Asset Price Changes, External Wealth and Global Welfare *

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Abstract

U.S. equity outperformance and sustained dollar appreciation have led to large valuation gains for the rest of the world on the U.S. external position. I construct their global distribution, carefully accounting for the role of tax havens. Valuation gains are concentrated and large in developed countries, while developing countries have been mostly bypassed. To assess the welfare implications of these capital gains, I adopt a sufficient statistics approach. In contrast to the large wealth changes, most countries so far did not benefit much in welfare terms. This is because they did not rebalance their portfolios and realize their gains, while they were further hurt by rising import prices from the strong dollar.

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1 Introduction

U.S. equity markets and the dollar have performed exceptionally well since 2010. The S&P 500 more than tripled up to 2021, outperforming world markets by far and the dollar appreciated by more than 20% against other currencies at the same time.[1] The implications of this asset price boom are felt not only in the U.S. but also globally. Foreigners are major investors in the world's largest asset market, holding more than 20 % of U.S. equity and bonds (corporate and treasuries).[2] Therefore, this has resulted in large capital gains of around 4% of U.S. GDP annually on the U.S. net foreign asset position for the rest of the world. This stands in contrast to the structurally high valuation gains the U.S. was earning pre-crisis, often referred to as the *exorbitant privilege*. Hence, recent valuation losses have been referred to as the *end of privilege* (Atkeson et al., 2023).

This paper studies the global implications of this process. First, I ask a very simple question: Who is earning these capital gains? Next, it is natural to ask whether the reversal of valuation gains and the associated 'end of privilege' go hand-in-hand with a reversal of welfare gains towards foreigners. To accomplish this, I develop a sufficient statistic to assess the welfare impacts of these asset price movements.

To answer the first question and find out where the valuation gains are, I need go beyond standard macroeconomic data, which records the U.S. external position relative to the rest of the world. Hence, I break down the U.S. international economic accounts to the bilateral level. I do so by combining multiple data sets, which are themselves inputs to the U.S. international accounts. The constructed bilateral data is consistent with the aggregates recorded in the U.S. external balance sheet and records all asset categories with major asset price movements at market value.[3]

The widespread use of tax havens obfuscates the true geography of global capital and in the raw data, around 30% of foreign holdings of U.S. assets are recorded in tax havens. I address this by carefully restating the bilateral data to a *nationality basis*, so that valuation gains are attributed

[1] For the dollar appreciation consider e.g. Jiang et al. (2022b).

[2] The number on foreigners' equity holdings is taken from Atkeson et al. (2023), foreign holdings of U.S. treasury, bonds are studied in treasury's annual reports on foreign holdings of U.S. securities

[3] There are small differences in coverage and concepts, in practice these are minor for the period considered, see the discussion in appendix A.2.

to their ultimate owners. To accomplish this, I use data on parent companies of tax haven investors for foreign direct investment. For traded securities, I leverage insights from the tax evasion literature (Alstadsæter et al., 2018) and use the Bank of International Settlements (BIS) locational bankings statistics on the nationality of depositors in tax havens, together with the restatement matrices of Coppola et al. (2021). In total, the constructed data set contains (across asset categories) positions, flows and valuation gains between the U.S. and over 80 other countries, covering all major economies and tax havens. In this sense, the paper constitutes a first step towards a set of *bilateral economic accounts*.

With this at hand, I am able to trace asset price gains to their ultimate earners and provide evidence on their distribution. The global map of valuation gains skews heavily towards high income countries in Europe and the rest of world. For these countries, valuation gains can be strikingly large. For the biggest gainers relative to GDP, Norway and Canada, they amount to more than 8% of GDP every year on average between 2010 and 2021. But also for most other high-income countries they are substantial, usually exceeding 1% of GDP annually from 2010 to 2021. Low and middle income countries have been mostly bypassed by the U.S. asset boom. The true geography of valuation gains becomes very apparent only after accounting for tax evasion and related activities, which otherwise distort the global map of capital. Importantly, I document that during this time period, net transactions have been an order of magnitude smaller than capital gains. Most countries held their positions, with some central European countries being important buyers of U.S. assets. These findings are robust to a variety of measurement approaches and tax haven restatements, for example measurement from the asset side through the IMF's coordinated portfolio survey or alternative restatements of tax haven holdings as in Gourinchas et al. (2012). Using these approaches, I provide bounds on my estimates of valuation gains.

To understand the heterogeneity across countries I decompose valuation gains into three components: capital gain differentials, portfolio composition, and timing of investors (Gourinchas and Rey, 2007a; Curcuru et al., 2010). The decomposition clarifies that the main driver of heterogeneity is the capital gain component, i.e., the performance of U.S. assets relative to those in the

counterpart. The emerging markets' portfolio tilt towards safe assets further means that they have not been in position to see large gains from increasing equity prices.

Given large valuation gains for the rest of the world, it is natural to ask what their welfare implications are. The traditional view on this question is shaped by the high valuation gains the U.S. earned on its foreign asset position up to the financial crisis. Many authors argue that these valuation gains put the U.S. in a unique position that enabled its persistent current account deficit – hence the name *'exorbitant privilege'*. For example, Gourinchas and Rey (2022) argue that *'One direct consequence of the exorbitant privilege is to relax the external constraint of the U.S., allowing it to run larger trade and current account deficits without worsening its external position commensurately'*.

To determine whether similar benefits accrued to the rest of the world in the past decade, I build a simple open economy framework in which countries trade assets with the U.S.. Within this framework, I develop a sufficient statistic, extending the tools of Fagereng et al. (2023) to the open economy. Intuitively, the sufficient statistic quantifies how asset price movements affect the external constraint of foreign economies. To first order, valuation gains loosen the external budget constraint when they are realized. Countries who never 'cash in' on their gains stand to gain nothing from booming asset prices. What is more, countries seeking to accumulate external savings are even hurt by asset price gains because they are buying assets at a premium. In the open economy, the source of asset price changes also matters. Valuation changes from a dollar appreciation do not only matter via financial channels, but have real consequences through the price of imports denominated in dollars.

Implementing the sufficient statistic to quantify these channels reveals that up to now, welfare gains from rising valuations are small and even negative for many countries. This stands in stark contrast to the large wealth gains. The reason is simple: foreigners did mostly not react to their gains and at times kept buying U.S. assets at a premium.[4] The lack of capital gain realization and portfolio adjustment means that welfare gains from asset price movements are limited for

[4] Bergant and Schmitz (2018) also note a lack of re-balancing in security-level data on Euro-area investors.

most countries. On the other hand, they were hurt by increases in import prices from the dollar appreciation. Therefore, asset price movements effectively tightened the external budget constraint in most countries so far. The welfare losses on the real side from increased prices outweigh the effects from asset revaluations. This holds particularly for emerging markets who experienced larger depreciations and have higher propensities to invoice in dollars.

