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FDI, exchange rate and firm's gain in terms of real assets

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Abstract

Here we argue that the difference between market exchange rate and PPP exchange rate of the local currency unit with respect to the investing one induces gain/loss for the investing firm in terms of ownership of real assets. When the market exchange rate of the local currency unit is greater than its PPP exchange rate, then the foreign investors gain in terms of PPP in the local market, i.e., the foreign investors now get the ownership of more assets than they could probably have in their native land by investing the exact same amount of money. On the other hand, when the market exchange rate is lower than the PPP exchange rate, then the foreign investors incur losses in terms of asset ownership, i.e., they now own less amount of physical assets than they could have alternatively owned if they chose to invest in their native land instead. Building upon the above arguments, here we empirically estimate the regions where US FDI should flow toward in order to reap the maximum benefits arising out of exchange rate differentials and compare it with the actual US investments abroad. The strategy presented here will provide firms a new perspective to gauge their overseas investment opportunities.

Keyword

FDI, market exchange rate, PPP exchange rate, multinational firms, wealth transfer

JEL Codes

F21, F23, F41

1 Introduction

According to the latest data released by the Bureau of Economic Analysis, US Department of Commerce, UK and Switzerland are amongst the top 10 US investment destinations abroad [1]. To date, US investments in UK and Switzerland stand at USD 1077.52 billion and USD 212.24 billion respectively [1]. However, there is at least one striking difference between these two top US investment destinations abroad. For UK, the market exchange rate of the local currency, i.e., British pound is greater than its PPP exchange rate in terms of US dollar. On the other hand, the market exchange rate of Swiss franc is lower than its PPP exchange rate again in terms of US dollar. To be precise, as on 2022, the market exchange rate and PPP exchange rate of British pound in terms of US dollar are 0.81 and 0.68 respectively [2]. This means, when a US firm intends to invest 1.00 US dollar in UK and converts its US dollar accordingly into British pound from international currency market, it will get 0.81 British pound in return. This is the first step for a multinational firm to invest in a foreign land, i.e., it needs to convert its own currency to the host currency in the first place. Then the firm invests its British pound to purchase goods and services in the UK in order to commence its operation. It is when the PPP exchange rate of British pound comes into play. As on 2022, the PPP exchange rate of British pound is 0.68 in terms of US dollar, i.e., what 1.00 US dollar can purchase in United States, can be purchased with 0.68 British pound in UK. Thus, the US investment firm after exchanging its 1.00 US dollar investment with 0.81 British pound, can now purchase 1.00 US dollar worth of physical assets in UK with

0.68 British pound only and it still have 0.13 British pound in hand after the purchase. So, by investing 1.00 US dollar in UK instead of investing the same in the United States, the US investment firm makes an overnight gain of 0.13 British pound. On the other hand, the market exchange rate and the PPP exchange rate of Swiss franc in terms of US dollar are 0.95 and 1.05 respectively as on 2022 [2]. So, what 1.00 US dollar can purchase in United States, can be purchased with 1.05 Swiss franc in Switzerland. When a US investor chooses to invest in Switzerland, he/she first needs to convert his/her US dollar to Swiss franc and in the process of doing so, he/she will get 0.95 Swiss franc per US dollar in return at the market rate. However, to purchase 1.00 US dollar's worth of goods and services in Switzerland, the foreign investor needs to invest exactly 1.05 Swiss franc in Switzerland. So, the US investor needs to invest 0.10 more Swiss franc in order to get 1.00 US dollar's worth of physical assets in Switzerland. In other words, the US investor in Switzerland loses 0.10 Swiss franc overnight due to his/her decision to invest 1.00 US dollar in Switzerland instead of investing the same in his/her home country.

From the above analysis, we can see that US investments abroad can be classified into two broad categories: 1) where US investors reap an overnight gain in terms of ownership of physical assets and 2) where investors lose in real assets due to the differences between market exchange rates and PPP exchange rates. In this study, we dissect US investments abroad and identify the countries where US investors may obtain windfall gain due to the difference between market exchange rate and PPP exchange rate of the local currency unit in terms of US dollar. We then use ARIMA model to forecast where US overseas investments should be destined to in times to come in order to gain maximum benefits with regard to ownership of physical assets. The rest of the article is organized as follows: Section: 2 provides an exposition regarding the macroeconomic impact of FDI in the existing literature and also discusses how the present discourse fits into the existing body of knowledge. Section: 3 elaborates the main proposition of this article. Section: 4 analyzes US FDI abroad in line with the main proposition of this article. Section: 5 extrapolates the data into the future in order to unveil where US FDI should flow toward in order to obtain maximum gain in terms of ownership of real/physical assets. Finally, Section: 6 concludes the article.

2 Role of FDI in the literature and the scope of the current study

In the existing literature, the impact of FDI on the macro-economy has been discussed in terms of its ability to promote economic growth [3], [4], [5], [6], [7], [8], [9], [10], [11], its environmental footprints [12], [13], [14], [15], [16], [17], [18], [19], [20], [21], [22], technology transfer [23], [24], [25], [26], development of human capital [27], [28], [23], productivity growth [29], [30], [31], [32], [33], [34], [35], [36] etc. We now discuss each of the aforesaid impacts of FDI on the macro-economy one by one.

