**Assessing the Impact of Exchange Rate Fluctuations on FDI: Comparative Insights from Austria and Germany**

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**1. INTRODUCTION**

**1.1** Conception and Influence

A vital pillar of a nation’s economic development is that of Foreign Direct Investment (FDI) (Lasbrey et al., 2018). Although the influence of FDI on Economic Growth (EG) is thoroughly established, particularly in cases for developing nations (Erickson 2019), it is more difficult to ascertain the relative role of contributor independent variables to what influences FDI, particularly that of FDI inflows (both horizontal and vertical). Thus, identifying the aforementioned roles of the independent variables in FDI are absolutely integral to nations across the world – if one can identify what economic factors influence FDI, nations can make conscious and concentrated efforts in manipulating these variables to their advantage (and to the advantage of other nations by proxy), and thus reap the benefits of FDI on EG.

**1.2** The Achilles Heel of Complexity

The issue of identifying the previously alluded to economic variables lies within the complexity of international economics as a whole. For instance, there is a large issue with the differences between nations – even among nations that are conceived as being “similar”. Take the two countries of Germany and the United States, for example. Both nations are considered part of the “western world”, but their economies, geography, political system (and political climate), etc. vary drastically. Moreover, one can further delineate between small and large nation-models as it pertains to international trade and finance (Mexico and Cuba, as an example).

**2. LITERATURE REVIEW**

**2.1** FDI Determinants

Although there is much ambiguity concerning the relative impact of various independent variables in determining the level of FDI inflows, there is economic theory and empirical data that indicate several potential causal variables in determining the level of FDI. Some of the aforementioned potential determinant variables of FDI can be identified. Namely, Chandra et al., (2020), a study that looked at 31 Asian countries from the period of 2002-2017, and identified political stability, the inflation rate, trade openness, the exchange rate, market size, and the interest rate as determinants for FDI, and found that “political stability, trade openness, and market size has [a] positive relationship with FDI inflows of the country”, and the inverse was true of the other variables identified. Taylor et al., (2022) found that the volatility of currency impacts a domestic firm's technological innovation. “We argue that FX volatility may deter firm-level innovation activities through two potential economic mechanisms: precautionary savings and trade slowdown.” In essence, as the volatility of the currency increases (and thus the volatility of the exchange rate of said currency increases), the rate of technological innovation (in the forms of research and development (R&D)) decreases.

To enumerate the sheer totality of the number of variables involved, Nguyen and Cieślik (2020) was evaluated. Nguyen and Cieślik examined 38 countries (from Europe to Asia) from 1995-2013 and identified various variables that are potential suspects for FDI determination. These variables include total income, market size, skilled labor endowments, investment costs, trade costs, exchange rate volatility, a common language, bilateral investment treaties, a historical colonial relationship, geographic regions, exchange rate regimes, the given nation’s Eurozone status, and the governance apparatus were all considered. Nguyen and Cieślik, for estimation methods, employ the Poisson-pseudo maximum likelihood (PPML), fixed effects (FE), random effects (RE), and RE Tobit. They found that 1) market size and total income are vital in encouraging horizontal FDI, 2) the “difference in skilled labor endowments between the European source and the Asian host countries has a positive impact on vertical FDI from Europe to Asia”, 3) “investment costs, trade costs, and exchange rate volatility are negatively correlated to FDI”, 4) the aforementioned “common language, bilateral investment treaty, and the mutual historical colonial relationship encourages FDI from Europe to Asia”, and 5) “heterogenous governance system, and source countries’ Eurozone membership lead to differences in empirical findings”. However, the impact of exchange rate volatility was only found to be statistically significant in Southeast Asian Countries.

Hanusch et al., (2018), in a panel of 80 developing and developed countries employing the period from 1990 to 2015, found a negative relationship between “de facto exchange rate” and FDI. Moreover, the authors suggest that “reducing exchange rate volatility by 10 percent over one year can boost FDI inflows – ceteris paribus – by an estimated 0.48 percentage points of GDP while the same reduction over the past five years can boost FDI inflows by 0.27 percentage points over the long-run”. Thus, not only do the authors suggest that the volatility of the exchange rate influences FDI, but that it does so in the short-run and in the long-run. Although Hanusch., et al (2018) implies that exchange rate volatility influences FDI in the short-run and the long-run for the 80 developed and developing countries, how does one explain the findings of Nguyen and Cieślik?

