.

Conclusion

The findings of this study are of value to an investor who seeks to reduce the total risk of his/her investments to the level of risk of the U.S. market. This study has shown that such an objective can be reached with fewer stocks of MNCs as compared to stocks of purely domestic corporations. Holding fewer securities means a reduction in transaction and management costs, which improves the net return on the investment. The investor can reduce the number of stocks in the portfolio even further if he/she ensures that the portfolio consists of firms that remain MNCs through the entire holding period.

This study has not provided conclusive evidence on whether MNC portfolios perform better than domestic portfolios. Also, the number of MNC stocks needed to reach the market level of risk seems to be increasing over time. Further research is needed to discern the effect of international economic integration, if any, on the risk reduction characteristics of multinational portfolios.

Inspite of the controversy whether MNCs provide a indirect vehicle for international diversification, this study has shown that an investor could still benefit through investment in MNCs because of a reduction in transaction costs that results from fewer MNC stocks being needed to attain the market level of risk.

Notes

1

See Brewer (1981), p. 114.

2

See Brewer (1981), p. 114.

3

Excess market value is defined by Errunza and Senbet as the difference between total firm value (market value of equity and book value of debt) and book value of assets, normalized by sales. See Thomadakis (1977) for further details on this definition.

4

Standard and Poor's Outlook 44:34 (August 21, 1972): 594-598.

5

Standard and Poor's Outlook 50:33 (August 14, 1978): 611-614.

6

Standard and Poor's Outlook 43:36 (September 6, 1971): 508-509.

7

The 100 Largest U.S. Multinationals. Forbes 130 (July 5, 1982): 126-128.

8

Directory of American Firms Operating in Foreign Countries. Juvenal L. Angel, compiler. New York: Uniworld Business Publications, 1979.

9

See Sharpe (1970), p. 142.

10

See Chow, G. C., Tests of the Equality between Sets of Coefficients in Two Linear Regressions. Econometrica 28 (July 1960): 591-605.

11

See Business Week (August 17, 1981): 98.

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APPENDIX A

TABLES

TABLE I

CORRELATIONS OF FOREIGN STOCK MARKETS
WITH THE U.S. MARKET

Stock Market	Grubel (1968) 1959-66	Solnik (1973) 1966-71	Lessard (1975) 1959-73
Australia	.06		.23
Austria			.12
Belgium	.11	.47	.46
Canada	.70		.80
Denmark			.04
France	.19	.06	.25
Germany	.30	.22	.38
Italy	.15	.07	.21
Japan	.11	.19	.13
Netherlands	.21	.51	.61
Norway			.17
Spain			.04
Sweden		.29	.33
Switzerland		.44	.49
United Kingdom	.24	.20	.29

Source: Gary L. Bergstrom, "A New Route to Higher Returns
and Lower Risks." Journal of Portfolio Management
(Fall 1975): p. 31.

TABLE II

INTERNATIONAL PORTFOLIOS--PERFORMANCE SUMMARY

MARCH 1971 TO JUNE 1974

Total International Portfolio Return	+ 30.8 %
S & P 500 -- Total Return	+ 11.6 %
NYSE Composite -- Total Return	+ 8.4 %
U.S. Growth Funds Average (21 Funds)	- 6.8 %
U.S. Common Stock Funds Average (24 Funds)	- 3.7 %
Standard Deviation of International Portfolios (per week)	2.0 %
Standard Deviation of NYSE Composite (per week)	2.7 %
Beta Coefficient versus NYSE Composite	.4
R^2 versus NYSE Composite	.35

Source: Gary L. Bergstrom, "A New Route to Higher Returns and Lower Risks." Journal of Portfolio Management (Fall 1975): p. 31.

TABLE III

PERFORMANCE OF MULTINATIONAL CORPORATIONS RELATIVE TO
DOMESTIC CORPORATIONS
1963-1972

Industry	MNC			Domestic		
	Ret.	S.D.	Beta	Ret.	S.D.	Beta
Non-ferrous Metals	14.7	9.8	1.31	14.7	9.3	0.92
Fabricated Metal Products	18.1	6.8	1.71	16.8	10.2	1.07
Electrical Machinery	19.3	9.0	1.17	21.8	5.0	1.32
Machinery, except Electrical	17.9	10.4	1.50	15.8	8.7	1.49
Petroleum refining	13.5	4.3	0.60	19.6	11.6	1.30
Chemical & Allied Products	17.4[†]	7.3	0.77	9.9	5.6	1.36
Food Products	5.3	5.0	0.77	12.3	7.2	0.65
All companies regardless of industry	16.2	n.c.	1.17	15.4	n.c.	1.12

(† significant at the .05 level)   (n.c. = not computed)

Source: Theodore Kohers, "A Risk-Return Comparison: U.S.
Multinational and U.S. Domestic Corporations."
University of Michigan Business Review 28:2
(March 1976): p. 26.

TABLE IV

MEANS, STANDARD DEVIATIONS, AND COEFFICIENTS OF
VARIATION OF RETURNS OF THIRTY MNCS AND
S&P 500 INDEX
1968-1975

Year	MNCs			S&P		
	Mean	S.D.	CV	Mean	S.D.	CV
1968	0.0146	0.0428	2.93	0.0097	0.0308	3.17
1969	-0.0067	0.0340	-5.07	0.0125	0.0295	2.36
1970	0.0110	0.0526	4.78	-0.0009	0.0478	-53.11
1971	0.0127	0.0473	3.72	0.0589	0.0339	0.49
1972	0.0178	0.0275	1.54	0.0144	0.0210	1.46
1973	-0.0114	0.0562	-4.93	-0.0172	0.0333	-1.94
1974	-0.0124	0.0687	-5.54	-0.0273	0.0492	-1.80
1975	0.0286	0.0587	2.05	0.0247	0.0498	2.02

Source: Azmi D. Mikhail and Hany A. Shawky,
"Investment Performance of U.S. Based Multinational
Corporations." Journal of International Business
Studies 10:1 (Spring/Summer 1979): p. 61.

