

Discussion Paper No. 1231

ISSN (Print) 0473-453X

ISSN (Online) 2435-0982

**THE FELDSTEIN-HORIOKA PUZZLE  
OR PARADOX AFTER 44 YEARS:  
A FALLACY OF COMPOSITION**

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February 2024

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# **The Feldstein-Horioka Puzzle or Paradox after 44 Years: A Fallacy of Composition**

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February 2024

**Abstract:** The finding of Feldstein and Horioka (1980) that domestic saving and domestic investment are highly correlated across countries despite the rapid globalization and liberalization of financial markets in recent decades has been regarded as a Puzzle or Paradox. However, in this paper, we show that countries as a whole may not be able to transfer their capital abroad and that the Feldstein-Horioka Finding of domestic saving and domestic investment being highly correlated across countries may arise even if there are no frictions in financial markets and even if individual investors can freely transfer their capital abroad if there are frictions in goods markets such as transport costs, tariffs, nontariff barriers, the cost of regulatory compliance, etc. In fact, there is evidence that frictions in goods markets are a more serious impediment to countries as a whole being able to transfer their capital abroad than frictions in financial markets, especially in the short run.

**Keywords:** Capital controls, fallacy of composition, Feldstein-Horioka Finding, Feldstein-Horioka Puzzle or Paradox, frictions in financial markets, frictions in goods markets, global interest rate, globalization and liberalization of financial markets, interest parity, interest rate equalization, international capital flows, international capital mobility, saving-investment correlations, saving retention coefficient, trade costs, trade frictions.

*Journal of Economic Literature* Classification Codes: F15, F21, F32, F36, F41, G15

This paper is a revised version of the Presidential Address that I delivered at the Autumn 2023 Meeting of the Japanese Economic Association that was held at Kansai University in Osaka, Japan, on September 16-17, 2023. It is forthcoming in the *Japanese Economic Review*, vol. 75, no. 3 (July 2024).

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## 1. Introduction

In my more than four decades as a researcher, I have written more than 150 scholarly papers and almost all of them have been about household economics—for example, the saving, consumption, borrowing, housing demand, bequest, and parental care behavior of households in Japan and other countries. For example, I tried to answer questions such as the following:

- (1) Why do household saving rates differ so much across countries?
- (2) Why was Japan's household saving rate so high in the past?
- (3) Why has Japan's household saving rate declined so rapidly in recent years?
- (4) For what motives do households save?
- (5) What impact does the age structure of the population have on the household saving rate?
- (6) Why don't the elderly decumulate their wealth more rapidly?
- (7) Why do people leave bequests to their children?
- (8) Why do people take care of their parents?
- (9) Are people selfish or altruistic?
- (10) Are people rational or irrational?
- (11) Are people myopic or forward-looking?
- (12) What impact do culture, social norms, and religion have on household saving behavior?
- (13) Do the rich save more?

I thought about talking about my research accomplishments in household economics in my Presidential Address, but I already talked about these in my keynote lecture at the Fall Meeting of the Japanese Economic Association that was held at Kobe University in 2019 and that was subsequently published in Horioka (2021a, 2021b). Thus, in the end, I decided to talk about an entirely different topic—namely, international capital mobility and the globalization and liberalization of financial markets—even though I have written only a few papers about this topic (Feldstein and Horioka, 1980; Yasutomi and Horioka, 2011; Horioka, et al., 2016; Ford and Horioka, 2017a, 2017b; and Horioka and Ford, 2017, 2022).

There has been a rapid globalization and liberalization of financial markets since at least the 1970s due to the elimination of capital controls in many countries, technological innovations in the financial services industry, and other factors. This has enabled

individuals to transfer their assets between countries with minimal cost and delay, and it therefore appeared that their capital had become “perfectly mobile” across countries.

My co-author and mentor, the late Martin Feldstein of Harvard University, and I reasoned that if capital were perfectly mobile, then a country’s additional saving should not be invested locally but should instead be invested in other countries around the world according to where the most profitable investment opportunities are. To see if this was the case, Feldstein and I conducted a simple empirical test of international capital mobility in a well-cited paper that was published in *The Economic Journal* in 1980 more than 40 years ago (Feldstein and Horioka, 1980). In this paper, we were very surprised to find that domestic saving and domestic investment are highly correlated across countries, which *seemed to suggest* that capital is not mobile internationally despite the rapid globalization and liberalization of financial markets since at least the 1970s. Moreover, almost all of the countless subsequent papers that have used the same methodology have obtained similar results. This surprising finding was named the “**Feldstein-Horioka Puzzle or Paradox,**” and it has since become one of the most famous puzzles in economics. Over the years, many explanations have been proposed to explain this Puzzle or Paradox, but there is still no consensus about which explanation is the correct one or the most important one.

The purpose of this paper is to put forth Nicholas Ford’s and my proposed explanation of the Feldstein-Horioka Puzzle or Paradox, which we believe to be the simplest, most important, and most convincing explanation of the Puzzle or Paradox (see, for example, Ford and Horioka, 2017, and Horioka and Ford, 2022). In a nutshell, our explanation is that, even though individuals will be able to transfer their capital abroad if there are no frictions in financial markets, countries as a whole will not be able to transfer their capital abroad even if there are no frictions in financial markets if there are frictions in goods markets and that the considerable frictions that exist in goods markets can explain why domestic saving and domestic investment are so highly correlated across countries despite the apparent mobility of capital. Thus, our explanation relies on the **fallacy of composition** and on **frictions in goods markets**, which are also called “**trade costs**” or “**trade frictions.**” I hope that you will find this explanation to be interesting and convincing in its own right but also because it will give us cause to reflect on how we approach economic research more generally, as I will discuss at the very end of this paper. This paper synthesizes my earlier work on the Feldstein-Horioka Puzzle or Paradox including Feldstein and Horioka (1980), Yasutomi and Horioka (2011), Horioka, et al.

(2016), Ford and Horioka (2017a, 2017b), and Horioka and Ford, 2017, 2022).