Additionally, I provide a weaker test of welfare effects, which is robust to the concern that the sufficient statistic only holds to first order and might miss a collateral channel in which foreigners see a relaxation in borrowing constraints.[5] If these effects play a big role, countries with more asset price gains should be observed reducing their current account as their constraints loosen. They do not – if anything the effect goes the other way and higher valuation gains on U.S. assets predict more external saving. I show that these results run counter to the experience of the U.S. before the financial crisis. Applying my sufficient statistic to the U.S. for the period of 1973–2004 yields sizable welfare gains, because the U.S. ran large current account deficits, so that asset price gains loosened its external constraint.

Finally, I analyze the future adjustment of the U.S. net foreign asset position, which has become very negative after more than a decade of current account deficits and valuation losses. My analysis highlights that the future development of the U.S. external positions carries important welfare implications. If adjustment happens largely through the current account, foreigners will benefit in welfare terms by realizing the future consumption opportunities afforded to them by their valuation gains. If on the other hand valuations adjust, foreigners will see their asset price gains melt away without realizing them. I forecast the future development of the U.S. external position using the method of Gourinchas and Rey (2007b) and link the forecast to my sufficient statistic. The forecast predicts that a large fraction of adjustment will come through a reversal of valuations, so that going forward welfare gains for foreigners will remain limited.

In conclusion, for the rest of the world, the change in the capital gains on the U.S. foreign asset position has so far materialized mostly in wealth terms, but not in welfare terms.

[5] A similar possibility is that foreigners anticipate future asset sales and already consume out of rising valuations.

Literature. This article contributes to three strands of the literature. First, I relate to work on the exorbitant privilege and the importance of capital gains on the net foreign asset position (Gourinchas and Rey, 2007a; Curcuru et al., 2008; Gourinchas et al., 2019; Jiang et al., 2022a; Sauzet, 2023; Bertaut et al., 2023). The reversal of valuation gains since 2010 is studied in Atkeson et al. (2023) from a U.S. perspective. Relative to these papers focusing on the U.S., I provide the counterpart, tracing the valuation gains to the foreigners earning them. In pioneering work, Gourinchas et al. (2012) construct a similar set of bilateral valuation effects from 2007Q4-2008Q4, using the assumption that bilateral asset flows are proportional to asset holdings. Given recent advances in the literature and increased data availability, my estimates relax their assumptions on the construction of valuation changes and tax havens while also covering a longer time period. Milesi-Ferretti (2022) studies valuation changes on foreign asset positions at the aggregate (and not the bilateral) level. He highlights an important discrepancy: In U.S. national accounts, foreign holdings and capital gains are much larger than when aggregating national accounts in the rest of the world. He attributes this to measurement issues related to tax havens, which lead to an understatement of U.S. holdings by foreigners. My estimates are constructed from the U.S. balance sheet and account for holdings through tax havens and financial centers. These would otherwise go unrecorded (Zucman, 2013), considerably understating valuation gains for the rest of the world.

Second, an important literature studies the origins and distributional effects of asset price booms in the closed economy (Greenwald et al., 2019; Kuhn et al., 2020; Martínez-Toledano, 2020; Kuvshinov and Zimmermann, 2022; Del Canto et al., 2023). With open financial markets, asset price booms also spill across borders. For the case of the U.S. equity boom, I show that this means large wealth gains for high-income countries. This provides an international analogue for the finding of Kuhn et al. (2020), who show that within the U.S., it is the rich who gain from rising equity valuations. The sufficient statistic approach I use to evaluate welfare gains builds on Fagereng et al. (2023), who study welfare effects from asset price booms with heterogeneous households. Auclert (2019) and Zhou (2022) provide analogues for monetary policy and exchange rate transmission respectively.

Table 1: Structure of the U.S. NFA

Assets	Liabilities	
Outward Foreign Dir. Inv.	Inward Foreign Dir. Inv.	
Equity Holdings abroad	Foreign Equity Holdings in U.S.	Portfolio Investment
Bond Holdings abroad	Foreign Bond Holdings in U.S.	
Other Assets	Other Liabilities	

Notes: This table illustrates the U.S. net foreign asset position.

Finally, the article also contributes to work on global capital allocation. Tax havens are known to distort global capital allocation and capital flows, prompting research focused on uncovering the true economic activity underlying the data (Zucman, 2013; Alstadsæter et al., 2018; Damgaard et al., 2019; Coppola et al., 2021; Beck et al., 2023). I rely on and contribute to this effort by restating the U.S. external position to a nationality basis in terms of holdings, flows and valuation changes.

The article proceeds as follows: Section 2 introduces data and methods to decompose the U.S. external balance sheet across countries. I then present results on the global distribution of valuation gains and its drivers in section 3. Finally, in section 4, I develop a sufficient statistic to study welfare. Results of the sufficient statistic are presented in section 5.

2 Data and Methodology

In this section I introduce the relevant data and explain the construction of the bilateral valuation effects.

2.1 Concepts in the International Economic Accounts

First I review basic concepts of national accounting that will be used throughout. The foreign assets and liabilities of a country are recorded in its net foreign asset position (NFA) and are split into three main asset categories, which I briefly summarize. Table 1 gives an overview of the structure of the U.S. net foreign asset position.

- **Foreign direct investment** captures cross-border investment associated with ”significant degree of influence on the management of an enterprise”, that is with an ownership stake of greater than 10%.
- **Portfolio investment** includes cross border positions in debt or equity which are not included in direct investment. It is split into its debt and equity components and captures the majority of cross-border financial investments.
- **Other Assets** includes loans, deposits, trade credit, derivatives and currencies. For the U.S., this category mostly consists of cross-border loans and deposit holdings.

The NFA records the stock of assets held, while the balance of payments records flows within asset categories. Importantly, revaluations are not included in the flows. The asset side of the U.S. external balance sheet represents foreign assets held by U.S. citizens, while the liabilities side consists of claims of the rest of the world on the U.S.. Hence, increases in the price of U.S. assets relative to foreign assets result in a valuation loss on the U.S. net foreign asset position.[6] On both sides of the balance sheet, the BEA records annual positions, flows and valuation changes.

The development of the NFA can be expressed in the law of motion

$$\text{NFA}_{t+1} = \text{NFA}_t + CA_t + VA_t + OVC_t,$$

which indicates that changes in the aggregate U.S. net foreign asset position can be split into flows (the current account), valuation changes and other valuation changes. Other volume changes $OVC_{i,t}$ result from changes in concepts, statistical discrepancies or mismeasurement. For the period I consider, other changes are very small as I show in appendix A.1.

Each component of the accumulation equation is the sum of the underlying asset categories, such as portfolio investment or FDI across both sides of the external balance sheet, i.e. foreign holdings in the U.S. and U.S. holdings abroad. The key limitation of the NFA is that it refers to the

[6]Note that this does *not* mean that the U.S. gets poorer in total as total wealth is the sum of net foreign assets (which go down) and domestic assets, which go up and are larger than the foreign asset position.

aggregate position of the U.S. vis-a-vis the rest of the world. For my study, I need to go beyond the aggregate position and construct bilateral linkages.