TABLE V

REDUCTION IN TOTAL RISK AS THE NUMBER OF
SECURITIES IN A PORTFOLIO INCREASES

1966-1970

Number of securities in portfolio	Percentage of standard deviation of CRSP index		
	Domestic	MNC	OMNC
2	229	133	108
3	180	118	99
4	169	104	89
5	164	101	82
6	149	97	80
7	128	84	89
8	139	84	70
9	132	83	77
10	133	82	71
15	124	83	77
20	124	83	69
25	118	80	71
30	120	76	67
Entire sample	109	72	64

The sample sizes were: Domestic: 75
                        MNC: 47
                        OMNC: 35

TABLE VI

REDUCTION IN TOTAL RISK AS THE NUMBER OF
SECURITIES IN A PORTFOLIO INCREASES

1972-1976

Number of securities in portfolio	Percentage of standard deviation of CRSP index		
	Domestic	MNC	OMNC
2	154	148	112
3	162	106	123
4	154	114	103
5	148	106	108
6	133	112	87
7	131	99	85
8	120	99	93
9	116	89	84
10	117	85	94
15	115	92	85
20	115	83	81
25	107	94	81
30	106	84	82
Entire sample	105	80	78

The sample sizes were: Domestic: 109
                                            MNC: 110
                                            OMNC: 63

TABLE VII

REDUCTION IN TOTAL RISK AS THE NUMBER OF
SECURITIES IN A PORTFOLIO INCREASES

1977-1981

Number of securities in portfolio	Percentage of standard deviation of CRSP index		
	Domestic	MNC	OMNC
2	280	163	173
3	221	180	115
4	164	125	116
5	195	116	119
6	189	113	96
7	188	114	93
8	158	111	96
9	165	108	93
10	164	115	90
15	142	101	79
20	156	100	82
25	149	91	77
30	139	99	81
Entire sample	134	91	76

The sample sizes were: Domestic: 119
                          MNC: 131
                         OMNC: 59

TABLE VIII

RATE OF RISK REDUCTION

(γ coefficients)

	1966-70	1972-76	1977-81
Domestic	-2.4940	-1.7765	-2.9285
MNC	-1.3269	-1.2821	-1.9406
OMNC	-0.9777	-1.0753	-1.9690

TABLE IX

SYSTEMATIC AND UNSYSTEMATIC RISK AS A
PERCENTAGE OF TOTAL RISK

(1966-1970)

(percentages)

Number of securities in portfolio	Domestic		MNC		OMNC	
	Sys.	Unsys.	Sys.	Unsys.	Sys.	Unsys.
2	52	48	54	46	47	53
3	57	43	54	46	54	46
4	64	36	56	44	58	42
5	68	32	64	36	59	41
6	79	21	67	33	63	37
7	68	32	64	36	61	39
8	76	24	70	30	54	46
9	77	23	71	29	67	33
10	76	24	67	33	70	30
15	83	17	77	23	73	27
20	85	15	79	21	75	25
25	88	12	81	19	76	24
30	88	12	79	21	76	24

TABLE X

SYSTEMATIC AND UNSYSTEMATIC RISK AS A
PERCENTAGE OF TOTAL RISK

(1972-1976)

(percentages)

Number of securities in portfolio	Domestic		MNC		OMNC	
	Sys.	Unsys.	Sys.	Unsys.	Sys.	Unsys.
2	46	54	44	56	27	73
3	57	43	54	46	52	48
4	66	34	63	37	59	41
5	67	33	66	34	58	42
6	72	28	67	33	61	39
7	69	31	67	33	59	41
8	74	26	73	27	62	38
9	81	19	67	33	64	36
10	84	16	71	29	65	35
15	83	17	79	21	69	31
20	89	11	74	26	75	25
25	90	10	80	20	72	28
30	90	10	81	19	73	27

TABLE XI

SYSTEMATIC AND UNSYSTEMATIC RISK AS A
PERCENTAGE OF TOTAL RISK

(1977-1981)

(percentages)

Number of securities in portfolio	Domestic		MNC		OMNC	
	Sys.	Unsys.	Sys.	Unsys.	Sys.	Unsys.
2	48	52	47	53	45	55
3	56	44	55	45	57	43
4	60	40	63	37	62	38
5	66	34	64	36	64	36
6	73	27	71	29	65	35
7	71	29	71	29	69	31
8	73	27	74	26	49	51
9	72	28	79	21	74	26
10	79	21	75	25	73	27
15	84	16	79	21	78	22
20	88	12	81	19	79	21
25	91	9	84	16	80	20
30	90	10	85	15	80	20

TABLE XII

MEAN, STANDARD DEVIATION, AND COEFFICIENT OF VARIATION
OF THE RETURNS OF DOMESTIC PORTFOLIOS

1966-1970

Number of securities in portfolio	Mean monthly return	Standard deviation	Coefficient of variation
2	0.0075	0.0844	11.2533
3	0.0089	0.0749	8.4157
4	0.0074	0.0726	9.8108
5	0.0076	0.0713	9.3815
6	0.0069	0.0680	9.8550
7	0.0080	0.0630	7.8750
8	0.0074	0.0659	8.9054
9	0.0083	0.0640	7.7108
10	0.0074	0.0644	8.7027
15	0.0074	0.0621	8.3919
20	0.0082	0.0620	7.5609
25	0.0072	0.0606	8.4166
30	0.0083	0.0612	7.3734
75	0.0078	0.0582	7.4519
CRSP index	0.0072	0.0558	7.7500

TABLE XIII

MEAN, STANDARD DEVIATION, AND COEFFICIENT OF VARIATION
OF THE RETURNS OF MULTINATIONAL PORTFOLIOS

1966-1970

Number of securities in portfolio	Mean monthly return	Standard deviation	Coefficient of variation
2	0.0055	0.0644	11.7091
3	0.0049	0.0607	12.3877
4	0.0066	0.0570	8.6363
5	0.0072	0.0560	7.7777
6	0.0064	0.0549	8.5781
7	0.0062	0.0511	8.2419
8	0.0071	0.0513	7.2253
9	0.0067	0.0507	7.5671
10	0.0069	0.0506	7.3333
15	0.0085	0.0509	5.9882
20	0.0068	0.0507	7.4558
25	0.0067	0.0500	7.4626
30	0.0078	0.0487	6.2435
47	0.0074	0.0474	6.4054
CRSP index	0.0072	0.0558	7.7500

TABLE XIV

MEAN, STANDARD DEVIATION, AND COEFFICIENT OF VARIATION
OF THE RETURNS OF ONGOING MULTINATIONAL PORTFOLIOS

1966-1970

Number of securities in portfolio	Mean monthly return	Standard deviation	Coefficient of variation
2	0.0022	0.0578	26.2727
3	0.0073	0.0556	7.6164
4	0.0059	0.0526	8.9152
5	0.0070	0.0505	7.2142
6	0.0055	0.0497	9.0363
7	0.0055	0.0526	9.5636
8	0.0077	0.0465	6.0389
9	0.0057	0.0489	8.5789
10	0.0077	0.0468	6.0779
15	0.0066	0.0489	7.4091
20	0.0062	0.0464	7.4839
25	0.0069	0.0468	6.7826
30	0.0065	0.0458	7.0461
35	0.0066	0.0446	6.7575
CRSP index	0.0072	0.0558	7.7500