- **Economic Growth:** Whether FDI can promote economic growth in the host country is subject to debate. While some studies report positive relationship between FDI inflow and economic growth, others find no significant inter-relationship between the two. The positive effect of FDI on economic growth is usually reaped through technology transfer and knowledge diffusion resulting into an increase in productivity and improvement in allocation of resources in the host country [3]. For example, Pegkas (2015) [4] suggests the existence of long run co-integrating relationship between FDI stock and economic growth in the Eurozone countries. In addition, Alfaro et al (2004) [5] reports that the countries with a well-developed financial system gain more in terms of economic growth through the inward flow of FDI. Wang (2009) [6] analyzes the heterogeneous effect of sector-level FDI inflows

on host country's economic growth using the data of 12 Asian economies and reports that inward FDI in the manufacturing sector has a significant positive impact on the host country's economic growth. Reichert and Weinhold (2001) [7] suggests the relationship between FDI and economic growth in developing countries to be very heterogeneous in nature and the countries with more open economies benefit more from the inward flow of FDI. Mehic et al. (2013) [8] identifies the existence of positive and statistically significant impact of FDI on economic growth for a sample of seven southeast European countries. However, on the contrary, Zhao and Du (2007) [9] reports no significant causality running between inward FDI and Chinese economic growth. They conclude that it is the remarkable economic growth of China that attracts inward FDI and not necessarily the vice versa. Using the Tunisian data during the period 1970-2008, Belloumi (2014) [10] suggests no causal relationship exists between FDI inflow and economic growth at least for Tunisia, although the variables of interest may co-integrate in the long run. Chakraborty and Nunnenkamp (2008) [11] conducts a sectoral analysis of Indian data and concludes that FDI in service sector may only have a transitory effect on Indian economic growth. However, they also report that the service sector FDI may also have a spillover effect on the growth of the manufacturing sector in India. Drawing upon the above discussion, we can conclude that the empirical literature is still highly divided about whether and to what extent the inward FDI may influence host country's economic growth.

- **Environment Impact:** Like many other economic discourses, the impact of inward FDI on host country's environmental parameters lies somewhere in the grey region and attains no clear answer in the existing literature. Two different theories, namely Pollution Haven Hypothesis (PHH) and Pollution Halo Hypothesis (PHL) evolve around this discourse. Pollution Haven Hypothesis (PHH) is rooted upon the fact that the developed countries usually tend to have a stricter environmental regulation, which lures the firms in the developed countries to relocate the environmentally hazardous part of their production process to developing countries with less stringent environmental compliance [12], [13]. Thereby, the firms in the developed countries seek to reduce their cost of production at the environmental expense of the developing countries and this tendency of bypassing the environmental regulation eventually leads to the race-to-the-bottom (RTB) hypothesis that may bring about a global peril [14]. In short, Pollution Haven Hypothesis (PHH) posits the existence of a positive correlation between environmental degradation and FDI inflows in the host countries [15]. Theory of comparative advantages in international trade serves as the bedrock for PHH by considering the environment as an essential factor of production [20]. While many studies find PHH to be a promising theory to explain cross-border trades, others criticize it on its inability to explain the shaping of Environmental Kuznets Curve (EKC) among others [16], [17], [18]. Another quite intriguing theory in this regard, namely, the Pollution Halo Hypothesis (PHL) holds a rather positive view on foreign direct investment and is inspired by the 'Halo Effect', which asserts that the positive impression of an entity in one region can possibly positively influence another entity's opinion and/or feeling in other regions [15]. Unlike the Pollution Haven Hypothesis (PHH), Pollution Halo Hypothesis (PHL) describes a negative relationship between inward FDI and host country's environmental degradation [17]. The main proposition of PHL is derived from the assumption that the developed countries transfer environmentally friendly technologies to the developing one through FDI [19]. Thus, according to PHL, FDI originating from the developed countries adds to the environmental quality of the FDI receiving countries [21], [22].

- **Technology Transfer:** FDI is often considered as a major channel for cross-border technology diffusion as it brings with it new technology, updated production methods and/or organizational management skills to the host country [23]. It has been argued that technology transfer through FDI usually provides substantial stimulus for the local firms to adopt/upgrade to newer and superior technologies in order to remain competitive in their niche market in terms of price and/or quality of the products [25]. Moreover, foreign investors from the developed countries usually hire high skilled workers in the host country and some of these workers eventually leave the firm to start their own ventures and along the way, they mould the new technology into the fabric of the local production process [24]. Thus, the technology transfer through FDI adds greatly to the Total Factor Productivity (TFP) of the FDI receiving countries, which eventually promotes economic growth as argued in [26], [23].
- **Development of Human Capital:** FDI is supposed to add substantially to the stock of human capital in the recipient countries through a number of channels, which include but not limited to on-the-job training, technology transfer, alternative management practices and organizational arrangements [27]. Host countries nowadays tend to rely on FDI as one of the primary sources of productivity gain, which enhances their competitiveness in the global market [28]. Empirical literature regarding the impact of FDI on host country's Total Factor Productivity (TVS) is quite extensive and to what extent FDI can promote factor productivity depends upon the host country's absorbing capacity of new technology and practices [23].
- **FDI and productivity growth:** FDI is supposed to enhance productivity either by forcing domestic firms to make their processes more efficient in order to remain competitive in the market or by compelling inefficient firms to permanently quit [29], [30]. Griffith et al. (2002) [30] finds that increased foreign presence within an industry is often found to be correlated with higher growth in productivity for the domestic firms in the same industry. Simeon et al. (2000) [31] uses firm-level data of Czech Republic to study the inter-relation between FDI and total factor productivity of the recipient countries and the results reinforce the predicted positive correlation between the two. Fillat and Woerz (2011) [32] also reports a positive relationship between FDI and productivity growth using industry-level data for some 35 countries during the time span of 1987-2002. Moreover, Wang (2010) [33] suggests FDI induces strong positive impact on total factor productivity (TFP) of the recipient country through both forward and backward inter-industry linkages and the more 'absorptive' the industry is, the more pronounced the effect will be. In fact, studies that report positive correlation between FDI inflows and productivity growth are quite numerous (see for example, Keller and Yeaple (2003) [34], Haskel, Pereira, and Slaughter (2007) [35], Harris and Moffat (2013) [36], Fu (2008) [37], Fu and Gong (2011) [38] and Demir and Su (2016) [39], Arnold and Javorcik (2009) [40], Yasar and Paul (2009) [41]). In a nutshell, liberalization of international capital flow is believed to improve allocation efficiency, increased credit flows, relaxation of foreign exchange bottlenecks, risk diversification, prevention of rent seeking, higher capital accumulation, and job creation as well as technology and skills' transfer, all of which are expected to enhance productivity and induce economic growth [42]. Although the literature cited above only highlights the positive impact of FDI on productivity growth, results on the contrary are not very scarce. Like many other economic discourses, the economic relation between FDI and productivity growth remains inconclusive and therefore the idea to promote productivity in the home country through FDI inflow is not unanimously entertained. For example, using bilateral data of