To understand what I do, let $A_{i,t}$ be the year-end holdings bilateral holdings with the U.S. of country i at t (for example U.S. portfolio equity held by France, or U.S. FDI in France). The change in asset holdings can be decomposed into flows, price changes and other volume changes using the accounting identity

$$A_{i,t+1} - A_{i,t} = CA_{i,t+1} + VA_{i,t+1} + OVC_{i,t+1}. \tag{1}$$

Here, $CA_{i,t+1}$ is the balance on the current account for the asset (which is equal to the net financial transactions), and $VA_{i,t}$ are valuation changes of the asset. I follow the recommendations of Lane and Milesi-Ferretti (2009) and allocate the residual to valuation changes for direct investment and to flows for all components of portfolio investment. This does not affect the valuation gains materially as other changes are small during the recent period, as I show in appendix A.1. The first goal of the paper is to construct the components of equation 1 for as many countries and asset categories as possible using inputs to the U.S. national accounts, while maintaining consistency with the aggregate data, so that I can decompose the net foreign asset position, capital gains and transactions across countries and asset classes.

Valuation changes include changes in the exchange rate. This matters, as the asset and liability side of the U.S. balance sheet are mismatched in terms of currency – many U.S. assets held abroad are denominated in foreign currency, while foreign investment in the U.S. is generally denominated in dollars. Hence, a dollar appreciation also leads to valuation gains for the rest of the world. Valuation changes are central to my study, so I will discuss measurement and robustness in detail when describing the data.

A large problem with international financial statistics is their reliance on the *residence principle*, which means that securities are allocated to the location in which the issuer or holder of that security resides. As the importance of tax havens grows, this problem becomes more acute.

Therefore, I construct estimates of foreign positions on the basis of *nationality*, meaning they are allocated to the ultimate holder of the security. The procedure is discussed in detail in section 2.3.

2.2 Data and Construction of Bilateral Positions

This subsection describes how I break down the aggregate international position of the U.S. into bilateral components as illustrated in equation 1 using inputs to the U.S. national accounts.[7] For now, all the data will be on a residence basis, the next subsection will focus on nationality-basis restatement.

Portfolio investment is well captured through the Treasury International Capital (TIC) reporting system, which is the input to the international economic accounts produced by the BEA. It relies on direct reporting from financial corporations, so the data quality is very high. In principle, data on both positions and transactions are collected monthly by country. Due to the so-called 'transaction bias' (Bertaut et al., 2006), I do not use the transaction data, but instead use the Bertaut and Judson (2022, 2014) data, which uses the monthly positions data together with country and asset specific price indices to estimate valuation changes. Flows are then backed out as a residual. The asset categories covered are granular and consist of equity, corporate, agency and treasury bonds, and are all priced at market value.

The stock data displays so-called 'custodial bias', which means that assets are at the recorded at the residence of the custodian. If a German citizen decides to hold U.S. assets through a Swiss bank, this will be recorded as a liability towards Switzerland, distorting the geography of capital flows. I sidestep this issue for now and discuss it separately in section 2.4.

[7]Valuation gains could also be constructed from the balance sheet of other countries, e.g. with the IMF's CPIS. There are three reasons why I choose to construct them from the U.S. balance sheet: (i) Total foreign assets of all countries are an order of magnitude *smaller* than total foreign liabilities (Milesi-Ferretti, 2022), so estimates from the asset side will understate the valuation gains of the rest of the world (ii) Investment inward is likely better captured in national accounts than investment outward, so the U.S. balance sheet is best used for assessing foreign exposure to the U.S. equity boom (iii) Bilateral U.S. statistics are available for a long time horizon with a consistent methodology, whereas many nations that are important for capital flows (specifically tax havens) report limited data on their external balance sheet (iv) TIC data breaks out equity holdings separately, whereas CPIS generally refers to 'Equity and Investment Funds', some of which may consist of bonds. I show valuation gains constructed from the CPIS in the next section.

Foreign direct investment is harder to capture at market prices. The BEA collects this data through surveys, which all investors undertaking FDI are required to file. Importantly, they also report their nationality.[8] Estimates of both assets and liabilities are collected at book value, then the MSCI (resp. foreign stock indices) is used to revalue the equity position of direct investment to market value for the headline measure. Similarly, I revalue the bilateral data from book to market values and match the BEA's headline numbers.[9] The BEA collects data for both the stock and flow of bilateral direct investment annually for a large set of economies. As outlined above, I then compute valuation effects using information on the annual positions and flows.

The countries covered in the TIC data (covering portfolio investment) and the direct investment data largely coincide. This allows me to construct a large panel of more than 80 countries, which are available in both samples. The country coverage increases over time, allowing me to track more capital flows and valuation gains in more recent years. Importantly, claims and liabilities towards well known tax havens are included in the data. The countries in my sample make up over 95% of external holdings in recent years, as I show in figure A.3 in the appendix. Appendix table A.1 gives details on the sample and harmonization of countries over time.

Discussion. The bilateral data I construct covers a large subset of the U.S. external balance sheet, and more importantly covers the parts in which valuation gains have been concentrated. More than 70% of the U.S. external balance sheet consists of portfolio and direct investment in recent years. As Atkeson et al. (2023) show, these are the asset classes where the vast amount of asset price changes have been occurring. Cross-border loans or deposits, which make up most of the remaining assets and are not covered, experienced almost no valuation changes, this is shown explicitly in figure A.2.

[8] All files are available at https://www.bea.gov/international/direct-investment-and-multinational-enterprises-comprehensive-data.

[9] Two measures of the FDI component of the bilateral flow are available at the aggregate: The first records the flows in assets and liabilities on each side of the balance sheet. The second, 'directional' measure records the direction of the transaction. These transactions only affect the gross positions of the debt component of foreign direct investment, the net position is unchanged. As the data on bilateral positions is only available on a directional basis (details in U.S. Bureau of Economic Analysis (2022) table 32.a.) I use this as my measure. As asset price gains for debts are usually small, valuation effects in these assets are likely not large. The adjustment to go from book to market value follows the same procedure as in table 6.1 of the BEA's international financial transaction account for direct investment. My procedure matches the BEA's 'current cost adjustment'.

A downside of my approach is that I have to estimate valuation changes in portfolio investment using benchmark asset price indices. This introduces the implicit assumption that every investor country earns the same capital gains within an asset class as in Jiang et al. (2022a); Meng and van Wincoop (2020). I directly test this assumption in appendix A.6, using mutual fund data from Maggiori et al. (2020) as well as the portfolio of the Norwegian Sovereign fund and the Japanese Government Pension fund. The evidence indicates that these investors track benchmark indices closely, with deviations on the order of a few basis points. This is consistent with other evidence that international investors track indices closely (often this is their institutional mandate). Using security-level data on mutual funds, Alok et al. (2022) document that flows backed out using price indices closely match flows obtained from the true asset allocation of funds. Bertaut et al. (2023) use the security-level data underlying the TIC to study cross-border returns, finding that returns line up closely with indices.

Milesi-Ferretti (2022) raises concerns about the valuation of FDI in the U.S. national accounts, arguing that using U.S. equity markets to value subsidiaries of multinationals in the U.S. is unsatisfactory. My baseline numbers follow U.S. national accounts, however I offer a breakdown into portfolio investment and FDI. For the most part, the geographic distribution of valuation gains in FDI and portfolio investment is similar, with each accounting for around 50 % of valuation gains. This means that directionally, the results of this paper are not affected by the valuation of FDI, in magnitude however the valuation gains are lowered when disregarding FDI.

