THE EFFECT OF INCREASING TRANSPORTATION COST ON

FOREIGN DIRECT INVESTMENT

A Senior Scholars Thesis

by

KIMBERLY GRESSLER

Submitted to the Office of Undergraduate Research
Texas A&M University
in partial fulfillment of the requirements for the designation as

UNDERGRADUATE RESEARCH SCHOLAR

April 2009

Major: Maritime Administration

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Approved by:

Research Advisor: Joan Mileski
Associate Dean for Undergraduate Research: Robert C. Webb

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ABSTRACT

The Effect of Increasing Transportation Cost on Foreign Direct Investment.
(April 2008)

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This study showed that certain influences in the global environment may have an impact on FDI's regional or country choice of investment. The following research questions were explored. Are changes in FDI location choices due to elevated transportation costs? Has the emphasis on market changed to a stauncher stance toward efficiency factors due to current oil pricing?

The data was tested by applying multiple linear regressions using archival data from Dun and Bradstreet, the World Bank, and the Bureau of Economic Analysis (BEA). This study looked at data in snapshots of two years of a decade beginning with 1997 and ending with 2007. A broader dataset which has already been developed will be expanded to include the dramatic changes in oil prices pre Y2K and post Y2K.

It was hypothesized that results will reflect that the cost of transportation will drive investment closer, rather than further, from the origin of investment. Due to the nature of

FDI immobility, it is further hypothesized that emphasis will be placed on efficiency

factors rather than market because of concern about transportation costs.

The purpose will be to explore the features that affect the location of the foreign direct

investment, and to address the differences in emphasis, if any, by decision-makers upon

locations chosen because of the present transport costs.

The findings of the tests were theoretically along the same lines as the hypothesis

predicted. In 1997 market factors were dominant instead of efficiency factors. This was

seen through the significance of GDP growth and the amount of roads paved. In 2007

exchange rates and distance showed significance, moving factors to a stauncher stance

toward efficiency. A pooled regression showed the results of the effect of transportation

cost over all. When looking at the variances at the 0.1 p level a rise in the level of FDI

investment was found, concluding that the hypothesis and transportation cost results

were counter intuitive.

To my Grandmother Jackie Stanford, Papa Kenneth, and my Mother and Father: they

are the faith that keeps my head held high.

ACKNOWLEDGMENTS

I would like to thank Dr. Mileski for all of her hard work and dedication to this research. Dr. Mileski's previous research has paved the way for my thesis. Her direction and guidance is much appreciated and has made it possible for this incorporation of higher learning to be present in my scholastic endeavors.

I would like to recognize my family, specifically my Grandmother Jackie and Papa Kenneth, and their dedication to my education. As I have progressed through school, there has been a solid commitment to my success seen through each one of them. My family has prayed and supported my every endeavor and has been my cheerleader through every peak and valley.

Lastly, I would like to thank Texas A&M University at Galveston. The Maritime Administration Department has made it possible for me to participate in this program even through relocation due to Hurricane Ike. The continued support and push for higher learning has enabled me to incorporate this program into my degree.

Thank you to each and every one of you for making this experience possible.

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CHAPTER I

INTRODUCTION: INVESTMENT FACTORS

In previous research, it is has been found that investment choices are often based on specific

sets of conditions. There are been three existing conditions that push a firm to participate in

foreign value-adding activities (Dunning,1993). This is noted in John H. Dunning's OLI

Paradigm. These conditions are comprised of specific advantages, internalization-incentive

advantages, and location specific variables.

As these conditions are used to make investment decisions, there are four factors that

determine why locations are selected and used for foreign direct investment (FDI). These

factors are based on: resource, market, efficiency, and/or strategy. All of these play a key

role in location selection. Although each one is used, not all may be equally weighted when

selecting a new location.

Resource based factors can be defined by advantages sought by the investor through assets

whether they be capital or natural resource. Market based factors are made up of investment

incentives, low labor and transaction cost, human capital, information skills, and

management expertise. Efficiency is defined through the production incentives, product

specialization, vertical integration, security advantages, and common governments.

This thesis follows the style of *Journal International Business Studies*.

Lastly, strategic based factors include product distribution, input access, and close proximity to customers, market access, and protection of inputs.

There is evidence that certain factors in the global community may have an impact on regional country choice of investment. Previous research has confirmed this. Specifically, research conducted in Mileski (2000) has proven that key events that have affected the international oil supply has shown shift in locations chosen for investment activities.