FDI flows of 108 host and 240 investing countries during the period 1990-2012, Demir et al. (2018) [42] finds no significant impact of FDI flows on host country's productivity growth and also on the productivity gap between the host and the frontier countries. A large number of already published works also reconfirm the claim reported by Demir et al. (2018) [42] (see for example, Haddad and Harrison (1993) [43], Aitken and Harrison(1999) [44], Liu (2008) [45], Xu,Wan and Su (2014) [46]).

Thus far, the literature on FDI is largely concentrated on how the host country may have been benefitted/affected from inward flow of FDI in terms of economic growth, environmental aspects, technology transfer, human resource development and things like these. To date, there is no comprehensive study regarding how the investor firm/nation may also be benefitted/affected in terms of ownership of physical assets arising out of outward FDI. Here, we argue that the investor firm/nation may also gain or lose immediately in the process of making investments abroad depending upon the relative purchasing power of the two currencies and their mutual nominal exchange rate prevailing in the international FX market. According to the discourse presented in this article, flows of FDI may facilitate cross-border transfer of wealth amongst the participating nations, and both the investor and host country may have been directly impacted upon in terms of real wealth, a fact that is largely overlooked in the existing literature of FDI so far. Here, we seek to investigate how and to what extent FDI may foster transnational transfer of wealth amongst the nations involved. The main arguments presented in this article is based upon the reasoning that the market exchange rate of the currency of the FDI receiving nation may vary from its PPP exchange rate and it is this difference that assists such transfer of wealth. When the market exchange rate of the host country is greater than its PPP exchange rate, then the foreign investor unleashes more purchasing power in terms of local currency unit in the host country as compared to equivalent investments in its native land. With this added purchasing power, the foreign investor can now own more assets in the host country than it could have owned alternatively in its home country with the same amount of investments.

3 Main proposition

Before delving into further detail, two preliminary definitions are on the way.

- **PPP exchange rate:** PPP exchange rate is the rate at which the currency of one country needs to be converted into the currency of some other country in order to get the exact same amount of goods and services in the two countries. The idea of PPP exchange rate can be easily grasped through the concept of Big Mac Index [47], which was introduced by *The Economist* back in 1986. Big Mac Index simply compares the price of a McDonald's Big Mac hamburger in two different countries. The exchange rate between the currencies of the two countries are so determined as the price of the Big Mac remains the same in the two territories. For example, as on July 2023, the prices of a Big Mac in UK and United States are 4.19 British pound and 5.58 US dollar respectively [47]. Assuming the price of Big Mac to be same in UK and United States, we get 5.58 US dollar is equal to 4.19 British pound or equivalently, 1 US dollar is equal to 0.75 British pound. Big Mac Index is an indicator of PPP exchange rate, which only considers one goods in the basket, i.e., the Big Mac Hamburger. In practice, PPP exchange rate between the two currencies is calculated by equating the prices of a representative basket of goods in the two currencies in their native regions [48].
- **Market exchange rate:** Market exchange rate is the rate at which the currency of one country is exchanged for another currencies in the international currency