2.3 Dealing with Tax Havens

A well known problem with international financial data is the widespread use of tax havens. The *residence principle* means that assets are attributed to the counterpart's residence, so tax havens are over represented in my data. As I show in appendix figure A.5, in recent years around 30% of foreign holdings are attributed to tax havens.[10] Fortunately, academic researchers and statistical agencies have recognized the necessity of understanding the true nature of international financial

[10] Here, and in general I follow the tax haven classification of Coppola et al. (2021) with the addition of Switzerland.

linkages, and have begun unveiling the global map of capital.

In this subsection, I outline how I restate the U.S. external position to a nationality basis. My estimates account for three important types of tax evasion, which I outline only briefly here for conciseness. The details of the tax haven restatements are found in appendix A.3, which also discusses the robustness of my approach.

First, I correct for FDI that is carried out indirectly through shell companies. To do so, I use the BEA's FDI surveys, in which corporations give the nationality of theeir 'ultimate beneficial owner', that is the ultimate company owning the tax haven affiliate recorded as the counterparty.[11] For the outflow of FDI from the U.S. I rely on data collected by Damgaard et al. (2019). They collect data on 'true' nature of FDI using reports from tax haven statistical agencies, augmented with Orbis firm data. Second, on the liability side (foreign holdings in the U.S,), I restate U.S. holdings through accounts in tax havens (Alstadsæter et al., 2022). The correction is done using the BIS locational banking statistics recording the universe of foreign holdings in tax haven bank accounts.[12] Third and finally, I correct U.S. holdings of securities issued in tax havens using the data of Coppola et al. (2021).

A related form of tax evasion is profit shifting by multinational corporations. Adjusting for this affects the income earned on foreign investment, and therefore the income component of FDI returns. However, this will not change the valuation effects or the current account– it means U.S. net exports are 'too small', while U.S. income earned abroad is 'too large'. These changes net out when constructing the current account, as is also argued in Guvenen et al. (2022).

Tracing offshore wealth is hard and inevitably involves assumptions, in particular on the foreign owners of portfolio investment in the U.S.. To validate my approach, I construct three additional estimates. I first consider the approach employed in Gourinchas et al. (2012). They assume that positions through tax havens are partly positions of the country into itself, following

[11]Companies are required to trace their ownership structure through their parents (or majority owner if they have more than one parent). For details see the definition of the BEA.

[12]The locational banking statistics are widely used in the tax evasion literature (Alstadsæter et al., 2018; Menkhoff and Miethe, 2019; Andersen et al., 2022) to understand the ownership of tax haven assets. For Europe, Beck et al. (2023) have recently provided improved estimates of ownership of assets in financial centers. I plan to update my analysis with their data as soon as it becomes publicly available.

the degree of portfolio home bias, and the rest of the investment is distributed following all other (non tax-haven) investment. In addition, I construct estimates constructed from the CPIS, in which foreign countries report their annual asset allocation. Finally, I make no adjustment and show the estimates obtained directly from the raw data. In the end, all these different ways of deconstructing the U.S. external balance sheet arrive at similar conclusions about the geography of the valuation gains on the U.S. NFA. Details on these approaches are in Appendix A.3 and A.5.

2.4 Custodial Bias

An issue of the TIC data on Portfolio Investment is the so-called custodial bias (Bertaut et al., 2006). This ocurrs when a foreign resident holds a U.S. security through a third country financial institution. The TIC data will then record this as a liability to the third country. In this section, I discuss the potential bias induced by this.

To gauge the bias, I compare the TIC data with portfolio holdings data from the Coordinated Portfolio Investment Survey (CPIS). As valuation gains mostly occurred in equity holdings, I compare the equity positions of the largest U.S. equity holders in the CPIS, raw TIC data and my preferred estimate (which restates tax haven wealth) in figure A.8 in the appendix.[13] There is a strong tilt towards tax havens in both the unadjusted TIC and the CPIS data, suggesting that issues relating to the custodial bias are be present in both data sets.

There are numerous reasons why the TIC and the CPIS may conflict beyond custodial bias. An obvious candidate is differences in reporting: In the CPIS, total foreign equity holdings in the U.S. are around 30% lower than in the TIC data. Custodial bias should not influence this aggregate, unless the custodian is in fact helping households evade taxes (Zucman, 2013). Beyond tax evasion, it is likely that not all foreign asset holdings are covered in many countries. The CPIS manual mentions that many countries find it hard to sample all foreign assets held by their residents. Large breaks in the time series of equity held in the U.S. for many countries point to

[13]Comparisons of the debt components of portfolio investment are hard because the CPIS does not include reserve holdings, but the TIC does.

the same fact. The TIC data on the other hand is based directly on the reports of intermediaries, ensuring that the aggregate coverage should be better and consistent over time.

I also construct estimates of valuation gains using the CPIS, which are similar to my baseline estimates. Although custodial bias remains an issue, this indicates that the broad trends are the same across measurement approaches.

3 Results

With the data at hand, I now explore the global distribution of the valuation effects on the U.S. net foreign asset position. My baseline estimates are constructed as described in the last section.

3.1 The Geography of Valuation Effects

Figure 1 shows the average annual valuation gains vis-a-vis the U.S. for the 'end of privilege' period 2010-2021 (Atkeson et al., 2023) as a percent of GDP for the countries in my sample.[14] This figure illustrates the global distribution of valuation gains on the U.S. NFA.

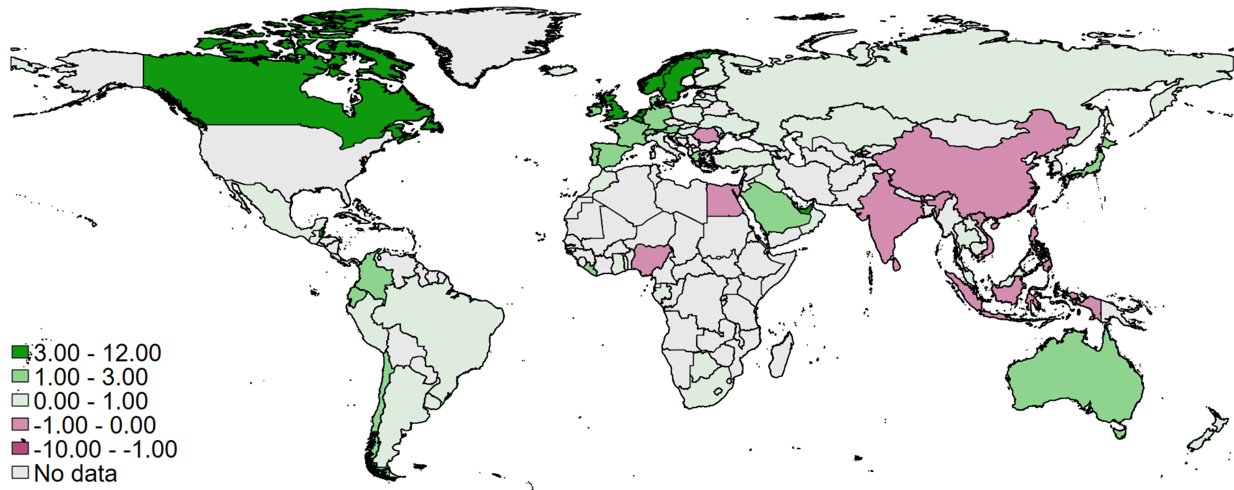
Valuation gains are large in developed countries around the world, sometimes even exceeding 3% of GDP annually, especially in Northern Europe. Cumulated over the 11-year horizon, this implies large gains for these countries on the net foreign asset position vis-a-vis the U.S.. Developing giants such as India or China, often seen as the source of the global savings glut (Caballero et al., 2008), see much lower gains. Some emerging economies, such as China or India, even experience net valuation losses.