Exploration of the following research questions was conducted: Are changes in FDI location choices due to elevated transportation costs? If this is true, is there a possibility of reverse globalization, and does it make connections to transportation costs? Has the emphasis from efficiency factors changed to a stauncher stance toward market factors due to current oil pricing? Is there a point at which oil/ transportation becomes too inefficient and investments are made closer to home? In relation to that, will transportation cost cause existing FDI to remove production from across boarders and locate closer to head quarters?

The testing of this was conducted through the analysis of international investment data provided by the Bureau of Economic Analysis (BEA). This data will provide information concerning investment cost made through FDI. Factors such as GDP growth

rates, currency rates, amount of paved roads, and trade barrier information will be used and provided by Dun and Bradstreet Investor Information Service.

After the implementation of all the data, linear regressions will be used to evaluate the information. By looking at the results graphically, connections can be made to determine at what point transportation cost pushes investment decisions. Pivotal points will be discovered and regressions will show that prices must reach a certain point before this takes place. At these pivotal points existing investments will have to make the choice to pull out or stay. These pivotal points will be seen through distance and overall costs. Further, if these preexisting investments choose not to relocate, more emphasis will be placed on market factors rather than efficiency factors due to the concern for transportation costs. This research plans to confirm the hypothesized results that the cost of transportation will drive investment closer, rather than farther, from the origin of investment

CHAPTER II

EVALUATION OF PAST AND PRESENT LOCATION

DECISIONS

Increases in Gross Domestic Product are stimulated by FDI and approximately 8% of 215 developing and industrial market economies countries, listed from Dun and Bradstreet's Explorers Encyclopedia, collective gross domestic product is represented through Foreign Direct Investment (FDI), (Dunning 1993). These factors include amount, type, and location (Root & Ahmed, 1978; Guisinger, et al., 1985; Lecraw, 1991; Loree & Guisinger, 1995). The location of FDI can have an impact on market factors and efficiency factors. Therefore, it is hypothesized that results will reflect that the cost of transportation will drive investment closer, rather than further, from the origin of investment, proving that efficiency factors will overcome market factors.

This paper will expand on previous research made on how investors choose locations, and the internal and external factors, specifically oil pricing and transportation. As part of this expansion, the underling theories of location choices must be known. .Dunning has put together three approaches to location choice. The first approach is a neoclassical approach to international production. The second is due to the market structure in which one is competing and the phase of the production cycle in which product is being formed (Dunning 2005). The final approach to choose locations is to consider the expected profits by the locations chosen due to created demand and supply models.

When looking at the choices made for investment, Dunning's OLI Paradigm is used as a reference. The OLI Paradigm explains this combination of three main factors, owner specific advantages (O), locations specific advantages (L), and internalization-incentive advantages (I). The OLI Paradigm provides the "frame work" for evaluation of investment choices made by firms. Dunning's paradigm states the four basic incentives for a firm to choose one location over another. These would be resource-based, market-based, efficiency-based, and strategy-based. Using this information as a guide, assessment of location choice can be made.

Investors find a location to benefit market factors or efficiency factors, and in light of this, transportation has developed and so has globalization. Globalization has taken a rapid turn and has become more prominent over the past thirty years (Rubin and Tal 2008). As cost of transportation is susceptible to fluctuation, it raises the question: Is there a possibility of reverse globalization? Research has found that there is such. As transportation costs rise, the effectiveness of shipping goods becomes less. The cost of oil influences the costs of shipping, thus becoming yet another factor for consideration for investors. This leads to my first research question: Are changes in FDI location choices due to elevated transportation costs? The proposed answer is yes because oil prices are directly linked to transportation in that it is half the cost of freight (Rubin and Tal 2008).

As this new idea of reverse globalization begins to take place and sets in motion the second question: Has the emphasis from market factors changed to a stauncher stance toward efficiency factors due to current oil pricing must be explored. Effectiveness in operations relates to global efficiency factors as well as institutional arrangements. Political and economic systems are apparent through institutional arrangements. Cost differences experienced by countries that effect firms in similar operations are referred to as global efficiency forces. Global efficiency is defined as cost differences in exchange rates, interest rates, and inflation rates, thus deeming market factors to be less effective in reducing cost and raising profit.