Ahmed et al., (2019) examined the impact of exchange rate volatility on FDI inflows for two countries: Morocco and Turkey. Morocco represents a small-nation model, contrary to Turkey. They observed that, for the period 1990 to 2017, for Morocco specifically, “[...] in both short and long-term, real exchange rate volatility is negative and highly significant.” In contrast, for Turkey, “FDI inflows are found more elastic to domestic price fluctuations. The exchange rate volatility, instead, turned out to have a positive but insignificant effect.” Furthermore, the authors suggest that there is more at play, particularly “potential market size, institution quality, and infrastructure”. Canada, a large nation, also seems to be influenced *positively* by exchange rate volatility in both the short and long-run (Lajevardi 2024), much like what Ahmed found.

**2.2** Exchange Rate Volatility

Although Ahmed et al., (2019) implied a lack of explanatory power for a larger country model, Nakagawa et al., (2022) analyzed the lack of empirical evidence regarding exchange rate fluctuations influencing FDI decisions. Although the relationship between the exchange rate and FDI is established in theory, the authors identify three issues in the prevailing literature: 1) FDI is often treated as a continuous variable, which does not consider the discrete (or binary) nature of actual investment decisions. 2) FDI data are typically aggregated, which obscures the more detailed firm-level relationship between exchange rates and FDI. 3) The regression models typically used may not be appropriate due to the different time-series properties of exchange rates and FDI data. The authors suggest that the study conduct a more novel approach, wherein they utilize a discrete choice model with a mixed application to better capture the discrete nature of investment decisions and the heterogeneity between firms, as well as emphasizing the cross-sectional dimension to mitigate the issues arising from the aforementioned time-series analysis, and, finally, employ firm-level location choice data and real exchange rate data to reflect international price level differences, allowing for the previously alluded to methodological improvements. After implementing these methodological improvements, the study conducts an empirical analysis “using firm-level data on the location choice of Chinese outward FDI during 2005-2016.” The authors conclude that “Our estimation results detect a significant exchange rate effect not accounted for previously, explaining why the evidence for the effect has been mixed across studies.”

Balaban et al., (2019) found that there is an unexplained component of the real exchange rate volatility that affects FDI. The authors concluded that there is a negative impact of high exchange rate volatility on FDI in the manufacturing sector, but that exchange rate volatility is not a statistically significant determinant of FDI in the transport and communications sectors – and the choice of the volatility measure does not affect the results.

**2.3** Small Nation, Large Nation

As previously alluded to by Chandra, Nguyen and Cieślik, and Ahmed, market size has a stark influence on FDI. To minimize various confounding variables – and to choose two nations that are different sizes in international economics, one must choose two similar countries wherein one falls under the large nation model and the other falls under the small nation model. This is the rationale for the two countries to be examined: Germany and Austria. Germany and Austria fit the large nation and small nation model respectively, have a shared language (hochdeutsch), are politically stable, geographically similar, switched to the Euro in 1999, have similar HDI rankings, and have eerily similar Fragile State Index rankings (in 2023, according to the Fragile States Index, Germany was 24.6 and Austria was 22.0).

**3. RESEARCH METHODOLOGY**

**3.1** General Methods

The aforementioned rationale for the selection of the small and large nation allows for a quasi-comparison of the relative impacts of the following independent variables in FDI. From the period of 1990 to 2023, data, when available, was gathered. The dependent variable for both Austria and Germany were net FDI inflows. There were six independent variables: Exchange Rate VolatilityIV1, Real GDPIV2, Trade BalanceIV3, Technological InnovationIV4, Human Development Index (HDI)IV5, and Political Stability (WGI)IV6. The rationale for not including more independent variables is that both the Human Development Index (HDI) and the Worldwide Governance Indicators (WGI) include a multitude of variables in themselves. These independent variables were, for the data available, put into Microsoft Excel. A correlation coefficient was calculated for each independent variable, and, from this, the T-Statistic and Degrees of Freedom (DoF) were calculated, which led to resulting p-values that determined the statistical significance of each correlation coefficient.

