

**INVESTMENT ENIGMA:
DETERMINANTS OF U.S. FOREIGN DIRECT INVESTMENT IN EUROPE**

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ABSTRACT

This paper examines the determinants of U.S. Foreign Direct Investment (FDI) in Europe. A panel data set includes observations for 22 European countries over the period 1980-2003. The model tests the responsiveness of U.S. FDI to host country variables such as the unemployment rate, R&D spending, demographics, and market demand conditions. Regression results indicate that U.S. FDI responds positively to countries that invest in R&D while maintaining strong domestic demand conditions. Unemployment and aging populations act as disincentives to investment as illustrated by their negative relationships to U.S. FDI.

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1. INTRODUCTION

1.1 Background

The United States maintains the largest stock of foreign direct investment (FDI) in the world. Since the 1970s, the growth of overseas production by Multinational Enterprises through FDI has increased substantially due to the removal of national barriers to transferring capital. In addition, a lack of foreign liquidity and increased domestic capital costs has boosted U.S. FDI. U.S. firms, then, enjoy considerable influence over which regions and countries receive inward investment and, consequently, achieve an improved economic environment. Host countries have paid particular attention to FDI over the last thirty years because it has increasingly impacted wealth, employment, and the balance of payments among other critical economic indicators. As firms continue to maximize shareholder value through foreign investment initiatives, the economic ramifications of such decisions are greater than ever before.

The prevalence of FDI in the world economy is apparent, however, *where* U.S. firms will invest in the future remains unclear. The European Union has reacted accordingly by adopting policies that reflect the new, investment-friendly economic community. The European stake in U.S. FDI is significant considering America accounts for over 50% of inward investment in the EU-25 (Worldbank.org). Although governments may develop policies to attract investment, ultimately a multitude of variables affect the location in which U.S. firms focus their investment energy. Consequently, nations that best understand FDI drivers will be most suited to successfully implementing effective investment-related policies, which ultimately improves the economic well-being of the European population.

The objective of this research is to test the responsiveness of U.S. FDI to the following variables: domestic demand, R%D expenditures of the host government, the unemployment rate,

and the aging population. The paper is divided into six sections. Section two introduces a framework for the research through investment literature. Section three reviews the data, included variables, and descriptive statistics. Section four explains the econometric model. Section five presents the estimated results. Section six concludes the study.

2. LITERATURE REVIEW

Barrell and Pain (1996) create a theoretical model to explain U.S. FDI in Europe during the 1970s and 1980s. The authors conclude that market size and factor costs such as labor and capital impact the investment decisions of multinational corporations. Their analysis indicates that FDI is more sensitive to variables with long-run implications. For example, daily exchange rates vary more than “sticky” variables such as wages. Although exchange rates may influence the timing of an investment, they fall short of impacting long-run investment decisions.

Concerning market size, the authors use GNP to advance their hypotheses. A positive relationship exists between FDI and GNP, indicating that firms target countries with larger markets. Barrell and Pain’s (1996) evidence indicates that a 1% rise in host country GNP increases business investment by 83%, *ceteris paribus*. The authors’ focus on GNP as an indicator of market size/demand highlights the point that firms are attracted to markets with a large potential customer base. Additional measures of market demand will be discussed later. Concerning the dependent variable, FDI, the authors emphasize the importance of considering all the sectors of economies. Investment researchers often use FDI data from solely the manufacturing sector and attempt to present these figures as an accurate representation of FDI across *all* sectors. Consequently, results fail to incorporate sector-specific investment effects that are especially important for service-based nations such as Luxembourg. Lastly, the authors establish a working definition of U.S. FDI: “U.S. external accounts as the book value of equity

in, and outstanding loans to, U.S. affiliates.” The only exception to this definition concerns situations in which U.S. investors maintain less than 10% of voting securities. Consequently, these assets are deemed as portfolio investments and not included as FDI.

Narula and Wakelin (2000) establish a strong relationship between labor costs and FDI. The authors use unit labor costs in the manufacturing industry to indicate that lower labor costs act as an incentive for U.S. companies to internationalize. The research of Barrell and Paine supports the hypothesis, although it is important to note that the effects of labor costs are small relative to other factors such as market size and technology. In addition, Narula and Wakelin introduce the relevance of measuring technology in FDI research. The authors utilize data focusing on patents issued in the U.S. to foreign firms as a measure of a country’s technological sophistication. This variable may have been less significant during the 1970s and 1980s (the timeframe on which Barrell and Paine concentrate), however, the transition to a technology-based world indicates that countries’ tech-sophistication influences their inward investment position.