TABLE XV

MEAN, STANDARD DEVIATION, AND COEFFICIENT OF VARIATION
OF THE RETURNS OF DOMESTIC PORTFOLIOS

1972-1976

Number of securities in portfolio	Mean monthly return	Standard deviation	Coefficient of variation
2	0.0103	0.0897	8.7087
3	0.0081	0.0917	11.3209
4	0.0101	0.0896	8.8713
5	0.0061	0.0878	14.3934
6	0.0071	0.0833	11.7324
7	0.0089	0.0826	9.2809
8	0.0075	0.0792	10.5600
9	0.0076	0.0778	10.2368
10	0.0099	0.0780	7.8787
15	0.0078	0.0774	9.9231
20	0.0077	0.0774	10.0519
25	0.0090	0.0745	8.2777
30	0.0082	0.0742	9.0487
109	0.0084	0.0738	8.7858
CRSP index	0.0071	0.0722	10.1690

TABLE XVI

MEAN, STANDARD DEVIATION, AND COEFFICIENT OF VARIATION
OF THE RETURNS OF MULTINATIONAL PORTFOLIOS

1972-1976

Number of securities in portfolio	Mean monthly return	Standard deviation	Coefficient of variation
2	0.0083	0.0879	10.5904
3	0.0094	0.0743	7.9042
4	0.0082	0.0772	9.4145
5	0.0079	0.0746	9.4430
6	0.0065	0.0764	11.7538
7	0.0071	0.0718	10.1127
8	0.0072	0.0719	9.9861
9	0.0064	0.0680	10.6250
10	0.0074	0.0668	9.0270
15	0.0083	0.0695	8.3735
20	0.0074	0.0660	8.9189
25	0.0070	0.0698	9.9714
30	0.0081	0.0662	8.1728
110	0.0076	0.0645	8.4868
CRSP index	0.0071	0.0722	10.1690

TABLE XVII

MEAN, STANDARD DEVIATION, AND COEFFICIENT OF VARIATION
OF THE RETURNS OF ONGOING MULTINATIONAL PORTFOLIOS

1972-1976

Number of securities in portfolio	Mean monthly return	Standard deviation	Coefficient of variation
2	0.0080	0.0764	9.5500
3	0.0046	0.0801	17.4130
4	0.0074	0.0733	9.9054
5	0.0052	0.0749	14.4038
6	0.0075	0.0672	8.9600
7	0.0067	0.0666	9.9403
8	0.0073	0.0699	9.5753
9	0.0059	0.0663	11.2372
10	0.0078	0.0699	8.9615
15	0.0077	0.0666	8.6493
20	0.0078	0.0650	8.3333
25	0.0068	0.0651	9.5735
30	0.0065	0.0653	10.0461
63	0.0070	0.0636	9.0857
CRSP index	0.0071	0.0722	10.1690

TABLE XVIII

MEAN, STANDARD DEVIATION, AND COEFFICIENT OF VARIATION
OF THE RETURNS ON DOMESTIC PORTFOLIOS

1977-1981

Number of securities in portfolio	Mean monthly return	Standard deviation	Coefficient of variation
2	0.0163	0.0889	5.4539
3	0.0164	0.0791	4.8231
4	0.0164	0.0681	4.1524
5	0.0193	0.0743	3.8497
6	0.0182	0.0732	4.0219
7	0.0177	0.0730	4.1243
8	0.0161	0.0669	4.1553
9	0.0181	0.0684	3.7790
10	0.0186	0.0681	3.6613
15	0.0171	0.0635	3.7134
20	0.0172	0.0665	3.8662
25	0.0174	0.0650	3.7356
30	0.0174	0.0628	3.6092
119	0.0173	0.0616	3.5606
CRSP index	0.0157	0.0532	3.3885

TABLE XIX

MEAN, STANDARD DEVIATION, AND COEFFICIENT OF VARIATION
OF THE RETURNS OF MULTINATIONAL PORTFOLIOS

1977-1981

Number of securities in portfolio	Mean monthly return	Standard deviation	Coefficient of variation
2	0.0116	0.0679	5.8534
3	0.0155	0.0714	4.6064
4	0.0078	0.0595	7.6282
5	0.0125	0.0572	4.5760
6	0.0109	0.0565	5.1835
7	0.0135	0.0567	4.2000
8	0.0126	0.0562	4.4603
9	0.0122	0.0551	4.5164
10	0.0102	0.0570	5.5882
15	0.0103	0.0536	5.2039
20	0.0942	0.0532	5.6595
25	0.0105	0.0508	4.8381
30	0.0113	0.0530	4.6902
131	0.0107	0.0507	4.7383
CRSP index	0.0157	0.0532	3.3885

TABLE XX

MEAN, STANDARD DEVIATION, AND COEFFICIENT OF VARIATION
OF THE RETURNS OF ONGOING MULTINATIONAL PORTFOLIOS

1977-1981

Number of securities in portfolio	Mean monthly return	Standard deviation	Coefficient of variation
2	0.0102	0.0699	6.8529
3	0.0077	0.0571	7.4156
4	0.0084	0.0572	6.8095
5	0.0078	0.0581	7.4487
6	0.0076	0.0521	6.8552
7	0.0086	0.0515	5.9883
8	0.0072	0.0523	7.2639
9	0.0085	0.0512	6.0235
10	0.0066	0.0504	7.6363
15	0.0071	0.0474	6.6760
20	0.0075	0.0482	6.4266
25	0.0063	0.0467	7.4127
30	0.0076	0.0479	6.3026
59	0.0072	0.0463	6.4305
CRSP index	0.0157	0.0532	3.3855