The remainder of this paper is organized as follows: In section 2, I discuss trends over time in the globalization and liberalization of financial markets; in section 3, I provide a summary of the original Feldstein and Horioka (1980) paper and describe what the Feldstein-Horioka Finding is; in section 4, I discuss why the Feldstein-Horioka Finding was regarded as a Puzzle or Paradox; in section 5, I discuss how the Fallacy of Composition can explain the Feldstein-Horioka Puzzle or Paradox; in section 6, I discuss why goods markets are needed to enable countries as a whole to transfer capital abroad; in section 7, I consider four regimes or vignettes and examine whether or not countries as a whole can transfer capital abroad in each of these regimes; in section 8, I discuss how financial markets and goods markets interact to enable countries as a whole to transfer capital abroad; in section 9, I discuss whether frictions in financial markets or frictions in goods markets are more important as an explanation of the Feldstein-Horioka Finding; and in section 10, I provide a summary of our findings and discuss the implications of our findings concerning the Feldstein-Horioka Puzzle or Paradox for economic theory, for economic policy, and for research methodology

## **2. The Globalization and Liberalization of Financial Markets**

Assuming that a country is not completely autarkic, factors of production (labor, capital, technology, etc.) as well as final goods and services will be mobile across national boundaries to at least some extent even though there are various barriers to their mobility. In this paper, I will focus on the international mobility of capital, and in this section, I discuss trends over time in the globalization and liberalization of financial markets.

As the reader is undoubtedly aware, there has been a massive globalization and liberalization of financial markets in recent years, but the trend toward the globalization and liberalization of financial markets has by no means been monotonic. Obstfeld and Taylor (2004, pp. 24-29) discuss trends over time in the globalization and liberalization of financial markets over the past century and a half in detail, and they divide this period into four subperiods, as follows:

In the first subperiod from 1870 until the start of World War I in 1914, financial markets became rapidly globalized and liberalized as an increasing share of the world economy

came under the classical gold standard and a global capital market emerged with London as its nerve center.

By contrast, during the second subperiod from 1914 until 1945 (the wartime and interwar periods), two World Wars and the intervening Great Depression brought about a rise in nationalism and increasingly noncooperative economic policy making, which destroyed the global economy and caused the globalization and liberalization of financial markets to reverse course.

During the third subperiod from 1945 until 1971 (the Bretton Woods era), an attempt was made to rebuild the global economy and trade flows were liberalized substantially, but capital controls were retained because fears of global capital that had been formed during the interwar period still persisted and because capital controls were needed as a means of preventing speculative attacks on currency pegs.

During the fourth and final subperiod from 1971 to the present, capital controls were largely reduced or eliminated because there was a shift from a fixed-but-adjustable exchange rate regime to a floating exchange rate regime, which meant that capital controls were no longer needed as a tool for preserving a fixed exchange rate peg since the peg was gone. Moreover, there were substantial technological innovations in the financial services industry during this period that also contributed to the globalization and liberalization of financial markets.

Thus, financial markets became rapidly globalized and liberalized before 1914 and after 1971, but they remained largely closed during the intervening half-century.

Abiad and Mody (2005) construct an index of financial liberalization, which equals 0 in the case of full repression and 18 in the case of full liberalization, for the 1973-96 period using data for 35 countries, and they found that this index increased from 3.7 in 1973 to 6.4 in 1985 and further to 12.0 in 1996 in their sample of 35 countries (if an unweighted average of their indices for the 35 countries is computed). This finding is consistent with Obstfeld and Taylor's contention that there was a rapid globalization and liberalization of financial markets starting in the 1970s.

Abiad and Mody's (2005) results by country and region show that there has been considerable variation from country to country and from region to region in their index

of financial liberalization, with the index being highest by far in the member countries of the Organisation for Economic Co-operation and Development (OECD) (not surprisingly), second highest in East Asia, somewhat lower in Latin America and Africa/Middle East, and lowest in South Asia. However, all regions show an increase in the index over time with the exception of Latin America in 1981-82.

Since there has been such a rapid increase in international capital mobility at least since the 1970s, it is important to know whether this is a good thing or a bad thing. It is not easy to answer this query because international capital mobility has advantages as well as disadvantages.

International capital mobility has at least two advantages: First, it enables countries with a scarcity of capital to borrow freely from abroad to finance their investment needs and, conversely, it enables countries with a surplus of capital to invest their excess funds abroad, leading to a more efficient allocation of capital.

Second, it allows investors to diversify their portfolios, which reduces the risk they have to bear.

On the other hand, international capital mobility has at least two disadvantages. First, it leads some countries to borrow excessively from abroad, which sometimes leads to sovereign default and/or capital flight, which may in turn precipitate a financial crisis.

Second, countries lose the ability to pursue an independent monetary policy unless they are willing to tolerate a flexible exchange rate regime (the so-called “macroeconomic policy trilemma”).

Thus, international capital mobility has advantages as well as disadvantages, and it is not evident, *a priori*, whether it is, on balance, a good thing or a bad thing. It is therefore important to know whether capital really has become more mobile internationally over time and whether this has had a good or bad impact on the global economy as a whole as well as on individual economies.

Given this background, a paper I published with Martin Feldstein 44 years ago (Feldstein and Horioka, 1980) drew considerable attention because it purported to test the extent to which capital is mobile internationally at a time when the globalization and liberalization

of financial markets were proceeding apace.

This paper is my first published paper (published when I was only 23), and it is also by far my most frequently cited paper. It has more than 5,400 Google Scholar citations as of Feb. 16, 2024 (see [https://scholar.google.co.jp/citations?user=l\\_13FUUAAAAAJ&hl=ja](https://scholar.google.co.jp/citations?user=l_13FUUAAAAAJ&hl=ja)), and is the 389th most cited paper in economics and the sixth most cited paper by a Japanese economist as of January 2024, according to Research Papers in Economics (RePEc) (see <https://ideas.repec.org/top/top.item.nbcites.html>). (The first five papers are by Hidehiko Ichimura, Hiro Toda, Taku Yamamoto, Motohiro Yogo, and Ikujiro Nonaka, four of whom are econometricians and one of whom is a management scientist.)

As I mentioned earlier, financial markets have rapidly become globalized and liberalized in recent years as a result of the lifting of capital controls, technological innovations in the financial services industry, and other factors. Thus, it appeared as if savers in many countries had become better able to invest their saving abroad and that capital had become “perfectly mobile” between many countries.