To illustrate the size of these gains, I compare them to total wealth growth for a number of countries,[15] which is the sum of domestic wealth and the net foreign asset position in appendix table A.2. Valuation gains are computed using the different scenarios presented above for the treatment of tax havens and custodial bias. Valuation gains on the U.S. NFA are sizable, even

[14]The sign of the valuation gain in the figure is positive if a country made net valuation gains vis-a-vis the U.S..

[15]Data on total wealth comes from the World Inequality Database.

Figure 1: World Map of Valuation Gains and Losses



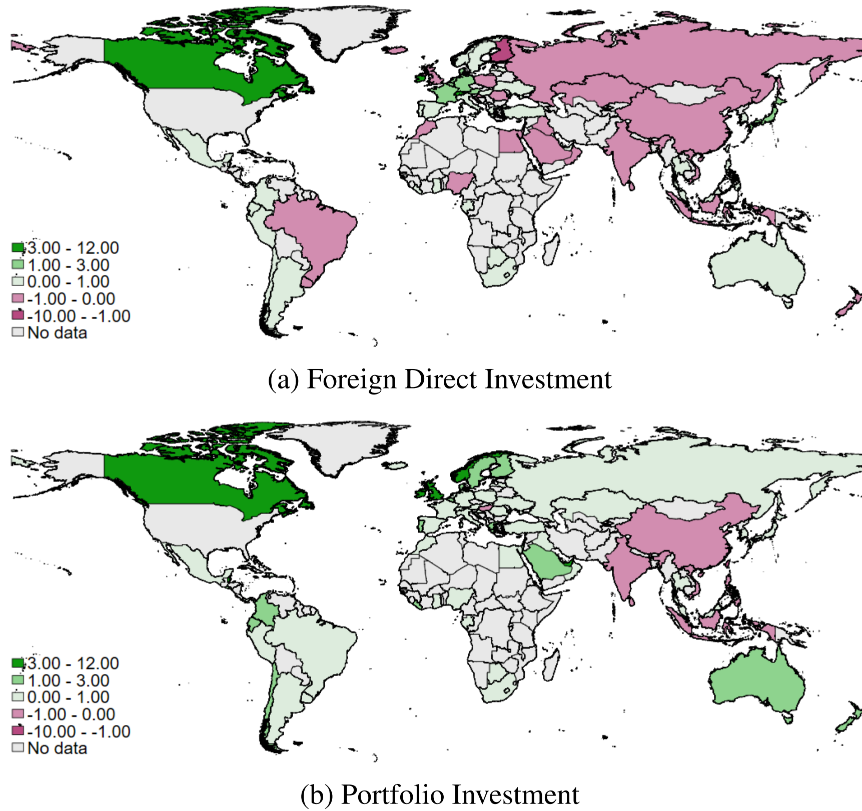
Notes: This figure shows the average annual net valuation effects from 2010-2021 as a percent of GDP for each country. Data construction and tax haven restatement is as in section 2. All numbers underlying the figure can be found in table A.2.

compared to total wealth growth. In some countries, such as Germany, Norway or France their size is even around 20% of total wealth growth.

Foreign Direct and Portfolio Investment. Figure 2 decomposes the net valuation gains from figure 1 into those in FDI and in portfolio investment. In general, gains in these two assets are highly correlated. Valuation gains in FDI are found mostly in Canada and central Europe, countries with many foreign corporate holdings abroad. Again, emerging economies see negative valuation gains. For portfolio investment, northern European countries, Canada and large oil exporters see the largest gains. The valuation gains I show are *net* valuation gains. On each side of the U.S. external balance sheet there are large gross valuation gains for foreign investors investing in the U.S. or U.S. americans investing abroad. This will mean that countries who had larger equity booms themselves will tend to see lower valuation gains on their position vis-a-vis the U.S.. I study net valuation gains, as these aggregate up to the valuation gains on the U.S. net foreign asset position. Additionally, for the framework developed to analyze welfare later, valuation gains on both side of the U.S. external balance sheet will matter.[16] For reference, valuation gains on the

[16]There is a further technical reason to prefer net capital gains. Gross capital gains depend on the currency choice in which to record capital gains in the data, as exchange rate movements only change the price of foreign currency. Net capital gains are invariant to the currency choice – a dollar appreciation corresponds to a depreciation of the foreign

Figure 2: Valuation Gains in Portfolio Investment and Foreign Direct Investment



(a) Foreign Direct Investment

(b) Portfolio Investment

Notes: This figure shows the annual net valuation effects from 2010-2021 as a percent of GDP for each country. Panel a) shows net valuation gains in foreign direct investment, while panel b) considers portfolio investment (equities + bonds). Data construction and tax haven restatement is as in section 2. All numbers underlying the figure can be found in table A.2.

asset and liability side are shown and discussed in appendix figure A.10.

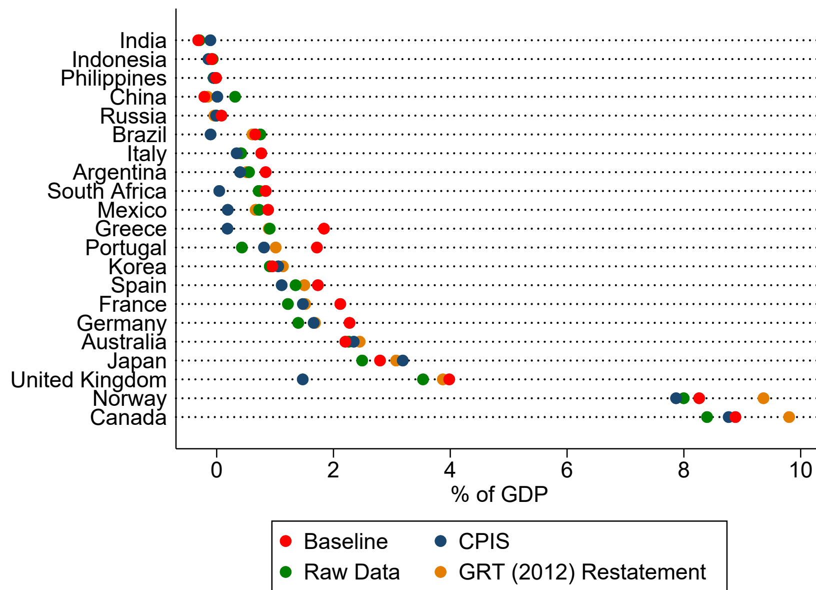
Flows. The period I study is dominated by large valuation swings on the U.S. NFA. By contrast, the current account deficit of the U.S moderated and averaged around -2% of U.S. GDP over this time period (see figure A.1). In figure A.11 in the appendix, I show the geography of these financial flows in my data to study who is funding the U.S. current deficit. In most countries, there are only moderate financial transactions observed during the period. The U.S. current account deficit is financed mostly by advanced economies in Europe and Asia. However, even for these countries, the flows are small compared to the the size of their capital gains.