The use of the industrial organizational approach explains much of the movement among investors. As the integration of returns to scale and immediate product markets became apparent, location away from home was beginning to be more common. Tariff systems along with government policies provided many ways for a company to exploit the host country. In addition, as investment grew, so did newer taxation and tariff agreements. At one point the countries that had higher tariff rates were harder to efficiently invest in; however, as time progressed into the late nineties, tariff rates were no longer considered "big barriers" it was the rise of oil (Rubin 2008).

As transportation cost began to rise, freight inevitably did also (Rubin 2008). The fastest form of transportation via shipping would be through containers. In the year 2000, the cost of one container was $3000. Presently, due to the cost of oil moving from $20.00 a

barrel to nearly $200.00, the cost of the shipment of one container will be $15,000

(Rubin 2008). This has pushed the cost of freight to mirror fifty percent of fuel cost.

This paper argues that as this change from and market factors, to cost of freight, oil, and

transportation all together, (efficiency factors) will cause investors to shorten the

distance from home. As transportation fluctuates, so will location. The efficiency factors

that this influences will proceed to take a higher piece of the totem pole than market

factors. The use of Dunning's theories and research will be used to explain this

argument.

The hypothesis I have formulated to fit this argument is that the price of transportation

will cause a curvilinear effect versus a linear effect. There are three main reasons why

this would be. The first explanation behind my hypothesis is that investors will continue

to make decisions based on the OLI Paradigm. This means the price of oil must rise to a

certain point that all other factors cannot override the expense of transportation.

Secondly, this hypothesis relies on the fact that firms are often immobile; investors have

already developed in a certain location. Lastly, the cost of transportation must be more

than the cost of relocation or the benefits lost by developing closer to home. These three

Theories translate why transportation cost and FDI location choices are not proposed to

be linear but curvilinear.

The methodology and variables of this theory will be explained through the next chapter.

CHAPTER III

METHODOLOGY

There are 115 existing governments from the years of 1997-2007 that are used to test the hypothesis. "These governments are a representation of many types of nations with multiple resources, market conditions, strategic industries, policies toward FDI, and efficiency factors" (Mileski 2000). Social and political structures along with economic development are represented by these governments. The populations were selected through their transactions connected outwardly by the US. Through the use of this requirement, very few countries were eliminated due to data availability (Mileski 2000).

This research is supported by a multi-vitiate linear regression. This regression illustrates the impact transportation has made on globalization. In order to test the hypothesis these steps must be taken:

- Define country characteristics

- Generalized Least Squares

- SAS/ Results

Define country characteristics

These are variables that may influence or determine FDI policies adopted by countries

Country characteristics

Market size, efficiency, transportation, strategy, and distance are used to influence FDI policies. These are the outlined in Dunning's OLI paradigm which is why they are best fit for this regression. In addition, these must be examined to learn whether transportation is the main determinant for decision makers.

Market size

Market characteristics as defined by Dunning (1993) are features that are linked to serving a regional or local market. Characteristic- size and growth are two features that illustrate this theory. Size consists of absolute size and relative size. Absolute size, which can predict FDI levels, refers to population, consumption, production, and GNP. Relative size, on the other hand refers to the idea that size of particular markets may be indicative of customer sophistication. Growth refers to the residents' growth rate which is indicative of the compound yearly rate of growth. The GDP growth rate of each country will be used to satisfy this element.

Efficiency in operations

Efficiency in operations relate to global efficiency factors as well as institutional arrangements. Political and economic systems are apparent through institutional arrangements. Cost differences experienced by countries that effect firms in similar operations are referred to as global efficiency forces. Global efficiency is defined as cost differences in exchange rates, interest rates, and inflation rates. Exchange rates from each country will be used as this variable.

Transportation

Number of roads, ports, railways, and airports make up transportation variables. The expansions of these are reflected through policies and FDI involvement. As transportation costs fluctuate and expansion in roads and shipping occur FDI policies shift positively and negatively toward or against investment. The number of available paved roads fit best for this variable.

Strategy

Strategy can be based on many things such as tariffs, government regulations, and industrial controls. The best variable to represent this aspect of the regression would be

industrial controls. Each country's controls relating to industry were evaluated and noted whether controls existed or not.

Distance

Each distance was calculated from the closest points between the U.S. and the other countries. This variable serves as a major indicator within the regression.

Generalized least squares

Testing to find a change in the mean of location factors for every country is used. An alteration found in the mean in a "statistically significant level" (0.1) points out change in the commerce of FDI has happened, and this signifies an alteration to location choice.