This being the case, one might have expected incremental increases in saving to be largely invested abroad instead of being invested in the country of origin, leading domestic saving and domestic investment to no longer be correlated across countries. Martin S. Feldstein and I tested this hypothesis in our 1980 paper and showed that domestic saving and domestic investment were still highly correlated across countries, suggesting that increases in saving tend to be invested in the country of origin rather than being invested abroad. Many economists (including ourselves) were surprised by our finding, and it came to be called the “**Feldstein-Horioka Puzzle or Paradox.**”

This Puzzle or Paradox has since become one of the most famous Puzzles or Paradoxes in economics. Indeed, Maurice Obstfeld and Kenneth Rogoff included this so-called Puzzle among the “**Six Major Puzzles in International Macroeconomics**” in their 2001 paper “Six Major Puzzles in International Macroeconomics: Is There a Common Cause” (Obstfeld and Rogoff, 2001).

According to Obstfeld and Rogoff (1980), the Six Major Puzzles in International Macroeconomics are the following:

1. The Puzzle of Home Bias in Trade



2. The Feldstein-Horioka Puzzle
3. The Puzzle of Home Bias in Equity Portfolios
4. The International Consumption Correlations Puzzle
5. The Purchasing Power Parity Puzzle
6. The Exchange Rate Disconnect Puzzle

A large number of papers have been written about the Feldstein-Horioka Puzzle or Paradox and a large number of possible explanations for the Puzzle or Paradox have been proposed in the more than 40 years since it was first posed in 1980, but the purpose of this presentation is to propose what my co-author Nicholas Ford and I believe to be the simplest and most important explanation for this Puzzle or Paradox, which is based on the **fallacy of composition** (see, for example, Ford and Horioka, 2017, and Horioka and Ford, 2022). I hope that you will find this explanation to be interesting in its own right but also because it may give us cause to reflect on how we approach economic research more generally, as I will discuss at the very end of my presentation.

### **3. A Summary of the Original Feldstein and Horioka (1980) Paper**

In this section, I would like to remind the reader of what the original Feldstein and Horioka (1980) paper does and what results it obtains.

This paper was intended to be an empirical test of whether or not the recent globalization and liberalization of financial markets had, in fact, caused capital to become more mobile internationally. In the paper, Feldstein and I estimate the following equation:

$$I/GDP = a + b*(S/GDP),$$

where I = domestic investment

S = domestic saving

GDP = gross domestic product

The coefficient of S/GDP (the so-called “saving retention coefficient”) measures the extent to which an increase in domestic saving is invested domestically instead of flowing abroad, and thus, Feldstein and I felt that it was a good measure of the degree of international capital mobility.

Feldstein and I hypothesized that the coefficient of the saving rate should be zero (for a small economy) and equal to the country's share of total world capital (for a large economy) if capital is perfectly mobile across national borders and that it should be one if capital is perfectly immobile across national borders.

Moreover, since financial markets had become so globalized and liberalized in recent years, we assumed that capital had become more mobile internationally and therefore expected to find the coefficient of S/GDP to be close to zero.

Feldstein and I estimated the above regression equation using cross-section data on the member countries of the Organisation for Economic Co-operation and Development (OECD) for the 1960-74 period, and we found that the coefficient of the saving rate was about 0.9 and that it is significantly different from zero but not significantly differently from one. I refer hereafter to this empirical finding as the **“Feldstein-Horioka Finding.”**

The Feldstein-Horioka Finding of a high correlation between domestic saving and domestic investment seems to be a highly robust as literally hundreds of later studies have estimated the same equation for more recent time periods and for various samples of countries or subdivisions of countries using various estimation methods and specifications and have found in the vast majority of cases that the coefficient of the saving rate is still significantly different from zero, even though it may have declined over time (see Lapp, 1996; Coakley, et al., 1998; Obstfeld and Rogoff, 2001; Apergis and Tsoumas, 2009; Moosa, 2020; and Camarero, et al., 2021, for comprehensive surveys of this literature).

For example, Obstfeld and Taylor (2004, pp. 62-67) estimated the Feldstein-Horioka equation using 5-year and 10-year averages from 1870 until 2000 and found that the coefficient of the saving rate has declined substantially since the early 1970s from close to 1 to slightly above 0.5, presumably due to the globalization and liberalization of financial markets, but that it has remained high (and significantly different from zero) nonetheless (see also Camarero, et al., 2021).

#### **4. The Feldstein-Horioka Puzzle or Paradox**

This “Finding” suggests that incremental saving tends to remain in the country of origin which is seemingly at odds with the trend toward the globalization and liberalization of financial markets in recent years, and this puzzle has since come to be called the **“Feldstein-Horioka Puzzle or Paradox.”**

At the time Feldstein and I wrote our 1980 paper, we felt that the Feldstein-Horioka Finding is indeed a Puzzle or Paradox because we did not expect to find high correlations between domestic saving and domestic investment given the globalization/ liberalization of financial markets. Moreover, even today, many economists feel that the Feldstein-Horioka Finding is indeed a Puzzle or a Paradox and are continuing to propose various explanations for this so-called Puzzle or Paradox.

Here I provide a very incomplete list of the explanations that have been offered (see Lapp, 1996; Coakley, et al., 1998; Obstfeld and Rogoff, 2001; Apergis and Tsoumas, 2009; and Moosa, 2020, for a more comprehensive list).

(1) The most commonly cited explanation of the Puzzle or Paradox is that, despite the rapid globalization and liberalization of financial markets, there are still substantial frictions in financial markets such as transactions costs, capital controls, exchange rate risk, and a bias against holding foreign assets and that these factors are causing domestic saving and domestic investment to be highly correlated across countries.

(2) Another explanation that has been proposed is that the Feldstein-Horioka methodology is not the “right” methodology for testing whether capital is mobile internationally (for example, because it does not take account of the endogeneity of saving) and therefore that a high correlation between domestic saving and domestic investment does not necessarily indicate that capital is not mobile internationally.

(3) A third explanation that has been proposed is that national governments want to prevent large and persistent trade and current account deficits and that they take measures to keep trade and current account deficits under control. And since capital account surpluses are the flip side of trade and current account deficits, keeping trade and current account deficits small is equivalent to keeping capital account surpluses small, which will in turn lead to domestic saving and domestic investment being highly correlated across

countries.<sup>1</sup>

What I want to argue here is that the Feldstein-Horioka Puzzle or Paradox is not necessarily a puzzle or a paradox after all and that a high correlation between domestic saving and domestic investment does not necessarily indicate that financial markets are closed, that there are substantial frictions in financial markets, or that individuals cannot freely move their capital abroad and therefore that the Feldstein-Horioka Puzzle or Paradox is not a Puzzle after all. And I will further argue that this misunderstanding on my part and on the part of many other economists can be explained using the concept of fallacies of composition.