APPENDIX B

FIGURES

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RATE OF REDUCTION OF PORTFOLIO STANDARD DEVIATION

1966-1970

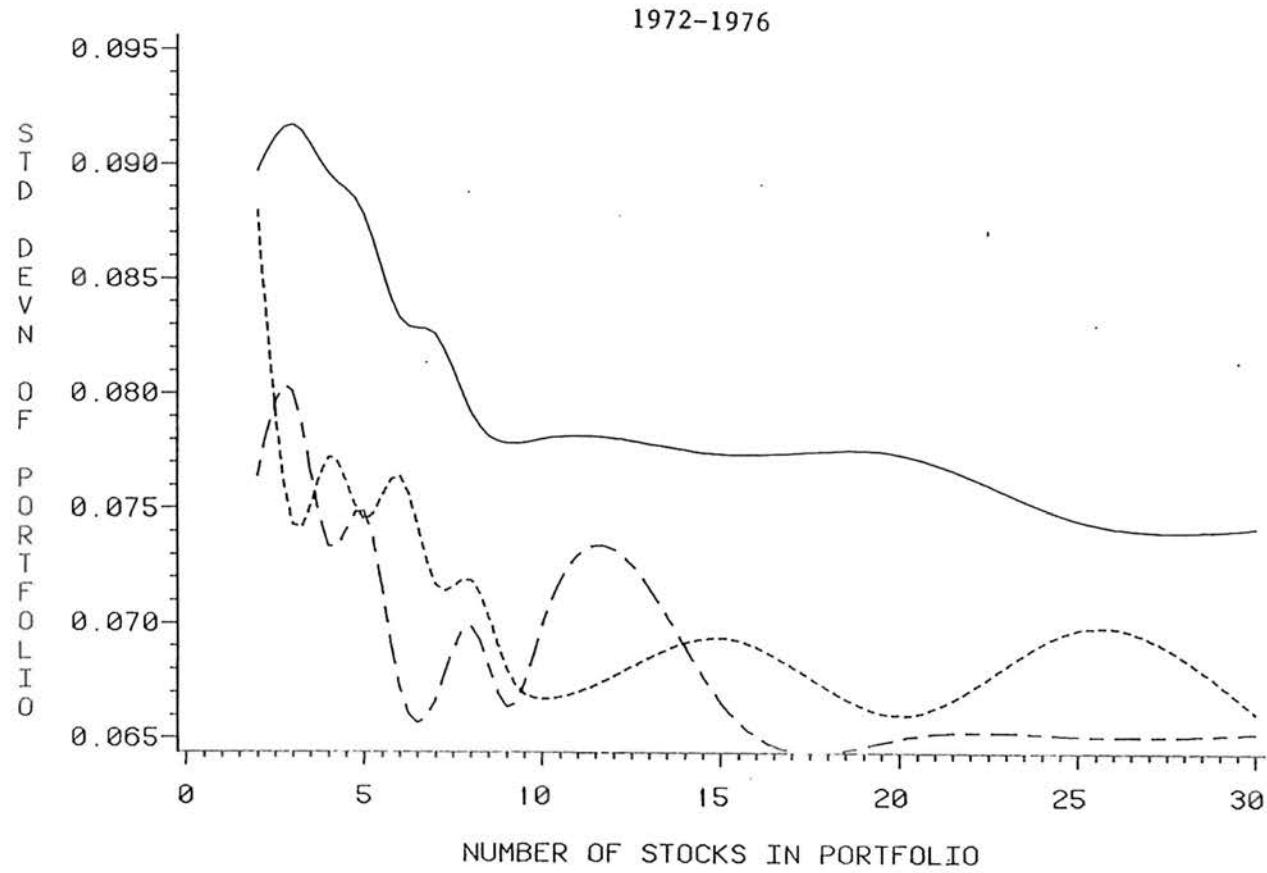NUMBER OF STOCKS IN PORTFOLIO

——— Domestic portfolios
— — — Multinational portfolios
— — — Ongoing multinational portfolios
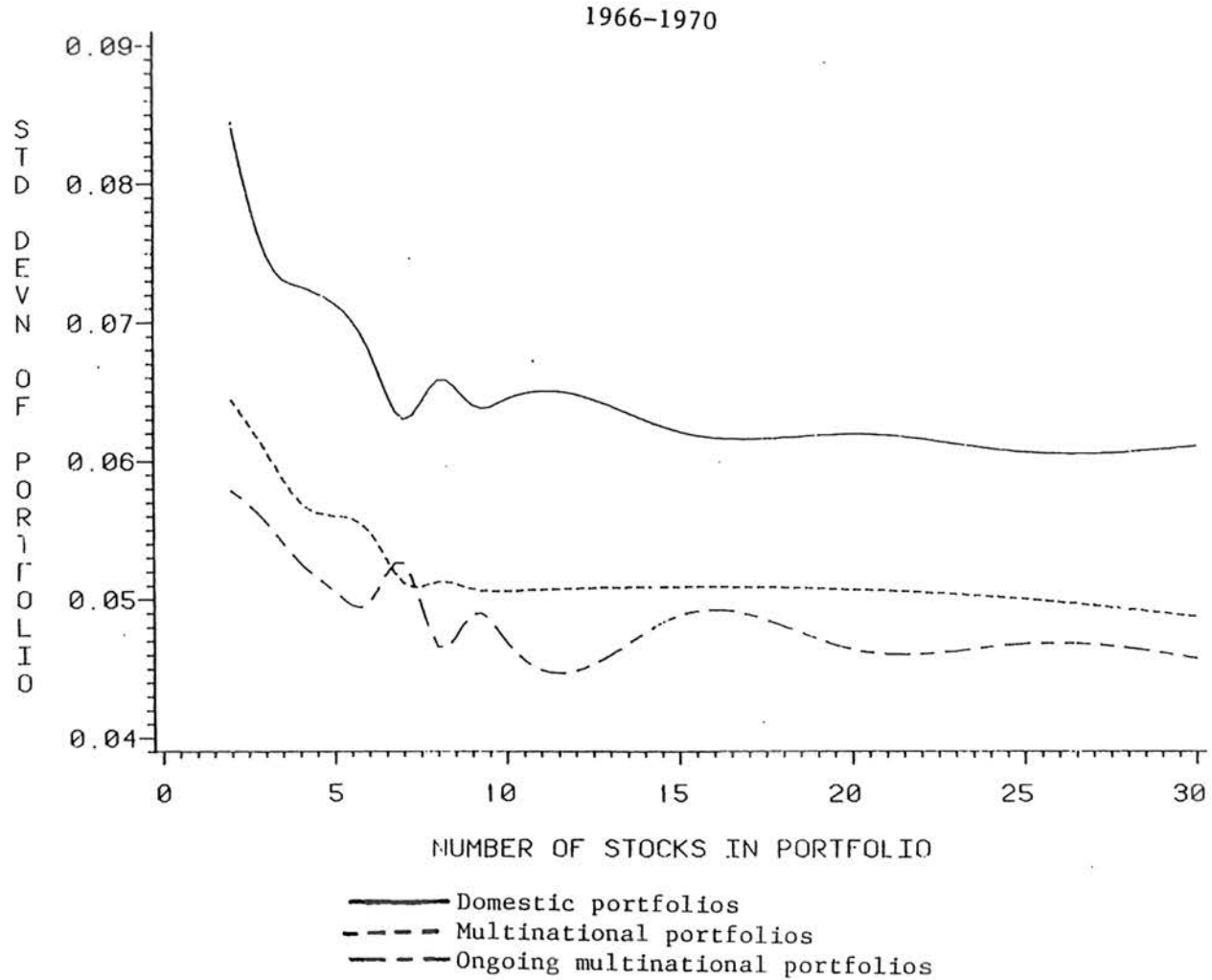
FIGURE 1