In a subsequent piece of literature, Barrell and Pain (1997) expand upon their previous research by emphasizing the significance of stable labor markets. Their research indicates that firms perceive economic costs related to labor markets in addition to explicit wage costs. For example, the authors use the number of strikes in a country when assessing the cost of factors of production. Unemployment rates, too, are an effective approach to assessing the “health” of a country’s labor market. The number of strikes and unemployment rates are acceptable reflections of labor markets’ stability because recent data indicates sufficient variation in these rates to properly illustrate such a picture. Also, the unemployment rate is one of the most well-recorded variables with regard to FDI studies. Further, the authors emphasize that domestic

demand conditions influence investment decisions significantly. Barrell and Paine note the vast economy of scale opportunities that American firms may take advantage of through FDI activities. While U.S. enterprises have historically focused on domestic investment, Barrell and Paine state that the changing patterns of demand inevitably changes where firms will choose to invest, which explains the recent efforts of U.S. firms to undertake investment in foreign countries. Lastly, the authors acknowledge that increasing technology has made some measure of technical sophistication essential in FDI econometric studies. Similar to Narula and Wakelin's use of patents to gauge technology, Barrell and Paine include R&D expenditures of the host government. One may infer that as countries establish a technological competitive advantage, U.S. firms will look for investment partners that can support service-based activities in addition to manufacturing.

Erdal and Tatoglu (2002) support, alter, and expand upon the previous literature. For example, the authors focus on market size using GDP as opposed to GNP. Numerous methods of measuring market demand accurately capture the demand for goods and services across nations. The authors focus on Turkey, which brings to light certain implications critical to properly explaining FDI in Europe. For example, total investment (1985-1986) in Turkey was \$158 million as compared to \$1 billion from 1997-1998. Clearly, drivers to investment in Turkey may have changed as its market has become more economically integrated with the rest of Europe. Research, therefore, will best explain variation over a period of time larger than a decade. Erdal and Tatoglu use a sample over the years 1980-1998. In addition, Erdal and Tatoglu express the unemployment rate as a natural logarithm. Although this technique is not essential for all FDI studies, their approach indicates that there is room for manipulation with regard to the unemployment variable. One short fall of the study, however, concerns the origin

of FDI. The authors were unable to obtain country specific data, which then limits the country specific effects within the model. Given data availability, a panel data set will more effectively incorporate country specific effects (which their time series model lacks).

3. DATA

A panel data set includes observations for 22 European countries over the period 1980-2003. As this research focuses on FDI in Europe and not solely the EU, certain listed countries are not EU members. A list of included countries appears in Table 1 in the Appendix. While maintaining many of the critical aspects cited in the literature review, the sample attempts to correct for two primary shortcomings of previous research. First, post 1980 observations (in this study) indicate that the impact of technology will be properly incorporated. Second, panel techniques will effectively account for country specific effects. All data is available from the online database of the OECD except for FDI, the source of which is the Bureau of Economic Analysis.

3.1 Variables and Expected Signs

The dependent variable for the model is net U.S. FDI measured in real USD (FDI). Domestic demand (DD) is measured through an OECD calculated demand index that allows a comparison of countries' demand situations over 20 years. Although this approach deviates from using GDP or GNP as a measure of market health, GDP and GNP are highly correlated with DD, *ceteris paribus*, suggesting that all three variables are valid approaches to the investment question. The OECD index incorporates nuances of country-specific market demand that merit its inclusion in the model. DD is hypothesized to have a positive sign because firms favor economies with an abundant of consumers, *ceteris paribus*. GDP and GDP have consistently positive relationships, *ceteris paribus*, with FDI in all reviewed literature.

R&D expenditures of the host government (RD) is measured in millions USD. Inclusion of a “tech variable” ensures that technological sophistication is measured across countries. The presence of RD in this model reflects the recommendations of Barrell & Paine and Narula & Wakelin. Both pairs of authors hypothesize that R&D is positively associated with FDI, *ceteris paribus*. U.S. firms are attracted to countries that have the technological sophistication to undertake investment-related initiatives. Therefore, as supported through theory and literature, RD is expected to have a positive relationship with FDI, *ceteris paribus*.