## **5. The Fallacy of Composition**

In this section, I will first discuss the concept of fallacies of composition generally and then discuss in particular how it can explain the Feldstein-Horioka Puzzle or Paradox.

A fallacy of composition is to mistakenly assume that what applies to a member of a group also applies to the group as a whole. For example, if one spectator at a baseball game stands up, he or she will be able to see the game better, but if all spectators stand up, they will not necessarily be able to see any better than when everyone was sitting down.

To cite the most commonly used example of a fallacy of composition in economics, as it is taught in Introductory Economics, usually in the context of a depression or recession, individuals attempting to save more will not necessarily result in an increase in saving in the economy as a whole because, if individuals try to save more, this will reduce aggregate demand, contract the economy, and lead to less saving, not more, in the economy as a whole. This example of a fallacy of composition is often called the “paradox of thrift.”

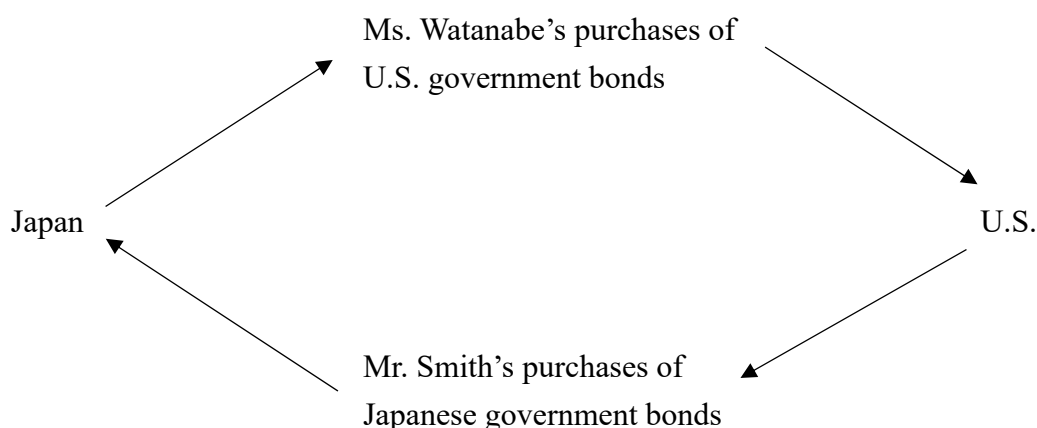
Since economists are presumably well aware of the concept of a “fallacy of composition,” it is surprising that they were tripped up by a fallacy of composition in the context of international capital mobility.

To cite an example of a fallacy of composition in the context of international capital flows, if financial markets were fully open and there were no frictions in financial markets, an individual Japanese investor (for example, Ms. Watanabe) would be freely able to

purchase U.S. government bonds and transfer part of her capital to the U.S. However, this does not necessarily mean that Japan as a country is able to transfer part of its capital to the U.S. What is true for an individual investor is not necessarily true for the country as a whole. In other words, there is a fallacy of composition in this case as well.

Without the assistance of goods markets, international financial markets will be able to achieve Ms. Watanabe's transfer of capital from Japan to the U.S. only if she is able to find a counterparty (say, a Mr. Smith) who is willing to exchange his dollars for her yen and use those yen to buy Japanese assets (say, Japanese government bonds).

Thus, the counterparty Mr. Smith transfers his capital in the opposite direction to Ms. Watanabe:



Since Mr. Smith's transfer of capital will fully offset that of Ms. Watanabe, no net transfers of capital will have occurred in either direction and neither country will have been able, as a country as a whole, to transfer capital to or from other countries

Thus, even if financial markets were fully liberalized and free from frictions so that individuals were freely able to transfer their capital abroad, such financial markets would not, *by themselves*, enable a country as a whole to make a (net) transfer of capital to another country.

Martin Feldstein and I, as well as many other researchers who addressed the "Puzzle," were wrongly extrapolating from financial markets, *by themselves*, allowing an individual to transfer his or her capital abroad to allowing a country as a whole to transfer its capital abroad. This is a perfect example of a fallacy of composition.

## 6. The Role of Frictions in Goods Markets

Given that financial markets cannot, *by themselves*, achieve net transfers of capital between countries, what else is needed? What is needed is transactions not only in financial markets but also in goods markets. In this section, I will discuss the role played by goods markets.

Suppose that Ms. Watanabe sells her yen to Mr. Smith for dollars and uses the dollars she purchases from Mr. Smith to buy U.S. government bonds, but suppose that her counterparty Mr. Smith, who trades his dollars for Ms. Watanabe's yen, is a comic book fan who uses his yen to buy Japanese *manga* comic books rather than Japanese government bonds and ships them back to the U.S.

Now there has been a net transfer of capital from Japan to the U.S. and Japan as a country has been able to transfer capital to the U.S. because Ms. Watanabe's transfer of capital from Japan to the U.S. has not been offset by a transfer of capital in the opposite direction. Thus, not only Ms. Watanabe as an individual but also Japan as a country will have been able to transfer capital from Japan to the U.S.

However, if the costs of exporting the *manga* comic books from Japan to the U.S. (e.g., transport costs, tariffs, nontariff barriers, the cost of regulatory compliance, etc.) were too high, Mr. Smith may choose to content himself with U.S.-made Superman comic books instead of buying Japanese *manga* comic books and use the yen he purchased from Ms. Watanabe to buy Japanese government bonds.

We would then be back to a situation in which Japan as a whole cannot transfer its capital abroad because Ms. Watanabe's transfer of capital from Japan to the U.S. will again be exactly offset by Mr. Smith's transfer of capital from the U.S. to Japan. Consequently, any obstacles that impede the transfer of Japanese *manga* comic books to the U.S. (i.e., any frictions in goods markets) will also impede the transfer of capital between the two countries.

Hence, an absence of frictions in financial markets is sufficient to allow the capital of an individual such as Ms. Watanabe to be "perfectly mobile" and to allow her to transfer

her capital to another country. However, for the capital of Japan as a country to be “perfectly mobile” across national borders would also require there to be no frictions not only in financial markets but also in goods markets (i.e., no transport costs, no tariffs, no nontariff barriers, no costs of regulatory compliance, etc.). Clearly, this is never the case, so we should not have expected the saving of a country as a whole to be perfectly mobile across national boundaries in the first place.