RATE OF REDUCTION OF PORTFOLIO STANDARD DEVIATION

1972-1976

NUMBER OF STOCKS IN PORTFOLIO

——— Domestic portfolios
— — — Multinational portfolios
— · — Ongoing multinational portfolios

FIGURE 2

83

RATE OF REDUCTION OF PORTFOLIO STANDARD DEVIATION

1977-1981

APPENDIX C

LISTS OF CORPORATIONS

LIST OF DOMESTIC CORPORATIONS

1966-1970

1. Alpha Portland Inds Inc.	25. De Soto Inc.
2. American Bakeries Co.	26. Dome Mines Co.
3. American Ship Bldg Co.	27. Donnelley R R & Sons Co.
4. Amstar Corp.	28. Eagle Picher Inds Inc.
5. Armada Corp.	29. Eastern Gas & Fuel Assoc.
6. Armstrong Rubr Co.	30. Federal Paper Brd Inc.
7. Belding Heminway Inc.	31. Fuqua Inds Inc.
8. Benguet Corp.	32. Giant Portland & Mas Cem.
9. Bobbie Brooks Inc.	33. Great Northn Nekoosa Corp
10. Briggs & Stratton Corp.	34. H M W Inds Inc.
11. Brown Group Inc.	35. Hammermill Paper Co.
12. Callahan Mng Corp.	36. Holly Sugar Corp.
13. Campbell Red Lake Mines Co.	37. Hudson Bay Mng & Smlt Co.
14. Capital Cities Commns.	38. Ingredient Tech Corp.
15. Carling Okeefe Co.	39. Interpace Corp.
16. Carlisle Corp.	40. Keller Inds Inc.
17. Ceco Corp.	41. Kroehler Mfg Co.
18. Chock Full O Nuts Corp.	42. Loral Corp.
19. Coastal Corp.	43. Lowenstein M Corp.
20. Cone Mls Corp.	44. Lukens Stl Co.
21. Conwood Corp.	45. M E I Corp.
22. Cooper Tire & Rubr Co.	46. Manhattan Inds Inc.
23. Cyclops Corp.	47. Mc Intyre Mines Co.
24. Dan River Inc.	48. Meredith Corp.

(Continued)

49. Mesta Mach Co.

50. National Stl Corp.

51. National Svc Inds Inc.

52. North Amern Coal Corp.

53. Northwest Inds Inc.

54. Northwestn Stl & Wire Co.

55. Opelika Mfg Corp.

56. Oxford Inds Inc.

57. Phillips Van Heusen Corp.

58. Quanex Corp.

59. Rop Roper Corp.

60. Russ Togs Inc.

61. S P S Tech Inc.

62. SFN Cos Inc.

63. Smucker J M Co.

64. Southeastn Pub Svc Co.

65. Stone Container Corp.

66. Stride Rite Corp.

67. Sunshine Mng Co.

68. Texas Inds Inc.

69. U N C Res Inc.

70. U N R Inds Inc.

71. United Sts Tob Co.

72. Vista Res Inc.

73. Walter Jim Corp.

74. Wayne Gossard Corp.

75. Wheeling Pitt Stl Corp.

LIST OF MULTINATIONAL CORPORATIONS

1966-1970

1. Abbott Labs
2. American Cyanamid Co.
3. Amp Inc.
4. Avon Products Inc.
5. Black & Decker Mfg Co.
6. Boise Cascade Corp.
7. Caterpillar Tractor Co.
8. Celanese Corp.
9. Chesebrough Ponds Inc.
10. Chrysler Corp.
11. Clark Equipment Co.
12. Colgate Palmolive Co.
13. Crown Zellerbach Corp.
14. Dow Chemical Co.
15. Eastman Kodak Co.
16. Ford Motor Co.
17. Foster Wheeler Corp.
18. W.R. Grace & Co.
19. Ingersoll Rand Co.
20. Intl Business Machs.
21. Intl Harvester Co.
22. Intl Minerals & Chem.
23. Intl Tel & Teleg Corp.

24. Johnson & Johnson
25. Joy Mfg Co.
26. Kaiser Alum & Chem Corp.
27. Merck & Co. Inc.
28. Minnesota Mng & Mfg Co.
29. Mobil Corp.
30. Monsanto Co.
31. Murphy Oil Corp.
32. N C R Corp.
33. Norton Co.
34. Pfizer Inc.
35. Quaker Oats Co.
36. Reynolds Metals Co.
37. Schering Plough Corp.
38. Singer Co.
39. Standard Oil Co.
40. Sterling Drug Inc.
41. Texaco Inc.
42. Texas Instrs Inc.
43. Union Carbide Corp.
44. United Sts Inds Inc.
45. Upjohn Co.
46. Warner Lambert Co.
47. Westinghouse Elec Corp.

LIST OF ONGOING MULTINATIONAL CORPORATIONS

1966-1970

1. Abbott Labs	25. Pfizer Inc.
2. American Cyanamid Co.	26. Reynolds Metals Co.
3. Amp Inc.	27. Schering Plough Corp.
4. Avon Products Inc.	28. Singer Co.
5. Black & Decker Mfg Co.	29. Standard Oil Co.
6. Chesebrough Ponds Inc.	30. Sterling Drug Inc.
7. Chrysler Corp.	31. Texaco Inc.
8. Colgate Palmolive Co.	32. Texas Instrs Inc.
9. Dow Chemical Co.	33. Union Carbide Corp.
10. Eastman Kodak Co.	34. Upjohn Co.
11. Ford Motor Co.	35. Warner Lambert Co.
12. W.R. Grace & Co.	
13. Intl Business Machs.	
14. Intl Harvester Co.	
15. Intl Minerals & Chem.	
16. Intl Tel & Teleg Corp.	
17. Johnson & Johnson	
18. Joy Mfg Co.	
19. Merck & Co Inc.	
20. Minnesota Mng & Mfg Co.	
21. Mobil Corp.	
22. Monsanto Co.	
23. N C R Corp.	
24. Norton Co.	