SAS results

To conclude these steps the use of Generalized least squares will be used. The collected data will be cleaned then inputted it into a SAS program. It is then that the Generalized Least Squares will be used to analyze the data. The analysis will address the changes, if any transportation has had on FDI location choices.

CHAPTER IV

RESULTS AND CONCLUSIONS

This study showed that certain influences in the global environment may have an impact on FDI's regional or country choice of investment. This regression tested two questions: "Are changes in FDI location choices due to elevated transportation costs? Has the emphasis on efficiency changed to a stauncher stance toward market factors due to current oil pricing?" Results were found positive in one regression, but not both.

In order to test these questions there were five independent factors that were used. Distance from the host to home country, currency rates, amount of paved roads, special regulation by industry, and GDP growth rates were looked at as determinants of FDI location choice. Each was put in the regression as independent variables. These were tested along with the dependent variables which were countries that showed significant levels of FDI in each country.

The findings of the tests were theoretically along the same lines as the hypothesis predicted. In 1997 market factors were dominant instead of efficiency factors. This was seen through the significance of GDP growth and amount of roads paved. In summary of these findings, the underlining factor was the price of oil. This fact leaves efficiency factors to have a significant dominance over market due to relevance of transportation costs.

In 2007 exchange rates and distance showed significance. Transportation cost rose in the cost of oil (EIA). Therefore making reinvestment elsewhere more expensive, and pushed investors to stay put. Investors, like hypothesisized, reached a pivotal point of cost and redirected investment decisions, and aligned with efficiency.

Both tests did not come out positive for dominance of efficiency over market factors. FDI is able to move up in down as factors fluctuate. The regression mirrored FDI's ability to exploit and use factors of relevance, such as paved roads and GDP growth, to be successful. In 2007, the results were perfectly aligned with the hypothesis due to the rise in transportation cost from one year to the other. This proved the pivotal point theory, which states that at a certain price firms will revaluate and redirect if able. When transportation cost reached a certain point the move from market factors to efficiency factors was seen, and the variance changed to currency rates and distance.

Conclusions

A pooled regression showed the results of the effect of transportation cost over all. When looking at the variances at the 0.1 p level a rise in the level of FDI investment was found, concluding that the hypothesis and transportation cost results were counter intuitive. The year as a variable as well as GDP growth rate showed significance. The reason for rise in investment is due FDI's ability to be sticky. In this case, because

transportation was more expensive, it was cheaper to keep investments where they

originated. It was not what was hypothesized; investors choose to stick with market

factors instead of efficiency.

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APPENDIX

Pooled Results

```
The SAS System                           16:00 Tuesday, April 21, 2009   1

The REG Procedure
Model: MODEL1
Dependent Variable: fdicost

Number of Observations Read                167
Number of Observations Used                156
Number of Observations with Missing Values      11


                    Analysis of Variance

                    Sum of       Mean
Source           DF     Squares      Square   F Value   Pr > F

Model             6   55031825033   9171970839    3.59   0.0024
Error           149   3.808649E11   2556140453
Corrected Total 155   4.358968E11


Root MSE            50558   R-Square   0.1262
Dependent Mean      17822   Adj R-Sq   0.0911
Coeff Var         283.67746


              Parameter Estimates

           Parameter     Standard
Variable   DF   Estimate      Error   t Value   Pr > |t|

Intercept   1    5225.09508     11741    0.45    0.6570
gdp         1   -1345.15437  1442.41037  -0.93    0.3525
rdpaved     1       0.13465    0.03718    3.62    0.0004
specreg     1    3106.41862  9201.47891   0.34    0.7361
exchange    1      -0.03180    0.05438   -0.58    0.5595
distance    1      -0.39187    0.27354   -1.43    0.1541
year        1       19366   9109.44835    2.13    0.0352
```

1997 Results Continued

```
The SAS System                                          15:17 Tuesday, April 21, 2009
1

The REG Procedure
Model: MODEL1
Dependent Variable: fdicost

Number of Observations Read                        53
Number of Observations Used                        52
Number of Observations with Missing Values          1


                            Analysis of Variance

                                    Sum of          Mean
Source                   DF        Squares        Square    F Value    Pr > F

Model                     5       52329895      10465979       1.64    0.1692
Error                    46      294101919       6393520
Corrected Total          51      346431814


Root MSE              2528.54108    R-Square      0.1511
Dependent Mean        4624.96154    Adj R-Sq      0.0588
Coeff Var               54.67161


                            Parameter Estimates

                      Parameter      Standard
Variable      DF       Estimate         Error    t Value    Pr > |t|

Intercept      1     3990.86527     900.47080       4.43     <.0001
gdp            1      234.66592     120.65401       1.94     0.0579
rdpaved        1        0.00567       0.00306       1.85     0.0707
specreg        1     -230.07447     872.36325      -0.26     0.7932
exchange       1       -0.00443       0.01975      -0.22     0.8236
distance       1       -0.02019       0.01516      -1.33     0.1896
```