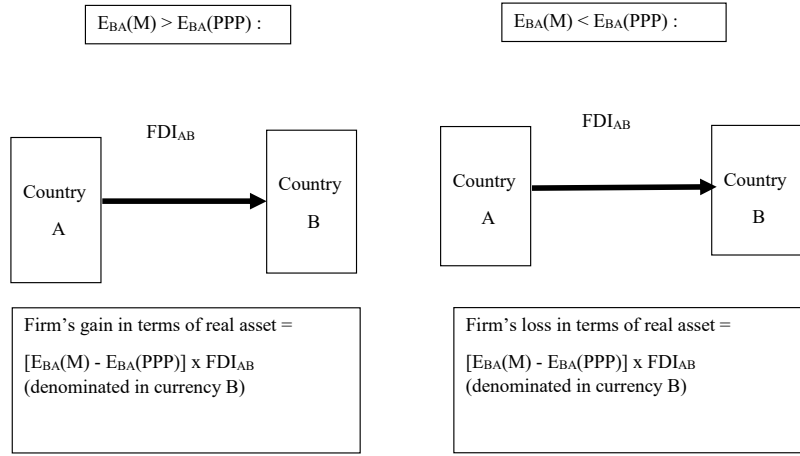


Fig 1. Gain/loss of the investing firm in terms of real assets

market. International currency market is a global, decentralized, over the counter market for all the major global currencies including US dollar, euro, British pound, Japanese Yen etc. Main participants in the currency market are the central banks, large multinational banks, investment management firms, retail foreign exchange traders, non-bank foreign exchange companies, money transfer/remittance companies among others. When a firm chooses to invest overseas, then it can either convert its local currency into another currency native to its investment destinations directly through the international currency market or equivalently, it can consult a bank to perform the conversion on its behalf. Market exchange rate of a currency in terms of another currency is highly volatile and changes instantaneously and often reported on annual average basis [49].

Let us assume that a firm in country A chooses to invest FDI_{AB} amount of money (denominated in the currency of country A) in country B. Let us also assume that $E_{BA}(M)$ and $E_{BA}(PPP)$ denote the market exchange rate and PPP exchange rate of currency B in terms of currency A respectively. At the very first, the firm needs to convert its intended investment amount FDI_{AB} from currency A to currency B as it needs currency B to commence its operation in country B. It can easily convert FDI_{AB} from any bank native to country B and can get currency B or it can do the conversion through international currency market. In either way, the market exchange rate of currency B in terms of currency A is used and the firm receives $FDI_{AB} \times E_{BA}(M)$ amount of currency B. Up to this point, the firm has nothing to do with the $E_{BA}(PPP)$, i.e., the PPP exchange rate of currency B in terms of currency A.

After the firm has obtained currency B in its account and ventures on to purchase any real goods/services in country B, this is when the $E_{BA}(PPP)$ comes into play. If $E_{BA}(M) > E_{BA}(PPP)$, then the investing firm can spend $E_{BA}(PPP) \times FDI_{AB}$ amount of currency B to purchase the same amount of assets that could have been purchased by FDI_{AB} amount of currency A in its native land. However, after purchasing the same amount of physical assets in country B, the firm now has additional $(E_{BA}(M) - E_{BA}(PPP)) \times FDI_{AB}$ amount of currency B at its disposal. So, by choosing to invest in country B instead of doing so in its native land, the firm reaps in an overnight gain of $(E_{BA}(M) - E_{BA}(PPP)) \times FDI_{AB}$ (in currency B).

However, if $E_{BA}(M) < E_{BA}(PPP)$, then the firm needs additional $(E_{BA}(PPP) -$

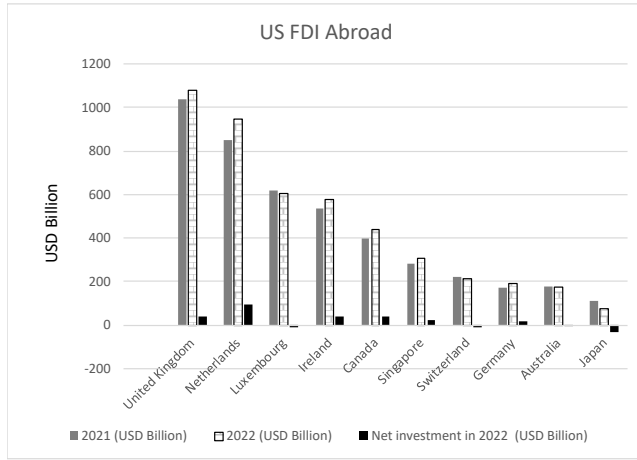


Fig 2. Top 10 US investment destinations abroad in 2022

$E_{BA}(M) \times FDI_{AB}$ amount of currency B in order to purchase the same amount of assets that could be alternatively purchased by the investing firm through investing FDI_{AB} amount of currency A in its native land. Under this circumstances, the investing firm incurs a loss of $(E_{BA}(PPP) - E_{BA}(M)) \times FDI_{AB}$ amount of currency B. So, in either case, the gain/loss of the firm in terms of ownership of real asset is given by the following construct:

$$G/L = [E_{BA}(M) - E_{BA}(PPP)] \times FDI_{AB} \quad (1)$$

The above expression embodies the gain/loss of the investing firm in terms of currency B. When $E_{BA}(M) > E_{BA}(PPP)$, then G is positive, i.e., the firm gains and when $E_{BA}(M) < E_{BA}(PPP)$, then G is negative, i.e., the firm incurs losses in terms of ownership of physical assets. So, when a multinational firm intends to invest overseas, then other things remaining the same, it must choose the country for which the construct G/L given by equation: 1 is maximized. The whole exposition is graphically demonstrated in Fig: 1.

4 Analysis of US FDI in line with the current proposition

According to the latest release made by the Bureau of Economic Analysis, US Department of Commerce, the top 10 US investment destinations abroad are UK, the Netherlands, Luxembourg, Ireland, Canada, Singapore, Switzerland, Germany, Australia and Japan. The list implies that all the major overseas investments of US firms are destined to the developed countries and 4 out of top 10 belong to the Eurozone. The cumulative sums of country-wise US FDI in historical cost basis are graphically presented in Fig: 2.