LIST OF DOMESTIC CORPORATIONS

1972-1976

1. A P L Corp.

2. Aileen Inc.

3. Alpha Portland Ind Inc.

4. American Bakeries Co.

5. American Ship Bldg Co.

6. Amstar Corp.

7. Apache Corp.

8. Armstrong Rubr Co.

9. Athlone Inds Inc.

10. Belding Heminway Inc.

11. Benguet Corp.

12. Blair John & Co.

13. Bobbie Brooks Inc.

14. Briggs & Stratton Corp.

15. Brockway Glass Co.

16. Brown Group Inc.

17. Callahan Mng Corp.

18. Campbell Red Lake Min Co.

19. Capital Cities Commn.

20. Carlisle Corp.

21. Ceco Corp.

22. Chelsea Inds Inc.

23. Chock Full O Nuts Corp.

24. Cone Mls Corp.

25. Conwood Corp.

26. Cooper Tire & Rubr Co.

27. Core Inds Inc.

28. Cyclops Corp.

29. Dan River Inc.

30. De Soto Inc.

31. Dome Mines Co.

32. R R Donnelley & Sons Co.

33. Eagle Picher Inds Inc.

34. Eastern Gas & Fuel Assoc.

35. Ennis Business Forms Inc.

36. Esquire Inc.

37. Federal Co.

38. Federal Paper Brd Inc.

39. Federal Signal Corp.

40. Florida Stl Inc.

41. Fuqua Inds Inc.

42. Gannett Inc.

43. Genstar Corp.

44. Giant Portland & Masonary

45. Great Northn Nekoosa Corp

46. H M W Inds inc.

(Continued)

47. Hammermill Paper Co.	73. Northwestern Stl & Wire
48. Holly Sugar Corp.	74. Norton Simon Inc.
49. Interspace Corp.	75. Oxford Inds Inc.
50. Int State Bakeries Corp.	76. Phillips Van Heusen Corp.
51. Kane Miller Corp.	77. Quanex Corp.
52. keller Inds Inc.	78. R T E Corp.
53. Knight Ridder Newsp Inc.	79. Roper Corp.
54. Loral Corp.	80. Russ Togs Inc.
55. Lowenstein M Corp.	81. S P S Technologies Inc.
56. Lukens Stl Co.	82. Safeguard Scientifics
57. M E I Corp.	83. SFN Cos Inc.
58. Manhattan Inds Inc.	84. Skyline Corp.
59. Marion Labs Inc.	85. Southdown Inc.
60. Mc Intyre Mines Co.	86. Stone Container Corp.
61. Meredith Corp.	87. Stride Rite Corp.
62. Mesta Mach Co.	88. Sunshine Mng Co.
63. Monogram Inds Inc.	89. Swank Inc.
64. Murray Ohio Mfg Co.	90. T R E Corp.
65. National Presto Inds Inc.	91. Telex Corp.
66. National Stl Corp.	92. Texas Inds Inc.
67. National Svc Inds Inc.	93. Texfi Inds Inc.
68. NCH Corp.	94. Todd Shipyards Corp.
69. Newhall LD & Farming Co.	95. Triangle Inds Inc.
70. North Amern Coal Corp.	96. Triangle Pac Corp.
71. Northgate Expl Co.	97. U N C Res Inc.
72. Northwest Inds Inc.	98. U N R Inds Inc.

(Continued)

99. Union Corp.

100. United Sts Tob Co.

101. V F Corp.

102. Vista Res Inc.

103. Wallace Computer Services Inc.

104. Walter Jim Corp.

105. Watkins Johnson Co.

106. Wayne Gossard Corp.

107. Wheeling Pittsburgh Stl Corp.

108. Winnebago Inds Inc.

LIST OF MULTINATIONAL CORPORATIONS

1972-1976

1. Abbott Labs	24. Chrysler Corp.
2. Acme Cleveland Corp.	25. Clark Equip Co.
3. Alberto Culver Co.	26. Coca Cola Co.
4. American Cyanamid Co.	27. Colgate Palmolive Co.
5. American Home Prods Corp.	28. Control Data Corp.
6. American Std Inc.	29. Corning Glass Wks.
7. Aro Corp.	30. Cummins Engine Inc.
8. Avon Prods Inc.	31. Digital Equip Corp.
9. Bausch & Lomb Inc.	32. Dow Chem Co.
10. Baxter Travenol Labs Inc.	33. Eastman Kodak Co.
11. Black & Decker Mfg Co.	34. Eaton Corp.
12. Borg Warner Corp.	35. Emhart Corp.
13. Bristol Myers Co.	36. Ex Cell O Corp.
14. Brown & Sharpe Mfg Co.	37. Ferro Corp.
15. Brunswick Corp.	38. Firestone Tire & Rubr Co.
16. Bucyrus Erie Co.	39. Ford Motor Co.
17. Burroughs Corp.	40. Foxboro Co.
18. C P C Intl Inc.	41. G C A Corp.
19. Cabot Corp.	42. General Foods Corp.
20. Caterpillar Tractor Co.	43. General Instr Corp.
21. Celanese Corp.	44. W.R. Grace & Co.
22. Chesebrough Ponds Inc.	45. Hanna Mng Co.
23. Chicago Pneumatic Tool Co.	46. H J Heinz Co.

47. Helene Curtis Ind Inc.	73. Outboard Marine Corp.
48. Hercules Inc.	74. Perkin Elmer Corp.
49. Hewlett Packard Co.	75. Pfizer Inc.
50. High Voltage Engr Corp.	76. Pitney Bowes Inc.
51. Honeywell Inc.	77. Polaroid Corp.
52. Intl Business Machs.	78. Proctor & Gamble Co.
53. Intl Flavors & Frag.	79. Products Resh & Chem Corp
54. Intl Harvester Co.	80. Quaker Oats Co.
55. Intl Min & Chem.	81. Reynolds Metals Co.
56. Intl Tel & Teleg Corp.	82. H H Robertson Co.
57. Johnson & Johnson	83. A H Robins Inc.
58. Joy Mfg Co.	84. Rohm & Haas Co.
59. Kellogg Co.	85. Schering Plough Corp.
60. Kennametal Inc.	86. Schlumberger Inc.
61. Levi Strauss & Co.	87. Scott Paper Co.
62. Lubrizol Corp.	88. G D Searle & Co.
63. Mcdermott Inc.	89. Simmonds Prec Prod Inc.
64. Merck & Co Inc.	90. Singer Co.
65. Minnesota Mng & Mfg Co.	91. Squibb Corp.
66. Mohawk Data Scs Corp.	92. Stanley Wks.
67. Monsanto Co.	93. L S Starrett Co.
68. Murphy Oil Corp.	94. Sterling Drug Inc.
69. N C R Corp.	95. Sundstrand Corp.
70. Nalco Chem Co.	96. Sybron Corp.
71. Nashua Corp.	97. T R W Inc.
72. Norton Co.	98. Tektronix Inc.