Robustness. The allocation of tax haven wealth and the associated valuation gains involves as-

currency.

sumptions, although with advances in this area these are less restrictive than in the previous literature. To quantify the uncertainty and assess the robustness of my findings, I provide three alternative estimates. First, I make no corrections and show the raw data. Second, I reassign portfolio holdings in tax haven wealth using the assumption of Gourinchas et al. (2012), that is using the 'leave-out'-distribution of U.S. asset holdings when excluding tax havens. Finally, to address concerns about custodial bias in the TIC, I measure portfolio investment from the asset side using the CPIS. Alternative maps are shown in figure A.9 in the appendix, along with the precise numbers in table A.2. Figure 3 shows the difference in point estimates for a number of large countries.

Figure 3: Capital Gains under Alternative Restatements



Notes: This figure shows the average annual capital gains under different restatements. Capital gains are measured as a percentage of GDP, as in the map in figure 1. The red dots are the baseline estimates. Alternative estimates are constructed using holdings from the CPIS (blue), raw data without adjustments for tax havens (green) and the restatement of Gourinchas et al. (2012) (yellow). World maps using those restatements are in figure A.9.

The main conclusion is very robust: Gains on the U.S. assets were mainly earned by developed economies. The developing world was largely left out, Latin America being somewhat of an exception. The differences between estimates are usually in the range range of 1-2 percentage points of GDP. Accounting for the presence of tax havens is important to assess the distribution of valuation gains within those groups however. Large parts of the European periphery see their

valuation gains rise, as do many Latin American economies.

The largest difference arises for United Kingdom, whose holdings of U.S. assets in the TIC data are around twice as large as in the CPIS. A similar gap is found in Beck et al. (2023) for the U.K investments in the Euro Area. They attribute this to incomplete coverage of foreign holdings in the U.K. national accounts and custodial bias. U.K. national accounts miss investment fund holdings of households and nonprofits, which are important for foreign investment in many countries, so that they underestimate total foreign holdings of the U.K.. Unveiling the countries underlying the U.K. custodians is still an open question. However, this discrepancy is not large enough to change the conclusions about the foreign earners of capital gains on the U.S. NFA.

Currency Movements. From 2010-2021, the U.S. Dollar has appreciated more than 20% against other major currencies (Jiang et al., 2022b).[17] This creates valuation gains on the net foreign asset position through the currency mismatch on the U.S. external balance sheet: Nearly all claims foreigners have on the U.S. are dollar denominated, while U.S. citizens often hold foreign currency assets abroad (though there is a significant home currency bias (Maggiori et al., 2020)). In Appendix A.8, I separate the valuation gains into those stemming from exchange rate movements and pure price effects. As I outline there, I create bilateral currency exposure shares for the U.S. net external position, extending the work of Lane and Shambaugh (2010) and Bénétrix et al. (2015) to the bilateral level. Figure A.13 shows the valuation gains through exchange rate movements for the period 2010-2021 for a number of countries, again normalized by GDP. These gains are positive for most countries, but smaller than the total valuation gains (pure asset prices plus exchange rate movements). They are relatively large for South American countries and South Africa, which have experienced large depreciations over this time period. This leads many Latin American economies to experience larger valuation gains than other emerging markets over this time period [18]

[17] Jiang et al. (2022b) link this to an increase in savings from foreign investors, relatively tight U.S. monetary policy and investor demand shifts towards U.S. financial assets

[18] See De Gregorio and Peña (2023) for further evidence on dollar appreciation and valuation effects in emerging markets.

3.2 Decomposing Valuations Effects

Why did some countries experience very large valuation gains while others lost out? To answer this, I decompose gains into three components: Return differences within an asset class, allocation between asset classes and timing effects.

The decomposition follows the framework of Curcuru et al. (2010) and Gourinchas and Rey (2007a).[19] In an accounting sense, the average net valuation gain $\bar{va}^{\text{net}}$ from figure 1 is

$$\bar{va}^{\text{net}} = \frac{1}{T}\sum_{t=1}^{T}\sum_{k=1}^{K} w_{k,t-1}^{\text{A}} r_{k,t}^{\text{A}} - \frac{1}{T}\sum_{t=1}^{T}\sum_{k=1}^{K} w_{k,t-1}^{\text{L}} r_{k,t}^{\text{L}},$$

where $k = 1 \dots K$ are different asset categories (FDI, Portfolio equity $\dots$) and $t = 1 \dots T$ is the time covered. Moreover, $r_{k,t}^{A}$ is the capital gain on the asset side of the U.S. balance sheet, and $w_{t,k}^{A}$ are total holdings to GDP of the asset (resp. $r_{k,t}^{L}$ and $w_{k,t}^{L}$ for the liabilities and capital gains earned on them). We can rearrange to the following identity, in which each line is one component of the decomposition:

$$\begin{aligned} \bar{va}^{\text{net}} = & \sum_{k=1}^{K}\left(\frac{\bar{w}_k^{\text{A}} + \bar{w}_k^{\text{L}}}{2}\right)(\bar{r}_k^{\text{A}} - \bar{r}_k^{\text{L}}) \\ & + \sum_{k=1}^{K}\left(\frac{\bar{r}_k^{\text{A}} + \bar{r}_k^{\text{L}}}{2}\right)(\bar{w}_k^{\text{A}} - \bar{w}_k^{\text{L}}) \\ & + \frac{1}{T}\sum_{t=1}^{T}\sum_{k=1}^{K}(w_{k,t-1}^{A} - \bar{w}_k^{\text{A}}) r_{k,t}^{\text{A}} \\ & - \frac{1}{T}\sum_{t=1}^{T}\sum_{k=1}^{K}(w_{k,t-1}^{\text{L}} - \bar{w}_k^{\text{L}}) r_{k,t}^{\text{L}} \end{aligned} \tag{2}$$

Every line of equation 2 carries a straightforward interpretation. The first line shows the differential valuation induced by return differences between the U.S. and the foreign country with asset classes (*Return Effect*). The next line captures the opposite, the differential arising through the difference in portfolios, given average returns over an asset class (*Composition effect*). The last

[19]The subtle differences are the following: While Curcuru et al. (2010) and Gourinchas et al. (2012) consider the net return differential, I study the net valuation gains, which can be seen as the capital gain component of returns times the amount of assets allocated. Hence in their framework $w_{k,t-1}$ is a portfolio share, while I use absolute amount allocated towards an asset class. Moreover, they also include the dividend component of returns in their framework, while I focus on the capital gain component.

two lines capture what Curcuru et al. (2010) call the *timing effect*, the differential introduced by the covariance of returns and portfolio adjustment. The third line is the U.S. timing, which is positive when U.S. investors increase their holdings in a country and asset class as returns are high. The last line is foreign timing, the covariance of foreign investment flows and U.S. returns.[20]

I compute each component of equation 2 using my baseline estimates of valuation gains and portfolio allocations for a number of large countries. In computing the decomposition, I distinguish three asset classes: FDI, portfolio investment in equity and portfolio investment in debt securities. Figure 4 presents the decomposition for a number of developing and developed countries. The crosses indicate the net valuation gain in terms of the country's GDP, the dots represent the other components from equation 2. As in the map, a positive total indicates that the country has been gaining in terms of valuations vis-a-vis the U.S..