From Fig: 2, we can see that US FDI decreases in Luxembourg, Switzerland, Australia and Japan in 2022, which means US firms, instead of investing to these countries, have repatriated a portion of their previous investments during 2022 (on a net basis). For the other six countries in the list, i.e., UK, the Netherlands, Ireland, Canada, Singapore and Germany, US firms have made net investments in the volume of USD 40.77, 93.37, 37.08, 40.22, 24.81 and 15.73 billion respectively during 2022. So, in terms of net investments

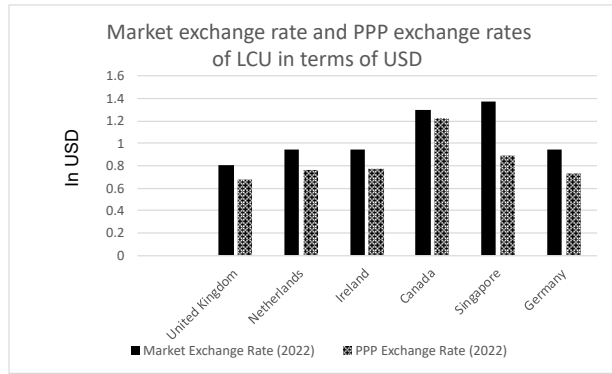


Fig 3. Difference between market exchange rate and PPP exchange rate of Local Currency Unit (LCU) per US dollar in 2022

made during 2022, the Netherlands comes first in the list with USD 93.37 billion net investments. Then comes United Kingdom (USD 40.77 billion), Canada (USD 40.22 billion), Ireland (USD 37.08 billion), Singapore (USD 24.81 billion) and Germany (USD 15.73 billion).

Next, we collect data of market exchange rate and PPP exchange rate of the currencies native to these 06 countries in terms of US dollar. Precisely, we collect market exchange rate and PPP exchange rate data of euro (for the Netherlands, Ireland and Germany), British pound, Canadian dollar and Singapore dollar in terms of US dollar from OECD [50] and World Bank [49] database for the year 2022. It is to be noted in this regard that although the countries in the Eurozone use the same currency euro as their legal tenders and are parts of the same currency and monetary union, the PPP exchange rates of euro in terms of US dollar in the member countries are not all the same. For example, as on 2022, the PPP exchange rates of one euro in the Netherlands and Luxembourg were 0.76 and 0.84 per US dollar respectively [50]. It means what 1.00 US dollar can purchase in United States, can be purchased with 0.76 and 0.84 euro in the Netherlands and Luxembourg respectively. On the other hand, the market exchange rate of euro in terms of US dollar is same for all the countries in the world and during 2022, it was 0.95 euro/US dollar. The collected data of market exchange rates and PPP exchange rates are pictorially presented in Fig: 3.

From Fig: 3, we can see that the difference between market exchange rate and PPP exchange rate is maximum for Singapore dollar and this difference is found to be 0.50. This implies, if a US firm chooses to invest 1.00 US dollar in Singapore in 2022, it will reap an overnight gain of 0.50 Singapore dollar with regard to ownership of physical assets. We then convert this gain into equivalent US dollar using the market exchange rate of Singapore dollar against US dollar for the year 2022. In the same manner, we calculate the difference between market exchange rate and PPP exchange rate of the local currency unit of the other 05 countries in the list, namely, UK, the Netherlands, Ireland, Canada and Germany. The difference thus calculated will provide us the net gain obtained or loss incurred in local currency unit by any US owned investing firms after it chooses to invest 1.00 US dollar in the respective jurisdiction. We then convert the net gain in local currency unit into equivalent US dollar using the market exchange rate of LCU in terms of US dollar. Gains in US dollar thus obtained are graphically presented in Fig: 4.

From Fig: 4, we can see that in the present sampled analysis, US FDI in Singapore

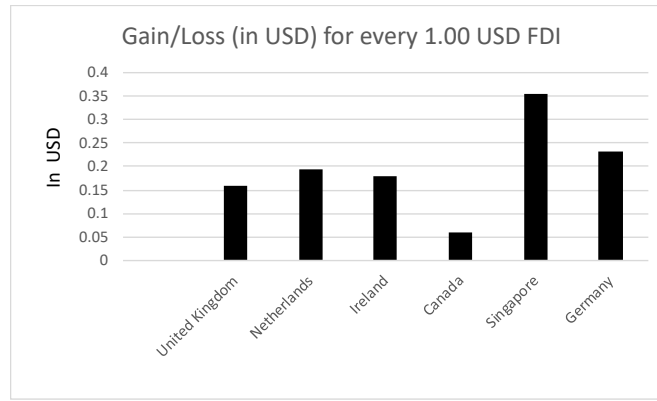


Fig 4. Overnight gain/loss reaped by the US firms by investing 1.00 US dollar in each of the mentioned jurisdictions in 2022

is the most profitable one with regard to the possession of physical assets provided other things remaining the same. To be precise, an US firm can obtain an additional gain of approximately 0.35 US dollar equivalent of real assets for every USD 1.00 investments in Singapore as compared to its investments in its home country and this gain simply happens overnight, i.e., right after the firm purchases physical assets in Singapore after converting its US dollar into Singapore dollar using market exchange rate. After Singapore, Germany is the most lucrative investment destinations for US firms and by investing 1.00 US dollar in the Germany, an US firm can reap an overnight gain of 0.23 US dollar in terms of ownership of real assets. Then comes the Netherlands, Ireland, UK and Canada with net gain of USD 0.20, 0.18, 0.16 and 0.06 for every 1.00 US dollar investment. So, although US firms have chosen the Netherlands, Ireland, UK and Canada over Singapore for investments in 2022, US investment in Singapore is the most profitable one in terms of real gain in assets. Now that we have calculated the net gain/loss obtained by the US firms for every 1.00 USD investment in the select countries, we can calculate country-wise consolidated net gain through multiplying the per USD gain by the net investments of the US firms in the respective region during 2022. The results are graphically presented in Fig: 5.