(Continued)

99. Texas Instruments Inc.

100. Timken Co.

101. Trane Co.

102. Union Carbide Corp.

103. Uniroyal Inc.

104. Upjohn Co.

105. Warner Lambert Co.

106. Weyerhaeuser Co.

107. Witco Chem Corp.

108. WM Wrigley Jr Co.

109. Xerox Corp.

110. Zapata Corp.

LIST OF ONGOING MULTINATIONAL CORPORATIONS

1972-1976

1. Abbott Labs
2. American Cyanamid Co.
3. American Standard Inc.
4. Avon Prods Inc.
5. Baxter Travenol labs Inc.
6. Black & Decker Mfg Co.
7. Borg-Warner Corp.
8. Bristol-Myers Co.
9. Bucyrus-Erie Co.
10. C P C Intl Inc.
11. Cabot Corp.
12. Caterpillar Tractor Co.
13. Celanese Corp.
14. Chesebrough Ponds Inc.
15. Chicago Pneumatic Tool Co.
16. Chrysler Corp.
17. Clark Equip Co.
18. Coca Cola Co.
19. Control Data Corp.
20. Cummins Engine Inc.
21. Digital Equip Corp.
22. Dow Chem Co.
23. Eastman Kodak Co.
24. Eaton Corp.
25. Ex Cell O Corp.
26. Firestone Tire & Rubr Co.
27. Ford Motor Co.
28. Foxboro Co.
29. General Foods Corp.
30. Hercules Inc.
31. Hewlett Packard Co.
32. Honeywell Inc.
33. Intl Business Machs.
34. Intl Flavors & Frag.
35. Intl Harvester Co.
36. Intl Tel & Teleg Corp.
37. Johnson & Johnson
38. Joy Mfg Co.
39. Kellogg Co.
40. Merck & Co Inc.
41. Monsanto Co.
42. N C R Corp.
43. Nashua Corp.
44. Outboard Marine Corp.
45. Perkin Elmer Corp.
46. Pfizer Inc.

(Continued)

47. Pitney Bowes Inc.

48. Polaroid Corp.

49. Rohm & Haas Co.

50. Schering Plough Corp.

51. Schlumberger Inc.

52. Singer Co.

53. Squibb Corp.

54. Sundstrand Corp.

55. Sybron Corp.

56. T R W Inc.

57. Texas Instrs Inc.

58. Union Carbide Corp.

59. Uniroyal Inc.

60. Upjohn Co.

61. Warner Lambert Co.

62. Weyerhaeuser Co.

63. Xerox Corp.

LIST OF DOMESTIC CORPORATIONS

1977-1981

1. A P L Corp.
2. Aileen Inc.
3. Alpha Portland Ind Inc.
4. American Bakeries Co.
5. American Ship Bldg Co.
6. Amstar Corp.
7. Apache Corp.
8. Armada Corp.
9. Armstrong Rubr Co.
10. Athlone Inds Inc.
11. Belding Heminway Inc.
12. Benguet Corp.
13. Blair John & Co.
14. Bobbie Brooks Inc.
15. Briggs & Stratton Corp.
16. Brockway Glass Co.
17. Brown Group Inc.
18. Callahan Mng Corp.
19. Campbell Red Lake Min Co.
20. Capital Cities Commn.
21. Carling Okeefe Co.
22. Carlisle Corp.
23. Ceco Corp.
24. Chelsea Inds Inc.
25. Chock Full O Nuts Corp.
26. Coastal Corp.
27. Cone Mls Corp.
28. Conrac Corp.
29. Conwood Corp.
30. Cooper Tire & Rubr Co.
31. Core Inds Inc.
32. Cyclops Corp.
33. Dan River Inc.
34. De Soto Inc.
35. Dome Mines Co.
36. R R Donnelley & Sons Co.
37. Eagle Picher Inds Inc.
38. Eastern Gas & Fuel Assoc.
39. Ennis Business Forms Inc.
40. Esquire Inc.
41. Federal Co.
42. Federal Paper Brd Inc.
43. Federal Signal Corp.
44. Florida Stl Corp.
45. Gannett Inc.
46. Genstar Corp.

(Continued)

47. Giant Portland & Masonary	73. National Svc Inds Inc.
48. Great Northn Nekoosa Corp.	74. NCH Corp.
49. H M W Inds Inc.	75. Newhall LD & Farming Co.
50. Hammermill Paper Co.	76. North Amern Coal Corp.
51. Holly Sugar Corp.	77. Northgate Expl Co.
52. Hudson Bay Mng & Smlt Co.	78. Northwest Inds Inc.
53. I C N Pharmaceuticals Inc.	79. Northwestern Stl & Wire
54. Interspace Corp.	80. Norton Simon Inc.
55. Int State Bakeries Corp.	81. Opelika Mfg Corp.
56. kane Miller Corp.	82. Oxford Inds Inc.
57. Keller Inds Inc.	83. Phillips Van Heusen Corp.
58. Knight Ridder Newsp Inc.	84. Quanex Corp.
59. Kroehler Mfg Co.	85. R T E Corp.
60. Loral Corp.	86. Redman Inds Inc.
61. Lowenstein M Corp.	87. Roper Corp.
62. Lukens Stl Co.	88. Russ Togs Inc.
63. M E I Corp.	89. S P S Technologies Inc.
64. Manhattan Inds Inc.	90. Safeguard Scientifics
65. Marion Labs inc.	91. SFN Cos Inc.
66. Mc Intyre Mines Co.	92. Skyline Corp.
67. Meredith Corp.	93. Smucker J M Co.
68. Mesta Mach Co.	94. Southdown Inc.
69. Monogram Inds Inc.	95. Southeastern Pub Svc Co.
70. Murray Ohio Mfg Co.	96. Southwest Forest Inds Inc
71. National Presto Inds Inc.	97. Stone Container Corp.
72. National Stl Corp.	98. Stride Rite Corp.