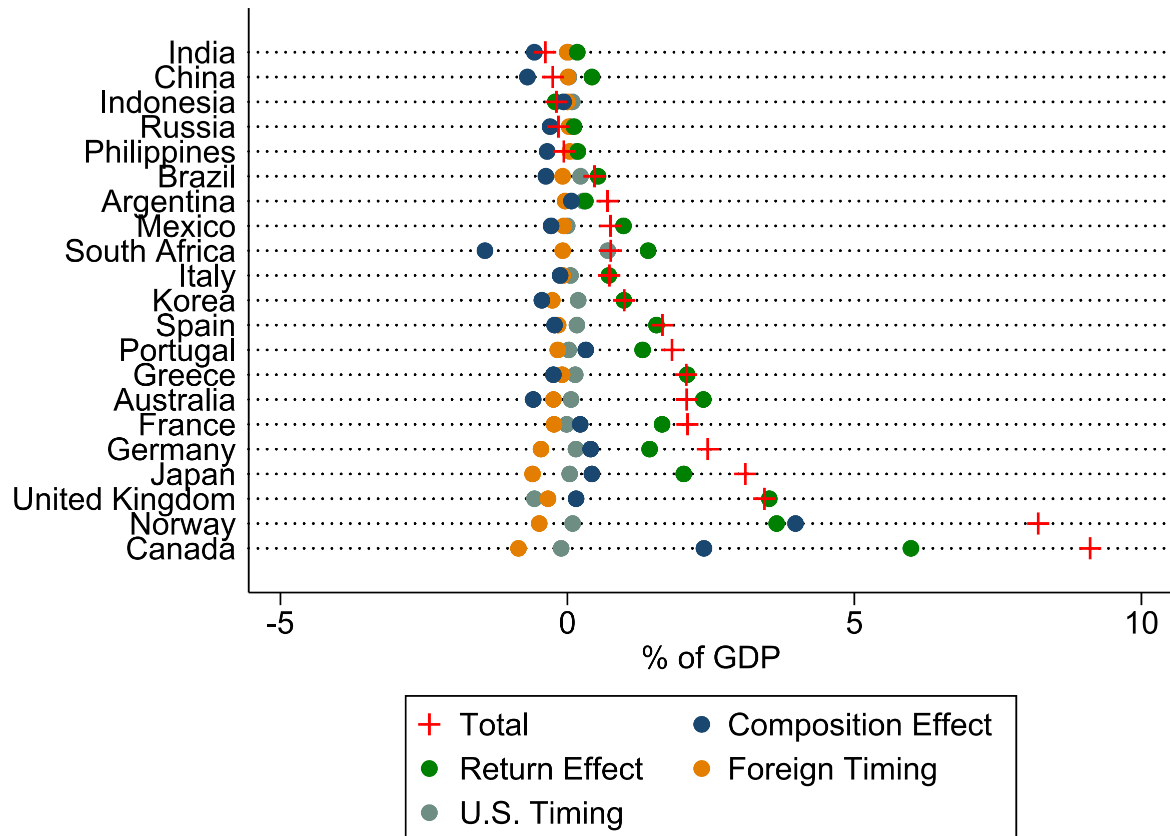
It is clear from this chart what drives differences across countries: The return effect accounts for most of the dispersion across countries. This means that valuation gains differ primarily because of country heterogeneity in asset performance.[21] The return effect is high for many high-income countries whose equity markets have performed poorly relative to the U.S.. For low income countries the return effect is still positive, but lower in general. The composition effect is generally negative for many emerging economies, which reflects their portfolio tilt towards safer assets. Timing effects are usually small. The timing of U.S. investors is close to zero throughout the sample, while there is some evidence that foreign investors in the U.S. exhibit bad timing. I show that these findings are not specific to the countries shown in table A.3 in the appendix, where I show the decomposition for separately for advanced and emerging economies.

These findings are interesting in light of the pre-crisis literature on exorbitant privilege. Gourinchas and Rey (2007a) and Curcuru et al. (2010) estimate similar decompositions on data up to 2004 and 2007 respectively. Gourinchas and Rey (2007a) find a return effect that favors the U.S., opposite from my computation for the period 2010-2021. Consistent with Curcuru et

[20] The FDI data is annual, but the TIC data is monthly. This means that the timing effects in lines 3 and 4 of equation 2 refer to monthly timing for portfolio investment but annual timing for foreign direct investment.

[21] Note however that these asset price differentials are weighted by the portfolio shares as can be seen in the first line in equation 2, so holding more assets in an portfolio category with a large differential increases the return effect.

Figure 4: Return Decomposition for Select Countries (2010-2021)



Notes: This figure shows the result of the decomposition in equation 2 for a panel of countries. 'Total' refers to the sum, i.e. the valuation gain. Numbers are shown as a percentage of GDP and over the period 2010-2021.

al. (2008), foreigners exhibit bad timing. It will be interesting to see what return effects will be like going forward, given the finding of Curcuru et al. (2010) that return effects fluctuate a lot depending on the sample.

4 Wealth Changes and Welfare Changes

The striking size of the spillovers from the U.S. asset price boom beg the question: Are these price changes meaningful or just paper gains? To answer this question, I develop a sufficient statistic for welfare in this section.

4.1 Framework

The baseline setting is a simple framework in which countries trade assets with the U.S., and also consume foreign goods. This results in a key role for the exchange rate, which induces changes in asset prices, but also affects the cost of imports.

Markets. Consider an economy which trades with the U.S. in international financial markets. There is no risk and time runs forever. There are domestic currency one-period bonds B_t available, which pay out 1 in the next period and trade at price Q_t. Moreover, countries can buy or sell shares $N_{t,k}$ in $k = 1 \dots K$ U.S. assets at price $P_{t,k}$ (in dollars) on the global financial market. Let s_t be the nominal exchange rate, defined as the price of foreign currency in home currency units, so that an increase in s_t is a depreciation of home currency. Hence, purchasing $N_{t,k}$ shares of a U.S. security costs $P_{t,k}s_t$ units of home currency. Assets pay dividends $D_{t,k}$ in the currency of denomination, so that the gross return from the perspective of the open economy is $R_{t,k+1} = (D_{t,k+1} + P_{t,k+1}s_{t+1})/P_{t,k}s_t$ in domestic currency.[22] Similarly, there exist $L = 1 \dots L$ domestic assets, with the holdings denoted $N_{t,l}$. These assets also pay out dividends in domestic currency. Of each asset, there is a total supply of $\overline{N}_k$ and $\overline{N}_l$.[23]

The gross return of the bond is $R_{t+1} = 1/Q_t$. Denote by $R_{0\to t} = R_1 \cdots R_t$ the total gross return on the bond from time 0 to t. Finally, in order to make portfolios determinate, there is an infinitesimal adjustment cost $\chi_k(\Delta N_{t,k})$ for foreign and a similar adjustment cost χ_l for domestic assets. As there is no uncertainty, without these adjustment costs there would be no difference between assets. For the welfare gains to first order, these adjustment costs and their functional form will not matter.