Once it is pointed out, this solution to the longstanding Feldstein-Horioka Puzzle or Paradox seems almost obvious. After all, virtually all undergraduate courses teach that an imbalance on the capital account of the balance of payments is the counterpart to an imbalance on the trade or current account in the opposite direction and hence that a net transfer of capital between countries necessitates a trade or current account imbalance in the opposite direction.

However, the many researchers, including Feldstein and myself, who have addressed the Feldstein-Horioka Puzzle or Paradox seem to have temporarily forgotten this and to have concentrated on trying to identify frictions in financial markets as the explanation for the Puzzle. I conclude that the fallacy of composition is alive and well, that it is very powerful, and that it has been confusing me and many other researchers for 44 years!

To summarize our findings so far:

- (1) Individuals will be able to transfer their capital abroad if there are no frictions in financial markets, even if there are frictions in goods markets.
- (2) However, countries as a whole may not be able to transfer capital abroad and the Feldstein-Horioka Finding of domestic saving and domestic investment being highly correlated across countries may arise even if there are no frictions in financial markets if there are frictions in goods markets.
- (3) This is an excellent example of a fallacy of composition.

To put it another way, the Feldstein-Horioka Finding of domestic saving and domestic investment being highly correlated across countries could be due to frictions in financial markets, frictions in goods markets, or both. It could arise even if there were no frictions in financial markets if there were frictions in goods markets, which there certainly are.

Thus, the Feldstein-Horioka Finding does not necessarily indicate that there are frictions in financial markets, and it is not necessarily a Puzzle or a Paradox after all!

The importance of frictions in goods markets (also called “trade costs” or “trade frictions”) as a possible explanation for the Feldstein-Horioka Finding was first pointed out by Maurice Obstfeld and Kenneth Rogoff in the aforementioned 2001 paper (Obstfeld and Rogoff, 2001), but they did not point out that financial markets cannot by themselves bring about net transfers of capital between countries. In the context of the Feldstein-Horioka Puzzle or Paradox, this was first pointed out by my co-author Nicholas Ford and me in Ford and Horioka (2017a) and Horioka and Ford (2022).

## 7. Four Regimes or Vignettes

To elucidate our explanation of the Feldstein-Horioka Puzzle or Paradox from a different angle, in this section, I would like to consider four possible regimes or vignettes, which differ with respect to whether goods markets are open or closed and with respect to whether financial markets are open or closed. As before, I will assume that there are only two market participants--Ms. Watanabe, a Japanese investor who wants to purchase (invest in) U.S. government bonds, and Mr. Smith, an American comic book fan who wants to purchase Japanese *manga* comic books.

Goods markets are “open” if there are no transport costs, tariffs, non-tariff barriers, costs of regulatory compliance, etc., and are closed if any of these frictions are considerable. Similarly, financial markets are “open” if there are no exchange controls, restrictions or prohibitions on the purchase or sale of foreign assets, transactions taxes on the purchase or sale of foreign assets, etc., and are closed if any of these frictions are considerable.

Case 1: Both goods and financial markets are open

In this case, because goods markets are open, Mr. Smith will be able to purchase Japanese yen from Ms. Watanabe and use them to buy Japanese *manga* comic books. And because financial markets are open, Ms. Watanabe will be able to use the U.S. dollars she purchased from Mr. Smith to purchase U.S. government bonds. Thus, in this regime, both Ms. Watanabe as well as Japan as a whole will be able to transfer capital from Japan to the U.S. because the transfer of Ms. Watanabe’s capital from Japan to the U.S. will not be



offset by a transfer of capital in the opposite direction (from the U.S. to Japan). As a result, domestic saving will no longer equal domestic investment in either country, and the Feldstein-Horioka Finding will not obtain.

Case 2: Goods markets are open, financial markets are closed

In this case, because goods markets are open, Mr. Smith will be able to purchase Japanese yen from Ms. Watanabe and use them to buy Japanese *manga* comic books. Ms. Watanabe would like to use the U.S. dollars that she purchased from Mr. Smith to buy U.S. government bonds, but because financial markets are closed, she will not be able to do so and will have to settle for purchasing (say) Superman comic books using her U.S. dollars. Thus, neither individuals nor countries as a whole will be able to transfer capital across national boundaries, and domestic saving and domestic investment will remain equal to one another (i.e., the Feldstein-Horioka Finding will obtain).

Case 3: Goods markets are closed, financial markets are open

In this case, because financial markets are open, Ms. Watanabe will be able to purchase U.S. dollars from Mr. Smith and use the U.S. dollars to buy U.S. government bonds. Mr. Smith would like to use the Japanese yen he purchased from Ms. Watanabe to buy Japanese *manga* comic books, but because goods markets are closed, he will not be able to do so and will have to settle for buying U.S.-made Superman comic books and for using the yen he purchased from Ms. Watanabe to purchase (say) Japanese government bonds. Thus, in this regime, Ms. Watanabe will be able to transfer her capital from Japan to the U.S., but Japan as a country will not be able to transfer capital to the U.S. because the transfer of Ms. Watanabe's capital from Japan to the U.S. will be fully offset by Mr. Smith's transfer of capital in the opposite direction (from the U.S. to Japan). For this reason, domestic saving will remain equal to domestic investment in both countries (i.e., the Feldstein-Horioka Finding will obtain) even though individuals are able to transfer their capital between the two countries. There is a fallacy of composition in this case because countries as a whole cannot transfer capital to another country even though individual investors are able to do so.

Case 4: Both goods and financial markets are closed

In this case, Mr. Smith wants to purchase Japanese *manga* comic books and Ms. Watanabe

wants to purchase U.S. government bonds, but neither is possible because both goods and financial markets are closed. Mr. Smith will have to settle for buying Superman comic books, and Ms. Watanabe will have to settle for purchasing Japanese government bonds. Thus, in this regime, neither individuals nor countries as a whole will be able to transfer their capital across national boundaries, and domestic saving and domestic investment will remain equal to one another (i.e., the Feldstein-Horioka Finding will obtain).

The four cases are summarized in Table 1, which shows whether or not individuals and countries as a whole can transfer their capital abroad in each of the four cases. As can be seen from this table, the only regime in which countries as a whole will be able to transfer capital abroad, in which domestic saving will *not* equal domestic investment, and in which the Feldstein-Horioka Finding of domestic saving and domestic investment being highly correlated across countries will not be observed is case 1 (in which both goods and financial markets are open).