(Continued)

99. Sunshine Mng Co.

100. Swank Inc.

101. T R E Corp.

102. Telex Corp.

103. Texas Inds Inc.

104. Texfi Inds Inc.

105. Todd Shipyards Corp.

106. Triangle Inds Inc.

107. Triangle Pac Corp.

108. U N C Res Inc.

109. U N R Inds Inc.

110. Union Corp.

111. United Sts Tob Co.

112. V F Corp.

113. Vista Res Inc.

114. Wallace Computer Services Inc.

115. Walter Jim Corp.

116. Watkins Johnson Co.

117. Wayne Gossard Corp.

118. Wheeling Pittsburgh Stl Corp.

119. Winnebago Inds Inc.

LIST OF MULTINATIONAL CORPORATIONS

1977-1981

1. A M F Inc.	24. C P C Intl Inc.
2. Abbott Labs	25. Cabot Corp.
3. Air Prods & Chem Inc.	26. Castle & Cooke Inc.
4. Allis Chalmers Corp.	27. Caterpillar Tractor Co.
5. American Brands Inc.	28. Celanese Corp.
6. American Cyanamid Co.	29. Cessna Aircraft Co.
7. American Hoist & Der Co.	30. Champion Spark Plug Co.
8. American Std Inc.	31. Chesebrough Ponds Inc.
9. Archer Daniels Midlnd Co.	32. Chicago Pneumatic Tool Co.
10. Avon Prods Inc.	33. Chrysler Corp.
11. Baker Intl Corp.	34. Cincinnati Milacron Inc.
12. Bally Mfg Corp.	35. Clark Equip Co.
13. C R Bard Inc.	36. Coca Cola Co.
14. Baxter Travenol Labs Inc.	37. Combustion Engr Inc.
15. Beatrice Foods Co.	38. Control Data Corp.
16. Becton Dickinson & Co.	39. Cummins Engine Inc.
17. Bell & Howell Co.	40. Data Gen Corp.
18. Big Three Inds Inc.	41. Deere & Co.
19. Black & Decker Mfg Co.	42. Dexter Corp.
20. Boeing Co.	43. Digital Equip Corp.
21. Borg Warner Corp.	44. Dow Chem Co.
22. Bristol Myers Co.	45. Dresser Inds Inc.
23. Bucyrus Erie Co.	46. E I Du Pont & Co.

(Continued)

47. Eastman Kodak Co.	73. Ingersoll Rand Co.
48. Eaton Corp.	74. Intl Business Machs.
49. Emerson Elec Co.	75. Intl Flavors & Frag.
50. Ex Cell O Corp.	76. Intl Harvester Co.
51. F M C Corp.	77. Intl Tel & Teleg Corp.
52. Faberge Inc.	78. Johnson & Johnson
53. Firestone Tire & Rubr Co.	79. Joy Mfg Co.
54. Fluor Corp.	80. Kellogg Co.
55. Ford Motor Co.	81. Libbey Owens Ford Co.
56. Foster Wheeler corp.	82. Litton Inds Inc.
57. Foxboro Co.	83. Lockheed Corp.
58. General Elec Co.	84. Mattel Inc.
59. General Foods Corp.	85. Mc Donnell Douglas Corp.
60. General Mtrs Corp.	86. Merck & Co Inc.
61. Getty Oil Co.	87. Monsanto Co.
62. Gillette Co.	88. Motorola Inc.
63. B F Goodrich Co.	89. N C R Corp.
64. Goodyear Tire & Rubr Co.	90. Nashua Corp.
65. Gulf Oil Corp.	91. Occidental Pete Corp.
66. Halliburton Co.	92. Outboard Marine Corp.
67. Harnischfeger Corp.	93. Perkin Elmer Corp.
68. Hercules Inc.	94. Pfizer Inc.
69. Hewlett Packard Co.	95. Philip Morris Inc.
70. Honeywell Inc.	96. Pitney Bowes Inc.
71. Hughes Tool Co.	97. Polaroid Corp.
72. Illinois Tool Wks Inc.	98. Ralston Purina Co.

(Continued)

99. Raytheon Co.	125. Upjohn Co.
100. Reading & Bates Corp.	126. Varian Assoc Inc.
101. Revlon Inc.	127. Warner Commn Inc.
102. Rexnord Inc.	128. Warner Lambert Co.
103. R J Reynolds Ind Inc.	129. Westinghouse Elec Corp.
104. Rockwell Intl Corp.	130. Weyerhaeuser Co.
105. Rohm & Haas Co.	131. Xerox Corp.
106. Schering Plough Corp.	
107. Schlumberger Inc.	
108. Seagram Co.	
109. Singer Co.	
110. Smith Intl Inc.	
111. Smithkline Corp.	
112. Sperry Corp.	
113. Squibb Corp.	
114. Standard Oil Co Calif.	
115. Standard Oil Co Ind.	
116. Sundstrand Corp.	
117. Superior Oil Co.	
118. Sybron Corp.	
119. T R W Inc.	
120. Texas Instrs Inc.	
121. Union Carbide Corp.	
122. Uniroyal Inc.	
123. United Brands Co.	
124. United Tech Corp.	

LIST OF ONGOING MULTINATIONAL CORPORATIONS

1977-1981

1. American Brands Inc.	24. General Foods Corp.
2. American Cyanamid Co.	25. General Motors Corp.
3. American Std Inc.	26. Getty Oil Co.
4. Avon Prods Inc.	27. Goodyear Tire & Rubr Co.
5. Beatrice Foods Co.	28. Gulf Oil Corp.
6. Black & Decker Mfg Co.	29. Halliburton Co.
7. Borg Warner Corp.	30. Hercules Inc.
8. Bristol Myers Co.	31. Hewlett Packard Co.
9. C P C Intl Inc.	32. Honeywell Inc.
10. Chrysler Corp.	33. Ingersoll Rand Co.
11. Coca Cola Co.	34. Intl Business Machs.
12. Control Data Corp.	35. Intl Harvester Co.
13. Deere & Co.	36. Intl Tel & Teleg Corp.
14. Digital Equip Corp.	37. Johnson & Johnson
15. Dow Chem Co.	38. Litton Inds Inc.
16. Dresser Inds Inc.	39. Merck & Co Inc.
17. E I Du Pont & Co.	40. Monsanto Co.
18. Eastman Kodak Co.	41. Motorola Inc.
19. Firestone Tire & Rubr Co.	42. N C R Corp.
20. Fluor Corp.	43. Occidental Pete Corp.
21. Ford Motor Co.	44. Pfizer Inc.
22. Foster Wheeler Corp.	45. Ralston Purina Co.
23. General Elec Co.	46. Revlon Inc.

(Continued)

47. R J Reynolds Inds Inc.

48. Schering Plough Corp.

49. Singer Co.

50. Smithkline Corp.

51. Sperry Corp.

52. Standard Oil Co.

53. T R W Inc.

54. Texas Instrs Inc.

55. Union Carbide Corp.

56. United Brands Co.

57. United Technologies Corp.

58. Warner Lambert Co.

59. Xerox Corp.

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