From Fig: 5, we can see that the US firms have reaped an overnight gain of USD 18.24 billion, 8.79 billion, 6.68 billion, 6.53 billion, 3.64 billion and 2.36 billion in 2022 from investing in the Netherlands, Singapore, Ireland, UK, Germany and Canada, which represent an instantaneous Return on Equity (RoE) of 19.54%, 35.44%, 18.02%, 16.03%, 23.13% and 5.88% respectively. So, in terms of instantaneous Return on Equity (RoE), Singapore comes first, followed by Germany, the Netherlands, Ireland, UK and Canada.

So far we have analyzed the profitability of US investments in a sample of 06 countries, namely, the Netherlands, UK, Canada, Ireland, Singapore and Germany. These are the 06 top overseas investment destinations of US firms during 2022. However, there are some other countries where US firms have substantial consolidated investments, namely, Luxembourg, Switzerland, Australia and Japan, although the firms' net investments into these countries during 2022 have declined. Now, we analyze the profitability of US investments in Luxembourg, Switzerland, Australia and Japan using the same technique as mentioned above in order to point out one striking difference between US investments in Switzerland and the other 09 countries in the list. So, we first calculate the difference between market exchange rate and PPP exchange rate for euro (Luxembourg), Swiss

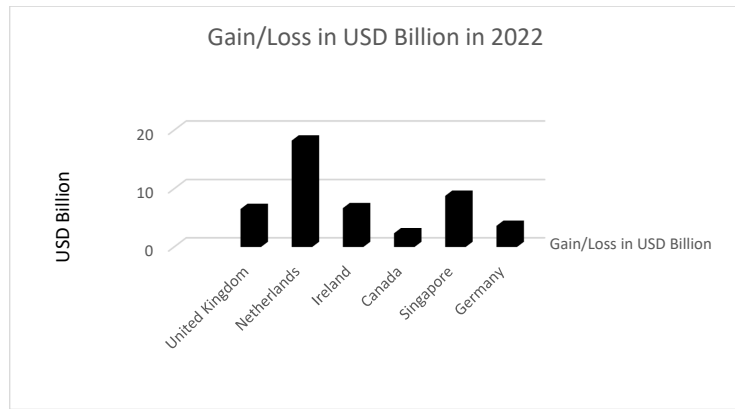


Fig 5. Consolidated gain/loss from US overseas investments in 2022 in the context of current exposition

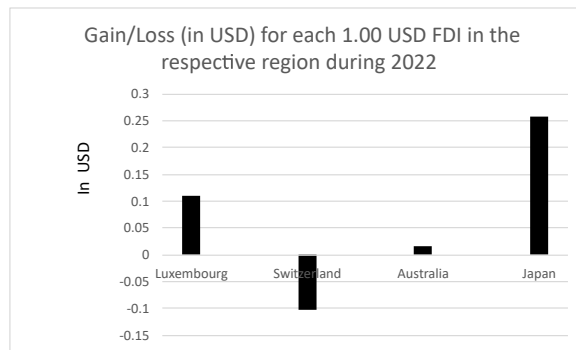


Fig 6. Overnight gain/loss reaped by the US firms by investing 1.00 US dollar in each of the mentioned jurisdictions in 2022

franc, Australian dollar and Japanese yen in terms of US dollar. The differences thus calculated will provide us the value of overnight gain obtained or loss incurred in local currency unit by the US firms by choosing to invest in these jurisdictions. As the gain/loss thus obtained is in local currency unit, we need to convert them into equivalent US dollar using the market exchange rate for comparison purposes. The results are graphically presented in Fig: 6.

From Fig: 6, we can see that the investing US firms are supposed to incur a loss of USD 0.10 for every USD 1.00 investments in Switzerland with regard to ownership of real assets. It is due to the fact that the market exchange rate of Swiss franc is 0.95 per US dollar during 2022, while its PPP exchange rate is 1.05 per US dollar. This means, when a US firm converts one US dollar into Swiss franc, it will get only 0.95 franc. However, to purchase 1.00 US dollar worth (in United States) of goods and services in Switzerland, the firm needs to spend 1.05 Swiss franc and thus it loses with regard to ownership of physical goods. In fact, Switzerland is the only country in the list, where a US investing firm incurs losses in terms of purchasing power parity. For the other three countries, namely, Luxembourg, Japan and Australia, the differences between

market exchange rates and PPP exchange rates are positive and Japan happens to be a more lucrative investment destination than Australia and Luxembourg according to the current proposition as can be seen from Fig: 6.