**3.2** Correlation Analysis

The correlation analysis led to many interesting indications. Firstly, the differences between Austria and Germany were staggering. In some instances, such as Political Stability (PS), Austria and Germany were indifferentiable. However, for variables such as exchange rate volatility as well as technological innovation, the difference was impossible to overlook. The following are the resulting correlation coefficients and p-values:

**Correlation Coefficients\***

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | Germany (DE) | Austria (AT) |  |
|  |  |  |  |
| Exchange Rate Volatility | 0.3288 | 0.0229 |  |
| Real GDP | 0.1229 | 0.2308 |  |
| Trade Balance | -0.0882 | -0.0318 |  |
| Technological Innovation | 0.1226 | 0.2729 |  |
| Human Development Index | 0.2114 | 0.0882 |  |
| Political Stability (WGI) | 0.1072 | 0.1076 |  |
|  |  |  |  |
| \*Taken from Excel Spreadsheet |  |  |  |

**P-Values\***

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | Germany (DE) | Austria (AT) |  |
|  |  |  |  |
| Exchange Rate Volatility | 0.0875 | 0.9078 |  |
| Real GDP | 0.5174 | 0.2565 |  |
| Trade Balance | 0.6369 | 0.8649 |  |
| Technological Innovation | 0.5592 | 0.1969 |  |
| Human Development Index | 0.2619 | 0.6429 |  |
| Political Stability (WGI) | 0.6525 | 0.6607 |  |
|  |  |  |  |
| \*Taken from Excel Spreadsheet |  |  |  |

**3.3** Exchange Rate Volatility (Fig. 1)

The only variable that comes close to being statistically significant is Germany’s Exchange Rate Volatility. Thus, we can only *marginally* “reject” the H0 (that there is no relationship between Exchange Rate Volatility and FDI inflows).

Although the resulting p-values do not indicate statistical significance, one can still analyze the resulting correlation coefficients and draw (perhaps erroneous) conclusions or point out oddities. One of these oddities is the striking difference in Exchange Rate Volatility. This, however, is explained away by the fact that the Austrian Schilling (the previous national currency before the Euro in 1999), was included in the calculation. A separate correlation coefficient calculation was performed that excluded the period 1990-1999, and the resulting correlation coefficient was 0.2066 – and the p-value attained from this calculation was 0.2914. Given the previous correlation coefficient was 0.0229, and the previous p-value was 0.9078, it is safe to assume that the Schilling (and the percent change in exchange rate volatility) was creating statistical noise – removing the Schilling and just starting from the Euro increased confidence, but not to a statistically significant level. Moreover, it did not close the gap to that of Germany. This *could* be indicative of a market size difference regarding the influence of Exchange Rate Volatility on FDI inflows.

**3.4** Real GDP and Trade Balance (Fig. 2, 3)

The difference between the correlation coefficients for Germany and Austria regarding Real GDP was not great. Perhaps Austria’s is greater, due to the size of the nation, or some influence of relative price levels. The resulting p-values were not statistically significant, thus leading to a failure to reject the null hypothesis. The Balance of Trade having a neutral impact for both countries were thoroughly surprising. One would naturally assume that trade deficits and so on would impact foreign investment into the nation. However, given the resulting p-values indicating very low statistical significance, especially for Austria, the null hypothesis cannot be rejected.

**3.6** Technological Innovation (Fig. 4)

Technological innovation having an impact on FDI is Taylor (2022). Although Germany’s correlation seems low, the p-value indicates that the correlation coefficient is not as robust as Austria’s. However, both indicate a lack of statistical significance, and thus a failure to reject the null hypothesis.

**3.7** HDI, Political Stability, and Missing Data

Both HDI and Political Stability seem to have little effect on FDI, although both had very, very weak p-values – thus a failure to reject the null hypothesis. For Political Stability (PS), a lack of data could have influenced the results. Moreover, given the status of both nations (as being highly stable), their relative HDI and WGI rankings could have little to no impact on the spirits of investors.