**Table 1: The Four Cases of Financial and Goods Market Openness**

		Goods Markets	
		Open	Closed
Financial Markets	Open	Case 1: Both individuals and countries as a whole can transfer capital abroad	Case 3: Individuals can transfer capital abroad but countries as a whole cannot
	Closed	Case 2: Neither individuals nor countries as a whole can transfer capital abroad	Case 4: Neither individuals nor countries as a whole can transfer capital abroad

Thus, if the Feldstein-Horioka Finding is not observed, the world is in case 1 (the case in which both financial markets and goods market are open). In all of the other three regimes (cases 2, 3, and 4), countries as a whole will not be able to transfer capital abroad, domestic saving will equal domestic investment, and the Feldstein-Horioka Finding will be observed. Thus, if the Feldstein-Horioka Finding is observed, we can rule out only case 1, and we will not be able to differentiate between cases 2, 3, or 4. Previous researchers have implicitly assumed that the fact that the Feldstein-Horioka Finding was obtained demonstrates that the world is in case 2 (the case in which goods markets are open but financial markets are closed) but it is equally likely that the world is in case 3 (the case in which goods markets are closed but financial markets) or case 4 (the case in which both goods markets and financial markets are closed). Further information is needed in order to determine which of the four cases applies in the real world.

## 8. How Financial Markets and Goods Markets Interact

In this section, I wish to explain how financial markets and goods markets interact with one another to transfer capital abroad and what role frictions in goods markets play in this process.

Suppose that there is an exogenous increase in domestic saving in Country A, due, for example, to increased uncertainty about the future. I would like to consider what happens next when financial markets and goods markets are completely “open,” when they are completely “closed,” and finally when financial markets are completely “open” but goods markets are not completely “closed” but have a realistic level of frictions.

### Case 1: Financial markets are closed

If financial markets are completely closed and agents are not able to purchase foreign assets, the increase in domestic saving in Country A will create an excess of domestic saving over domestic investment, which in turn will cause domestic interest rates to decline. The decline in interest rates will cause a decrease in domestic saving and an increase in domestic investment, leading to the restoration of equality between domestic saving and domestic investment. Thus, the entire increase in saving will be invested domestically, leading to the Feldstein-Horioka Finding. And since the increase in domestic saving will not lead to any outflows of capital, it will not change the demand for foreign currency and will therefore not bring about any changes in exchange rates. Hence, what does the adjusting is domestic interest rates rather than exchange rates. Note, moreover, that these results will be the same whether goods markets are open or closed.

### Case 2: Both financial and goods markets are “open”

If, on the other hand, financial markets are open and saving can be freely invested abroad, the increase in domestic saving in Country A will initially cause an imbalance between domestic saving and domestic investment, which in turn will cause domestic interest rates to decline. This will induce savers in Country A to seek to invest their saving abroad because interest rates are now higher abroad than they are at home. This, in turn, will increase the demand for other countries' currencies to increase, causing Country A's

currency to weaken relative to the currencies of other countries.

In a world in which not only financial markets but also goods markets are “open” in the sense of there being absolutely no frictions in these markets, the weakening of Country A’s currency will, in turn, cause Country A’s goods to become cheaper abroad, causing its exports to increase, and will cause foreign goods to become more expensive in Country A, causing its imports to decline, and Country A will show trade and current account surpluses.

Furthermore, if goods markets are “open” in the sense of there being absolutely no trade frictions, meaning that goods produced in country A are perfect substitutes for good produced in other countries and can be transported to other countries without cost, the trade balance will be infinitely elastic with respect to the exchange rate. This also means that only an infinitesimal change in the exchange rate will be necessary to divert all additional saving abroad and to restore the interest rate to the original level, the same level as that in other countries.

In the end, the entire increase in domestic saving will have been invested abroad, leading to a capital account deficit, but the capital account deficit will be fully offset by trade and current account surpluses, causing equilibrium to be restored in Country A’s balance of payments. Thus, the Feldstein-Horioka Finding of domestic saving and domestic investment being highly correlated across countries will not be observed. Moreover, the interest rate will return to its original level since equality has been restored between domestic saving and domestic investment without the need for interest rate adjustments. In other words, what does the adjusting in this case is the trade balance rather than domestic interest rates, which is the opposite of Case 1.

Case 3: Financial markets are open, goods markets are partially closed

The conclusion in Case 2 requires that there be absolutely no frictions in goods markets, which is highly unlikely. In reality, there are many types of frictions in goods markets, including such things as:

1. Transport costs
2. Tariffs and non-tariff barriers such as import quotas
3. The cost of complying with the regulatory requirements of each country (i.e., their

- standards and certification procedures)
4. The cost of translating labels and owner's manuals
  5. The cost of adapting products to local tastes
  6. Price stickiness in local currency terms
  7. The cost of shifting labor, capital, and other factors of production between sectors

(See Horioka and Ford, 2022, for a more detailed explanation.)

Given that these frictions exist in goods markets, exchange rate movements induced by the increase in domestic saving will usually not cause the increase in saving to result in an equivalent increase in the country's trade and current account surpluses, even if financial markets are open.

When domestic saving increases, the domestic interest rate in country A will fall, and savers in country A, preferring the higher yields available in the other country, will attempt to acquire foreign currency so they can buy these higher yielding assets. This will cause the value of the foreign currency to increase, which in turn will make country A's goods cheaper in the other country and foreign goods more expensive in country A, and thus country A's trade surplus will increase. This trade surplus is the flip side of the transfer of some of the additional saving abroad (a capital account deficit).

However, because of frictions in goods markets, the trade surplus of country A will not be perfectly elastic with respect to the exchange rate, as it was in Case 2. While the change in the exchange rate may make it profitable to export goods with low trade frictions (such as small, light, sturdy, and/or non-perishable goods with low transport costs or goods with low tariffs and other trade barriers), there will still be many goods (such as large, heavy, fragile, and/or perishable goods with high transport costs or goods with high tariffs and other trade barriers) whose trade frictions make it uneconomical for them to be sold to other countries. The actual size of country A's trade surplus will depend on how elastic its trade surplus is with respect to the exchange rate, which in turn will depend on the level of trade frictions on the various goods that might potentially be exported. However, these trade frictions will typically be so large that the increase in country A's trade surplus will be less than the increase in its domestic saving, meaning that part of the increase in domestic saving will have to be invested locally and that domestic interest rates will still fall. Thus, the Feldstein-Horioka Finding of domestic saving and domestic investment being highly correlated across countries will be observed even though financial markets

are open because goods markets are partially closed, and in this case, both domestic interest rates as well as exchange rates and the trade balance will do part of the adjusting.