2007 Results Continued

```
The REG Procedure
Model: MODEL1
Dependent Variable: fdicost

Number of Observations Read                     114
Number of Observations Used                     104
Number of Observations with Missing Values       10


                        Analysis of Variance

                              Sum of         Mean
Source                 DF     Squares       Square    F Value   Pr > F

Model                   5  66100269415  13220053883      3.64   0.0046
Error                  98  3.558645E11   3631270327
Corrected Total       103  4.219648E11


Root MSE               60260    R-Square     0.1566
Dependent Mean         24421    Adj R-Sq     0.1136
Coeff Var          246.75289


                        Parameter Estimates

                   Parameter      Standard
Variable     DF     Estimate         Error    t Value   Pr > |t|

Intercept     1        39223         17782       2.21     0.0297
gdp           1  -1514.66783    2182.78267      -0.69     0.4894
rdpaved       1      0.19042       0.05763       3.30     0.0013
specreg       1   4865.46166         13336       0.36     0.7160
exchange      1     -0.02964       0.06589      -0.45     0.6538
distance      1     -3.73231       2.54758      -1.47     0.1461
```

Price of Oil 1997 (EIA)

1997-Jan	01/03	23.18	01/10	23.84	01/17	22.99	01/24	22.05	01/31	21.87
1997-Feb	02/07	21.56	02/14	20.25	02/21	19.78	02/28	18.72		
1997-Mar	03/07	18.54	03/14	18.57	03/21	18.81	03/28	18.51		
1997-Apr	04/04	17.62	04/11	16.66	04/18	16.59	04/25	16.94		
1997-May	05/02	17.25	05/09	17.27	05/16	18.16	05/23	18.83	05/30	18.40
1997-Jun	06/06	17.69	06/13	16.52	06/20	16.57	06/27	16.89		
1997-Jul	07/04	17.39	07/11	16.92	07/18	17.13	07/25	17.26		
1997-Aug	08/01	17.68	08/08	17.77	08/15	17.44	08/22	17.43	08/29	17.08
1997-Sep	09/05	17.22	09/12	17.13	09/19	17.19	09/26	17.61		
1997-Oct	10/03	18.66	10/10	19.34	10/17	18.57	10/24	18.51	10/31	18.38
1997-Nov	11/07	18.25	11/14	18.28	11/21	18.07	11/28	17.83		
1997-Dec	12/05	17.01	12/12	16.41	12/19	16.04	12/26	15.95		

Price of Oil 2007 (EIA)

2007-Jan	01/05	54.63	01/12	50.12	01/19	48.20	01/26	50.14		
2007-Feb	02/02	52.11	02/09	54.38	02/16	53.65	02/23	54.46		
2007-Mar	03/02	57.83	03/09	58.04	03/16	58.03	03/23	57.78	03/30	61.81
2007-Apr	04/06	64.93	04/13	63.54	04/20	62.97	04/27	63.25		
2007-May	05/04	63.40	05/11	61.55	05/18	63.92	05/25	66.75		
2007-Jun	06/01	65.37	06/08	66.79	06/15	66.18	06/22	68.29	06/29	67.84
2007-Jul	07/06	69.91	07/13	73.44	07/20	74.43	07/27	73.69		
2007-Aug	08/03	73.81	08/10	69.87	08/17	68.15	08/24	67.10	08/31	68.46
2007-Sep	09/07	71.42	09/14	73.23	09/21	74.97	09/28	75.91		
2007-Oct	10/05	75.57	10/12	75.66	10/19	80.12	10/26	81.27		
2007-Nov	11/02	86.02	11/09	89.64	11/16	87.79	11/23	90.54	11/30	90.32

It should be noted that the variables of Special regulation, currency exchange rates, amount of paved roads, and GDP growth rates were obtained from the Dunn and Bradstreet Exporters" Encyclopedia. The variable of presence of the level of FDI by country was obtained from the U.S. Department of Commerce.

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