5 Where US investments should flow toward

In the previous section, we have analyzed the gain/loss (as defined in the current exposition) of the USI FDI abroad for a single year 2022. In this section, we extend the above study by forecasting such gain/loss obtained from each 1.00 US dollar US FDI into the selected set of countries for the period 2023-2040. Countries included in the analysis are UK, the Netherlands, Luxembourg, Ireland, Canada, Singapore, Switzerland, Germany, Australia and Japan comprising top 10 US investment destinations abroad according to the latest release [1]. To do this, we collect market exchange rate and PPP exchange rate data of the respective local currency unit in terms of US dollar for the aforementioned countries during the period 1960-2022 from World Bank database [49] and OECD database [50]. If we subtract PPP exchange rate of a currency from its market exchange, we, by virtue of the exposition presented here, will get the net gain obtained by the investing firm from each 1.00 US dollar investment and this gain is denominated in the respective local currency unit. This gain will then be converted into equivalent US dollar by using the market exchange rate for that currency in that specific period. This will give us 10 time series data each spanning from 1960-2022 embodying the year-wise gain resulting from every 1.00 US dollar FDI into the respective region in the designated year. We then forecast each of these 10 time series up until 2040 to get their future trends. The forecasted series will reveal most lucrative overseas investment destinations for US firms in the years to come in accordance with the current proposition. The remaining analysis is segregated into two sections. First section discusses the methodology used to forecast the series, while the second one discusses the empirical findings.

5.1 Methodology

We use ARIMA (p, d, q) models to forecast the aforementioned time series, where p, q and d are non-negative integers. ARIMA model is a model to forecast univariate time series using the lagged values of the forecasted variable (auto-regressive term) under consideration and a linear combination of the lagged errors (moving average term). The lag lengths of the auto-regressive and moving average terms are denoted by p and q in ARIMA (p, d, q) notation and d denotes the number of times the time series needs to be differenced before we obtain a stationary one.

To select the appropriate ARIMA model, we use three steps Box-Jenkins procedure comprising identification, estimation and diagnostic of the selected model. In the identification step, we first check for unit roots in the time series and go on differencing it until we find a stationary one. We use standardized unit root tests, i.e., ADF unit root test and Phillips-Perron test to determine the order of integration of the underlying series. Once the order of the underlying time series is determined, the next step is to look at the autocorrelation and partial correlation function of the stationary series. We check the correlogram of the stationary series to identify the lags at which the autocorrelation and/or partial correlation exceed their respective confidence intervals in either direction. Any lag at which the autocorrelation function exceeds its 95% confidence interval is a probable candidate for q in our ARIMA (p, d, q) model. On the other hand, any lag at which the partial correlation function exceeds its 95% confidence interval indicates a potential autoregressive term (p). Once the probable values of p and q are determined from the correlogram, we estimate all the possible ARIMA models with different values of p and q. In the estimated models, we first check for whether the coefficients of the

autoregressive (AR) and moving average (MA) terms are significant @5% level. We select the ARIMA model where both the autoregressive and moving average terms are significant. If there are more than one model with significant AR and MA, then we choose the model with lowest Akaike Information Criterion (AIC). The next step is to run the selected model and go for various diagnostic tests in order to determine the statistical stability of the model. The selected model is said to be stable if the residuals of the model are white noise. We use Ljung-Box Q statistic to determine the nature of the residuals. Moreover, for the model to be stationary and invertible, all the roots of AR/MA polynomials must lie outside the unit circle or equivalently, all the inverse roots must lie inside the unit circle. We then check for the roots of the AR/MA polynomials in order to ensure that we have chosen a stationary and invertible ARIMA model. If the chosen model suffers from any such problem, i.e., instability, non-stationarity and non-invertibility, then we change values of p and q until and unless we get a desirable model in terms of residuals and AR/MA roots.

5.2 Results

In this subsection, we resort to find appropriate ARIMA (p, d, q) model to forecast the aforementioned time series. The selected models along with the t-statistics and corresponding p-values for the autoregressive and moving average terms are presented in Table: 1. From Table: 1, we can see that almost all the autoregressive and moving average terms of the selected models are significant @5% level. A few exceptions where the AR/MA terms are not significant @5% level occur for ARIMA (4, 1, 4) model for German data (AR(4) term not significant), ARIMA (4, 1, 4) model for the Dutch data (again, AR(4) term not significant) and ARIMA (1, 1, 8) for the British data (MA(8) term not significant). Yet, these models are chosen as they are better than the other alternate models in terms of stability of the residuals as well as in terms of the stationarity and invertibility property of the model. Moreover, although there are a few non-significant variables in the selected models, the SIGMASQ values for all of them are significant @5% level, which is a desirable trait in time series forecasting. Apart from SIGMASQ values, all the AR/MA roots lie outside the unit circle, which ensures stationarity and invertibility of the models. Last but not the least, we check whether the residuals are white noises by using Ljung-Box Q statistic. It has been observed from the respective Q statistics that all the residuals are white noises. The details of the AR/MA roots and captured spreadsheet regarding the values Q statistics are not included here as this may unnecessarily eats up spaces.