The expected sign for the natural logarithm of the unemployment rate (LOGUR) is negative, *ceteris paribus*. In each of their studies, Barrell & Paine and Erdal & Tatoglu include the unemployment rate as a measure of labor market stability; essentially, healthy economies, *ceteris paribus*, should not have unemployment rates above their natural rate. When an excess of the labor force is unemployed, labor market inefficiencies occur which make the uncertainty concerning FDI increase. Elevated rates of unemployment act as a disincentive for firms to invest. Further, unemployment has been a growing problem in Europe over the past decade, which makes its inclusion in the model especially interesting.

A similar problem that Europe faces is the growing elderly population. As the working population must support a growing number of older individuals, the strain may ultimately influence U.S. firms’ investment decisions. Essentially, the elderly “extract” value from the output of the employed population. Theory, then, suggests that as the elderly population becomes proportionally larger, firms incur additional costs that decrease aggregate inflows, *ceteris paribus*. This model tests the number of citizens age 65 and older against the working population (OLD). The expected relationship between OLD and FDI is negative, *ceteris paribus*. The expected and estimated signs appear in Table 3 in the Appendix.

3.2 Descriptive Statistics

The descriptive statistics appear in Table 2 in the Appendix. The dependent variable, FDI, is measured in millions USD in real constant terms. The mean inward investment position is 19069.61 USD. Greece maintained the minimum net investment position in 1986 (129 USD) and the United Kingdom received the highest amount of U.S. investment in 2003 (272640 USD). Clearly, the range of inward investment illustrates that the attractiveness of investment opportunities varies considerably. The mean value of DD (domestic demand) was 0.74. The “best” domestic demand conditions as measured through the OECD index occurred in Spain in 2003 (2.00) and the poorest conditions were in Poland in 1980 (7.00E-04). While these particular statistics may be difficult to interpret because they are measured on an index, they do provide a relative comparison of demand conditions across countries and times. R&D spending of the host government was measured in millions USD in real constant terms. The mean value of R&D spending is 7966.16 USD. The range included Greece in 1981 (130.3 USD) and Germany in 2003 (54283.6 USD). Essentially, Germany was the most high tech economy in Europe while Greece lacked technology the most. The mean unemployment rate for Europe was 8.23%. Luxembourg in 2001 (1.2%) and Norway in 1980 (1.2%) managed the lowest unemployment rates across Europe and Spain experienced the worst unemployment in 1994 (23.9%). The population age 65 and older (OLD) was expressed in thousands of persons. The mean value was 23114.17. The most oldest individuals lived in Germany in 2003 (82520 individuals) while 1980 in Luxembourg (364.4) represented the population with the least older people.

Synthesizing the descriptive statistics, it becomes apparent that many competing variables drive U.S. firms’ decisions to undertake investment abroad. For example, the descriptive statistics indicate that firms have been attracted to the German economy largely

because it has such a high concentration of technology. However, the growing, aging population has repelled investment. Econometric techniques allow the variables to be tested and weighed to ultimately explain FDI drivers. Further, the ranges of the variables reflect the diverse investment options in Europe.

4. ECONOMETRIC MODEL

The objective of the model is to study the determinants of U.S. foreign direct investment in Europe. Specifically, to test the relationships between FDI and the included independent variables: domestic demand, technological sophistication, the unemployment rate, and the aging population. A panel data set is the optimal approach to understanding FDI because it allows for variation across countries and years. Also, a panel data set maximizes the variation by increasing the number of observations, which ultimately strengthens the explanatory power of the model. In addition, Barrell and Paine consistently use OLS estimation techniques, which justifies the approach in this model. The econometric model is presented below:

$$FDI = \beta_0 + \beta_1(DD) + \beta_2(RD) + \beta_3(LOGUR) + \beta_4(OLD) + \varepsilon$$

FDI = Foreign direct investment (millions USD)

DD=Domestic Demand of host country (OECD index)

RD=R&D expenditures of host government (millions USD)

LOGUR = Natural logarithm of the unemployment rate (percentage)

OLD=Population age 65 and older (thousand of individuals)

5. ESTIMATED RESULTS

The results for the analysis of the sample appear in Table 4 in the Appendix. DD, RD, LOGUR, and OLD are all found to be significant at the 1% level. DD and RD have the expected positive signs and LOGUR and OLD have the expected negative signs as hypothesized through theory and literature. Accordingly, firms perceive high rates of unemployment as labor market volatility and aging populations as an added burden on the workforce, *ceteris paribus*. LOGUR

and OLD both act as disincentives to U.S. investment. Larger markets have more potential consumers and high levels of technology indicate a country's technological sophistication. DD and RD have a positive relationship with FDI, ceteris paribus. Further, the coefficient of the unemployment rate may be interpreted as an elasticity because the natural logarithm is used. The estimated results indicate that a one percent increase in the unemployment rate will decrease foreign direct investment by 228 million USD.