In the extreme case in which goods markets are completely closed, Country A as a whole will not be able to transfer any of the increase in domestic saving abroad because, in the total absence of trade, it will not be possible to have a trade or current account surplus, and hence it will not be possible to have a capital account deficit. Thus, it will be domestic interest rates rather than exchange rates and the trade balance that do all of the adjusting, as in case 1.

We have so far been assuming that each country has its own currency and that exchange rates have meaning, but in the case of the Eurozone, there is only one currency so exchange rates have no meaning. What happens in this case? What does the adjusting in this case will be nominal prices rather than exchange rates or domestic interest rates. As before, the increase in domestic saving in Country A will cause savers in Country A to invest their money abroad, leading to a capital account deficit, but instead of causing changes in exchange rates, this will lead to a decline in the nominal prices of goods and services in Country A, which in turn will allow Country A to export more and rack up trade and current account surpluses that will offset its capital account deficit.

Thus, the process may take longer in the case of the Eurozone and other currency unions since it will presumably take longer for all nominal prices to adjust than it takes for one price (the exchange rate) to adjust. However, the conclusion that individuals as well as countries as a whole will be able to transfer their capital abroad if both financial and goods markets are open will be unchanged whether or not the country has its own currency.

To summarize the key points arising from our discussion of the three cases,

- (1) In the case of closed financial markets, it is domestic interest rates that do the adjusting and the entire increase in saving will be invested domestically, leading to the Feldstein-Horioka Finding of domestic saving and domestic investment being highly correlated across countries.
- (2) When financial markets are open, an individual's capital is "perfectly mobile" between countries. However, for a country's capital to be "perfectly mobile" and for domestic saving and domestic investment to be uncorrelated across countries would

require financial markets to be completely open and friction-free and also for goods markets to be completely open and friction-free such that trade balances are perfectly elastic with respect to the exchange rate. Clearly, this is only a hypothetical case that does not correspond to reality.

- (3) In reality, financial markets and goods markets interact to enable countries as a whole to achieve (net) transfers of capital vis-à-vis other countries. Reductions in domestic interest rates arising from an increase in domestic saving will cause real exchange rates to change (either via changes in the nominal exchange rate or, in the case of a currency union, via changes in nominal prices), and changes in the real exchange rate will create incentives for a net flow of goods and services between countries and hence a net transfer of capital between countries in the opposite direction. However, trade frictions limit the quantity of goods that can economically be transferred between countries, leading to some degree of correlation between domestic saving and domestic investment.
- (4) Thus, it is interest rates that do the adjusting in the case of closed financial and goods markets, it is trade balances (or, in the case of currency unions such as the Eurozone, nominal prices) that do the adjusting in the case of open financial and goods markets, and both do part of the adjusting in the case of open financial markets and partially closed goods markets.

## **9. Which Type of Friction Is More Important?**

I have so far tried to show that both frictions in financial markets and frictions in goods markets can prevent countries as a whole from transferring capital abroad, leading to the Feldstein-Horioka Finding of domestic saving and domestic investment being highly correlated across countries, but in this section, I will discuss which type of friction is relatively more important as an obstacle to countries as a whole being able to transfer their capital abroad.

An important paper by Eaton, et al. (2016) analyzes the extent to which frictions in goods markets (trade frictions or trade costs) can explain various puzzles in macroeconomics including the Feldstein-Horioka Puzzle or Paradox. Their simulations show that eliminating frictions in goods markets would cause the dependence of domestic

investment on domestic saving to fall by one-half or to disappear entirely, thereby attenuating the Feldstein and Horioka Finding. This suggests that frictions in goods markets are much more important than frictions in financial markets as an explanation for the Feldstein-Horioka Finding.

Moreover, a theoretical and calibration exercise conducted by my co-author Nicholas Ford and me that I will not be able to describe in detail here (see Horioka and Ford, 2022) suggests that frictions in goods markets are relatively more important in the short run but that frictions in financial markets are relatively more important in the long run.

## **10. Summary and Implications of Our Findings**

In this closing section, I will summarize our findings concerning the Feldstein-Horioka Puzzle or Paradox and explore the implications thereof.

### **10.1. A Summary of Our Findings**

- (1) The fallacy of composition applies in the case of international capital flows, and just because individual investors can freely transfer their capital abroad does not necessarily mean that countries as a whole can transfer their capital freely abroad.
- (2) In fact, countries as a whole are not able to transfer their capital freely abroad, which has led to the Feldstein-Horioka finding of a high correlation between domestic saving and domestic investment across countries.
- (3) The inability of countries as a whole to transfer their capital freely abroad could be due not only to frictions in financial markets but also to frictions in goods markets (trade costs or trade frictions), and countries as a whole will not be able to transfer their capital freely abroad even if there are no frictions in financial markets if there are frictions in goods markets.
- (4) In fact, the theoretical and empirical evidence suggests that frictions in good markets might be more important than frictions in financial markets as an impediment to countries as a whole being able to transfer their capital freely abroad, especially in the short run.



## **10.2. The Implications of Our Findings**

Our findings about the Feldstein-Horioka Puzzle or Paradox have broad-ranging implications, and in the final subsection of our paper, we wish to consider the implications of our findings for economic theory, for economic policy, and for research methodology.

### **10.2.1. The Implications for Economic Theory**

Looking first at the implications of our findings about the Feldstein-Horioka Puzzle or Paradox for economic theory, many, if not most, undergraduate and graduate economic textbooks and a great many published scholarly papers in economics, assume that, in the absence of frictions in financial markets and foreign country risk premiums, interest rates will be quickly equalized across countries and that there will be a “world interest rate,” usually designated as  $r^*$ , at which agents in any country will be able to lend and borrow (see, for example, Dornbusch, 1976, and Mankiw, 2000).

However, in the same way that financial markets cannot, by themselves, enable a country as a whole to transfer its capital abroad, financial markets cannot, by themselves, cause interest rates to be equalized across countries, even in the absence of risk premiums.<sup>2</sup> Goods markets are also needed, and frictions in both financial markets and goods markets can prevent interest rates from being equalized across countries. Thus, the failure of interest rates to be equalized across countries does not necessarily mean that there are frictions in financial markets; it could instead be due to frictions in goods markets.

Thus, a significant portion of what is being both presumed and taught about the impact of international financial markets is simply wrong!