Table 1. Selected ARIMA models

Time Series	d	AR term	t-Statistics	p-Value	MA term	t-Statistics	p-Value	SIGMASQ	t-Statistic	p-Value
Australia 1960-2022	1	AR(12)	-3.175994	0.0024	MA(1)	2.671218	0.0098	7.07755	7.07755	0
Canada 1960-2022	1	AR(12)	-2.450892	0.0173	MA(1)	2.572457	0.0127	5.5774	5.5774	0
Germany 1960-2022	1	AR(4)	-0.919168	0.3618	MA(4)	2.309951	0.0245	6.040242	6.040242	0
Ireland 1960-2022	1	-	-	-	MA(16)	2.069683	0.0429	6.247859	6.247859	0
Japan 1960-2022	1	-	-	-	MA(1)	2.059108	0.0439	7.420396	7.420396	0
Luxembourg 1960-2000	1	AR(1)	10.76109	0	-	-	-	8.035476	8.035476	0
Netherlands 1960-2022	1	AR(4)	-0.862629	0.3919	MA(4)	2.604546	0.0117	6.871378	6.871378	0
Singapore 1960-2022	1	-	-	-	MA(1)	4.790107	0	3.729415	3.729415	0.0008
Switzerland 1960-2022	1	AR(11)	-2.311398	0.0244	MA(6)	-1.857239	0.0684	7.028019	7.028019	0
UK 1960-2022	1	AR(1)	2.087994	0.0412	MA(8)	1.389384	0.17	5.178624	5.178624	0

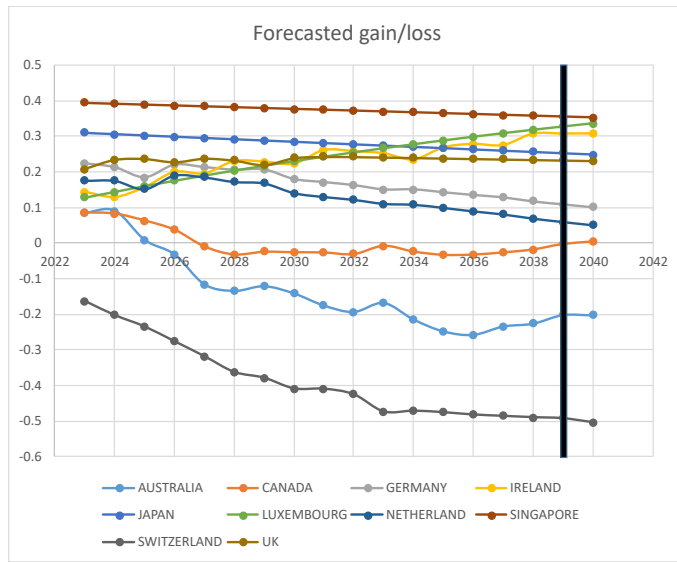


Fig 7. Forecasted gain/loss for each 1.00 US dollar US FDI abroad (2023-2040)

Results obtained from the ARIMA models are pictorially depicted in Fig: 7. Fig: 7 presents the forecasted data of gain/loss (in US dollar) obtained by the US firms by investing 1.00 US dollar equivalent of funds in the designated country during the period 2023-2040. There are ten forecasted series corresponding to UK, the Netherlands, Luxembourg, Ireland, Canada, Singapore, Switzerland, Germany, Australia and Japan. From Fig: 7, we can see that during the entire time span of 2023-2040, US investments in Singapore will be the most profitable one in terms of ownership of physical assets. On the contrary, US investments to Switzerland seem to incur losses throughout with regard to the possession of real assets. So, if we want to rank the countries in terms of gain/loss as defined in this article at any time into the future, we just need to draw a vertical line in our projected graphs corresponding to that specific future time. Then the vertical line will be intersected by each of the forecasted series and the intersection points will provide the overnight gain/loss that could have occurred if a US firm chooses to invest 1.00 US dollar in each of the respective jurisdictions. For example, a firm may wish to know which country will be the most profitable one in terms of gain/loss during 2039. To answer this question, we have drawn a vertical line through 2039 in Fig: 7. This vertical line intersects the forecasted time series for Singapore at the top corresponding to a gain/loss value of 0.35. So, if a US firm intends to invest 1.00 US dollar in Singapore in 2039, then it will reap an instantaneous gain of 0.35 US dollar through its purchase of physical assets in Singapore. From Fig: 7, we can see that Singapore is followed by Luxembourg, Ireland, Japan, UK, Germany, the Netherlands, Canada, Australia and Switzerland in terms of such gain/loss in 2039. Fig: 7 also reveals that US FDI in Singapore, Luxembourg, Ireland, Japan, UK, Germany and the Netherlands during 2039 will reap an overnight gain, while investments in Canada, Australia and Switzerland will incur losses in terms purchasing power parity.

6 Conclusion

472

Here we have discussed that the difference between market exchange rate and PPP exchange rate of the local currency unit in terms of the investing currency can act as a stimulant or a depressant for an investing firm depending upon its value and sign. When the market exchange rate of the local currency unit is greater than its PPP exchange rate, then the investing firm gains in terms of ownership of physical assets and the vice versa. Generally, when an MNC intends to explore new markets abroad, it usually considers, among other things, the difficulties of opening a new business in the host country, its tax structures, profit repatriation procedures, legal atmosphere, availability of utility connections, property and firm registration processes, availability of banks' credits, investors' rights, cross border payment infrastructures etc. Most if not all of the aforementioned criteria are highly qualitative in nature and are difficult to quantify. Here, in addition to these criteria, we have proposed a quantitative measure that could be easily calculated and consulted upon, whenever an MNC embarks on a new venture in a new country. On the other hand, the existing literature regarding FDI hinges around its impact to promote economic growth, technology transfer, human capital development, productivity growth, its spillover effect on the environment to name a few. The literature on FDI does not meticulously analyze the impact of FDI on the profitability of the foreign firms and/or the host country in terms of ownership of real assets. Here, we have presented a new perspective to look at the existing theory of FDI, which enables us to quantify the overnight gain obtained or loss incurred by the foreign investing firm arising from currency conversion and asset acquisition in the host country.

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Compliance with Ethical Standards

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