**4. CONCLUSION**

Not much can be drawn in terms of a conclusion regarding the findings of this paper, as the resulting p-values were too weak to reject any null hypotheses. However, one can make note that the exchange rate volatility for Germany correlated with net FDI inflows, and that the resulting p-value was *close* to being statistically significant – perhaps if there was more data, and one was able to remove some of the noisier data, and conduct a more thorough compilation and statistical analyses, a more robust result could be attained. A simple correlation analysis is riddled with issues, primarily in differentiating between correlation and causation. Given the number of extraneous variables and confounding variables, one cannot draw a solid conclusion through the results alone. One can look to the literature review to find an indication of what is going on. Much like Tan et al., (2021) states – “the determinants of FDI inflows are still unclear”. Intuitively, R&D, PS, HDI, and Exchange Rate Volatility should play a part, and nations should focus on gearing economic policy with this in mind.

**APPENDIX**

**Figure 1.**

**A graph with a line

Description automatically generated**

**Figure 2.**

**A graph showing the growth of a company

Description automatically generated with medium confidence**

**Figure 3.**

**A graph on a screen

Description automatically generated**

**Figure 4.**

**A graph with a line and a line

Description automatically generated**

Source: The World Bank – R&D Expenditure (% of GDP) - Germany, Austria.

**BIBLIOGRAPHY[[1]](#footnote-1)**

Lasbrey, A., Enyoghasim, M., Tobe, A., Uwajumogu, N., & Chukwu, B. (2018). Foreign Direct Investment and Economic Growth: Literature from 1980 to 2018. *International Journal of Economics and Financial Issues*, 8(5), 309-318.

Owusu-Nantwi, V., & Erickson, C. (2019). Foreign direct investment and economic growth in South America. *Journal of Economic Studies*, 46(2). Article publication date: 4 March 2019.

Chandra, T. A., & Handoyo, R. D. (2020). Determinants of Foreign Direct Investment in 31 Asian Countries for the 2002 - 2017 Period. *Contemporary Economics*, 14(2020), Issue 4, 566-581.

Taylor, M. P., Hsu, H. P., Wang, Z., & Xu, Q. (2022). Currency volatility and global technological innovation. Journal of International Economics, 137. <https://doi.org/10.1016/j.jinteco.2022.103607>

Nguyen, A., & Cieślik, A. (2020). Determinants of Foreign Direct Investment from Europe to Asia. Journal of The World Economy, 44(6), 1842-1858. <https://doi.org/10.1111/twec.13064>

Hanusch, M., Nguyen, H. A., & Algu, Y. (2018). Exchange Rate Volatility and FDI Inflows: Evidence from Cross-Country Panel Data. MTI Global Practice Discussion Paper; No. 2. World Bank Group, Washington, DC. <https://hdl.handle.net/10986/29911>

Ahmed, B., & Azzouzi, A. (2019). Impact of the Exchange Rate and Price Volatility on FDI Inflows: Case of Morocco and Turkey. Journal of Applied Economics and Finance, 6(3). Retrieved from <http://aef.redfame.com>

Lajevardi, H., & Chowdhury, M. (2024). How Does the Exchange Rate and Its Volatility Influence FDI to Canada? A Disaggregated Analysis. *Journal of Risk and Financial Management*, 17(2), 88. <https://doi.org/10.3390/jrfm17020088>

Nakagawa, H., & Li, S. (2022). Exchange Rates and foreign direct investment: evidence from Chinese firm-level data. Journal of the World Economy, 45(9), 2902-2923. <https://doi.org/10.1111/twec.13257>

Balaban, S., Živkov, D., & Milenković, I. (2019). Impact of an unexplained component of real exchange rate volatility on FDI: Evidence from transition countries. Journal of Economic Systems, 43(3-4). <https://doi.org/10.1016/j.ecosys.2019.100719>

Fund for Peace. (2023). *Fragile States Index 2023*.<https://fragilestatesindex.org/>

Tan, L., Xu, Y., & Gashaw, A. (2021). Influence of Exchange Rate on Foreign Direct Investment Inflows: An Empirical Analysis Based on Co-Integration and Granger Causality Test. *Mathematical Problems in Engineering*, 2021. <https://doi.org/10.1155/2021/7280879>

1. In the order in which they appear. [↑](#footnote-ref-1)