The statistics support the results as well. The F-statistic is 47.49, a relatively high value that implies the line is a good "fit." The R-squared of .83 reveals that the included independent variables explain about 84% of the variation. In addition, the adjusted R-square of .82 is close enough in relation to the R-squared to determine that the size of sample and degrees of freedom in the regression were significant enough to suggest the fit is relatively sound and the variables well-chosen. The degrees of freedom may be attributed to the panel approach, which significantly increased the number of observations. Barrell & Paine and Erdal & Tatoglu receive an R-squared of .80 and .88, respectively. The R-square of the current estimated regression, then, is consistent.

6. CONCLUSION

Economic theory and previous literature on U.S. FDI support much of the findings of this study. For example, the estimated signs in this paper are consistent with each piece of included literature. When considering locational advantages to FDI, this study indicates that U.S. firms are particularly sensitive to variables linked to market demand and cost, which is supported by Barrell and Paine (1997). In addition, it seems that market demand and labor force stability influence investment decisions. The most significant implication of this research concerns firms' awareness of the technological sophistication of the countries in which they invest. Although

companies may be sensitive to investment drivers such as low unemployment rates and low compensation costs, they are even more sensitive to variables such as R&D. As technology is a new variable for FDI studies within the last 25 years, one may infer that research concerning FDI and R&D is limited. The results of this study imply that R&D is now an essential “core variable” when attempting to explain U.S. FDI.

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APPENDIX

TABLE 1: LIST OF INCLUDED COUNTRIES

1. Austria
2. Belgium
3. Czech Republic
4. Denmark
5. Finland
6. France
7. Germany
8. Greece
9. Hungary
10. Ireland
11. Italy
12. Luxembourg
13. Netherlands
14. Norway
15. Poland
16. Portugal
17. Slovak Republic
18. Spain
19. Sweden
20. Switzerland
21. Turkey
22. United Kingdom

TABLE 2: DESCRIPTIVE STATISTICS

Variable	Mean	Deviation	Minimum	Maximum
FDI	19069.61	36360.96	129	272640
DD	0.74	0.27	7.00E-04	2.00
RD	7966.16	11148.62	130.3	52283.6
UR	8.23	4.56	1.2	23.9
POP	23114.17	23846.26	364.4	82520

TABLE 2: EXEPECTED AND ESTIMATED SIGNS

Variable	Expected Sign	Estimated Sign
DD	+	+
RD	+	+
LOGUR	-	-
POP	-	-

TABLE 3: RESULTS

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+-----+
| Least Squares with Group Dummy Variables
| Ordinary least squares regression Weighting variable = none
| Dep. var. = FDI Mean= 25438.96059 , S.D.= 41817.55140
| Model size: Observations = 203, Parameters = 21, Deg.Fr.= 182
| Residuals: Sum of squares= .5680091133E+11, Std.Dev.= 17666.15180
| Fit: R-squared= .839200, Adjusted R-squared = .82153
| Model test: F[ 20, 182] = 47.49, Prob value = .00000
| Diagnostic: Log-L = -2262.1802, Restricted(b=0) Log-L = -2447.6808
| LogAmemiyaPrCrt.= 19.657, Akaike Info. Crt.= 22.494 ||
+-----+
|-----+-----+-----+-----+-----+-----+
| Variable | Coefficient | Standard Error | b/St.Er. | P[|Z|>z] | Mean of X |
+-----+-----+-----+-----+-----+-----+
| Constant | 27228.77471 | 15176.722 | 1.794 | .0728 |
| DD | 37547.77084* | 10260.082 | 3.660 | .0003 | .78829064
| RD | 6.453371488* | .82207147 | 7.850 | .0000 | 10071.880
| LOGUR | -22869.74282* | 4056.9049 | -5.637 | .0000 | 2.0740323
| OLD | -27.77423799* | 6.2203870 | -4.465 | .0000 | 4087.7685
+-----+-----+-----+-----+-----+-----+

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* denotes significance at the 1% level