To go even further, Obstfeld and Rogoff (2001), Eaton, et al. (2016), Ford and Horioka (2017b), and Horioka and Ford (2017) point out that frictions in goods markets (“trade costs” or “trade frictions”) can explain several other puzzles in international macroeconomics, including the Puzzle of Home Bias in Trade, the Puzzle of Home Bias in Equity Portfolios, the International Consumption Correlations Puzzle, Purchasing Power Parity Puzzle, and the Exchange Rate Disconnect Puzzle.

### **10.2.2. The Implications for Economic Policy**

Turning to the implications of our findings about the Feldstein-Horioka Puzzle or Paradox for economic policy, our finding that not only frictions in financial markets but also frictions in goods markets can impede countries as a whole from transferring their capital abroad implies that reducing trade barriers and other frictions in goods markets will help achieve a better allocation not only of goods but also of capital and therefore that we can kill two birds with one stone by liberalizing trade, thereby reducing frictions in goods markets.

Governments often erect tariffs and other trade barriers in order to protect domestic industries and domestic workers, in order to keep trade imbalances from becoming too large, and in order to achieve greater economic security. However, they should bear in mind that this not only distorts the allocation of goods but also the allocation of capital and should examine whether the benefits of such policies more than offset the total cost of such policies including the cost of goods and capital being misallocated.

It is disturbing that frictions in goods markets (such as trade sanctions against Russia and China) have been increasing in the past few years, and it is imperative that this trend be slowed or reversed as soon as possible so that the allocation of goods as well as capital can be improved.

However, it should be borne in mind that international capital mobility is not an unmitigated blessing and that it also has downside risks such as making the country more vulnerable to shocks from abroad and reducing the independence of monetary policy. Thus, it is not necessarily the case that the greater the international mobility of capital the better. In fact, Obstfeld and Taylor (2004) have argued that developing countries should be wary of liberalizing capital flows before the preconditions for it (e.g., the development of financial markets, institutional architecture, and social safety nets) have been achieved.

Finally, our findings about the Feldstein-Horioka Puzzle or Paradox have policy implications for currency unions such as the Eurozone. As I have already explained, creating a currency union may make it more difficult for countries as a whole to transfer capital to other currency union members because they need to rely on changes in nominal prices (and wages) rather than on changes in exchange rates.

To cite one example, after the creation of the Eurozone, a substantial amount of capital flowed from core countries such as Germany to peripheral countries such as Greece, Portugal, and Spain, perhaps because the creation of the Eurozone made the assets of these countries more attractive by alleviating exchange rate risk. This caused the peripheral countries to show large capital account surpluses, and they had to achieve higher inflation rates as a way of generating the trade and current account deficits that were needed to offset their capital account surpluses. The problem is that relying on changes in nominal prices to restore equilibrium is presumably more time-consuming than it is to rely on changes in exchange rates because it is more cumbersome to change all nominal prices than it is to change just one price (namely, the exchange rate). This is one consideration that countries should take into account when deciding whether or not to join or to leave a currency union.

### **10.2.3. The Implications for Research Methodology**

Lastly, there are at least two implications of our findings about the Feldstein-Horioka Puzzle or Paradox for research methodology.

#### **(1) The Implication for the Fallacy of Composition**

The first is that, if one is fooled by the fallacy of composition, as Feldstein, I, and many other economists were with respect to international capital flows, one will reach the wrong conclusion. Thus, it is very important for all researchers in economics to avoid being fooled by the fallacy of composition.

#### **(2) The Implication for Thinking Outside the Box**

Finally, I want to turn to the second implication of our findings about the Feldstein-Horioka Puzzle or Paradox for research methodology. As I have already discussed, most researchers believed that the Feldstein-Horioka Finding was attributable to frictions in financial markets, but my co-author Nicholas Ford and I were not unduly influenced by what other researchers were claiming or doing and explored whether the Feldstein-Horioka finding may not be due to an entirely different factor such as frictions in goods markets rather than to frictions in financial markets. In other words, we were “thinking outside the box.”

In the same way, I believe that it is important for researchers in all fields of economics not to take the assertions of previous researchers or the conventional wisdom for granted but to “think outside of the box.” Important progress can be made in economic research by “thinking outside the box.”

In this section, we have discussed the many implications of our findings concerning the Feldstein-Horioka Puzzle or Paradox for economic theory, economic policy, and research methodology, and we would like to conclude our paper on that note.

### **Acknowledgements**

This paper is a revised version of the Presidential Address I delivered at the Autumn 2023 meeting of the Japanese Economic Association that was held at Kansai University in Osaka, Japan, on Sept. 16-17, 2023. I am grateful to the late Martin Feldstein for earlier collaborative work, Nicholas Ford for his extensive comments and advice and for the collaborative work on which this paper is based, and Reiko Aoki, Agnès Bénassy-Quéré, Marek A. Dąbrowski, Chris Dillow, Charles Engel, Chiaki Hara, Colin McKenzie, Yuri Sasaki, Michael Sposi, other participants of my Presidential Address at the Japanese Economic Association at Kansai University in Osaka, Japan; the International Conference on Growth, Resilience, and Sustainability in an Uncertain World at the Department of Economics, Central University of Rajasthan in Rajasthan, India, the ESRI International Conference on “Demographic Change and Economic Growth” at the Economic and Social Research Institute, Cabinet Office, Government of Japan, Tokyo, Japan, and my lecture at the Bank of France and l’École des Études Hautes en Sciences Sociales in Paris, France, and an anonymous referee for their valuable comments. This work was supported by JSPS (Japan Society for the Promotion of Science) KAKENHI Grant Numbers 18H00870, 20H01513, 20H05633, and 23H00831.

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## Endnotes

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<sup>1</sup>Throughout this paper, we use the term “capital account” to refer to the broader definition of “capital account” that includes both the “financial account” and the narrower definition of “capital account,” the latter of which includes financial transactions that do not effect income, production, or saving, such as international transfers of drilling rights, trademarks, and copyrights, which are typically negligible in magnitude (for more details, see Krugman, et al., 2023, Chapter 13).

<sup>2</sup>To be more precise, financial markets can, by themselves, equalize the return received by a U.S. citizen who invests in the U.S. and the return received by a U.S. citizen who invests in Japan (this is referred to as covered interest rate parity), but they cannot, by themselves, equalize the return received by a U.S. citizen and the return received by a Japanese citizen.