Households. A representative household consumes goods, some of which are invoiced in dollars. I denote by goods C_t^H the goods which are not invoiced in dollars (including domestic goods) and by $C_t^\$$ those goods which are priced in dollars.[24] The prices of the baskets of goods are P_t^H and

[22] Foreign one-period bonds are nested here as assets with dividend 1 and maturing at $t+1$.

[23] This supply is assumed to be in excess of the domestic asset demand and only matters for defining the net foreign asset position lateron.

[24] The invoicing currency of imports not denominated in dollars is irrelevant, as I only consider impacts of dollar exchange rate movements.

$P_t^{\$} s_t$ respectively. In addition to their income from dividends, households earn exogenous income Y_t. Households have a utility function U over an aggregate consumption C_t^{agg} aggregate that is implicitly defined over home and foreign goods,

$$\mathcal{C}(C_t^H, C_t^{\$}, C_t^{\text{agg}}) = 1$$

with $\mathcal{C}$ increasing over C_t^H and $C_t^{\$}$ and decreasing in C_t^{agg}. The corresponding ideal price index P_t^{agg} is defined as $P_t^{\text{agg}} := E(P_t^H, P_t^{\$} s_t, C_t^{\text{agg}})/C_t^{\text{agg}}$ given the countries implied expenditure function E. With this notation, given choices of C_t^H and $C_t^{\$}$, the total cost of purchasing these goods becomes $C_t^H P_t^H + C_t^{\$} P_t^{\$} s_t$.

Prices are taken as given, so that the household problem becomes

$$V = \max_{C_t, B_t, N_{t,k}, N_{t,l}} \sum_{t=0}^{\infty} \beta^t U(C_t^{\text{agg}})$$

subject to the initial holdings B_{-1}, $N_{k,-1}$, $N_{l,-1}$ and the budget constraint

$$\sum_{k=1}^{K} \Delta N_{t,k} P_{t,k} s_t + \sum_{l=1}^{L} \Delta N_{t,l} P_{t,l} + Q_t B_t + C_t^H P_t^H + C_t^{\$} P_t^{\$} s_t + \mathcal{X}_t$$
$$= Y_t + \sum_{k=1}^{K} D_{t,k} N_{t-1,k} s_t + \sum_{l=1}^{L} D_{t,l} N_{t-1,l} + Q_{t-1} B_{t-1}$$

such that all income (from labor or capital) is either used to purchase/sell financial assets or to consume at each time t. Here $\mathcal{X}_t$ are the aggregate trade costs for all assets. The associated no ponzi conditions for the bond, domestic and foreign assets are

$$\lim_{t\to\infty} R_{0\to t}^{-1} B_t Q_t = 0, \quad \lim_{t\to\infty} R_{0\to t}^{-1} N_{t,k} s_t P_{t,k} = 0 \; \forall k, \quad \lim_{t\to\infty} R_{0\to t}^{-1} N_{t,l} s_t P_{t,l} = 0 \; \forall l. \tag{3}$$

Relationship to Balance of Payments. The setup above relates naturally to the accumulation equation for the net foreign asset position, $\text{NFA}_{t+1} = \text{NFA}_t + \text{CA}_{t+1} + \text{VA}_{t+1}$, as outlined in section 2. In this setup, only positions and transactions with the U.S. are considered. Hence, the

net foreign asset position for a country is

$$\text{NFA}_t = \sum_{k=1}^{K} N_{t,k} P_{t,k} s_t - \sum_{l=1}^{L} \underbrace{(\overline{N}_l - N_{t,l})}_{\text{Share of domestic assets held by U.S.}} P_{t,l}$$

in local currency. The net international transactions (or equivalently, current account) are

$$\text{CA}_{t+1} = \sum_{k=1}^{K} (N_{t+1,k} - N_{t,k}) P_{t+1,k} s_{t+1} - \sum_{l=1}^{L} (N_{t,l} - N_{t+t,l}) P_{t+1,l}.$$

Finally, the valuation changes are

$$\text{VA}_{t+1} = \sum_{k=1}^{K} N_{t,k} (P_{t,k+1} s_{t+1} - P_{t,k} s_t) - \sum_{l=1}^{L} (\overline{N}_l - N_{t,l})(P_{t+1,l} - P_{t,l}).$$

4.2 Sufficient Statistic

I consider the impact of a price deviation $(\mathrm{d}s_t, \{\mathrm{d}P_{t,k}\}, \{\mathrm{d}P_{t,k}\})_{t=0}^{\infty}$, i.e changing asset prices and exchange rates. In this setting, I define the *welfare gain* as the effect of these price movements on total welfare V scaled by the marginal utility of consumption at time 0,

$$\text{Welfare gain} = \mathrm{d}V / U'(C_0^{\text{agg}}).$$

The *welfare gain* defined in this sense can be interpreted as the willingness to pay for a given path of prices (equivalent variation). It captures what foreign countries would be willing to pay for the observed path of price of U.S. assets, domestic assets and exchange rates. Proposition 1 decomposes the welfare gains from these price movements, extending the results from Fagereng et al. (2023). It shows that the welfare gains from revaluation of foreign assets through the exchange rate and price changes depend on the net purchase or sale of the assets. In language of the balance of payments, what matters for welfare is the current account, which captures the foreign saving behavior. Further, exchange rate movements not only have effects on the valuation of foreign

assets, but also on the price of goods and the value of dividends.

Proposition 1 (Welfare Gain in Open Economy) *The welfare gain coming from a price deviation* $\{ds_t, \{dP_{t,k}\}_k, \{dP_{t,k}\}_l\}_{t=0}^{\infty}$ *is*

$$\text{Welfare gain} = \sum_{t=0}^{\infty} R_{0\to t}^{-1} \Bigg(\underbrace{\sum_{k=1}^{K} (N_{t-1,k} - N_{t,k})(\mathrm{d}P_{t,k} + \mathrm{d}s_t)}_{\text{Asset Revaluation (Foreign in U.S.)}} + \underbrace{D_{t,k} N_{t-1,k} \mathrm{d}s_t}_{\text{Dividend Revaluation}}$$
$$+ \underbrace{\sum_{l=1}^{L} (N_{t-1,l} - N_{t,l}) \mathrm{d}P_{t,l}}_{\text{Asset Revaluation (U.S in Foreign)}} - \underbrace{C_t^{\$} P_t^{\$} \mathrm{d}s_t}_{\text{Goods Prices}} \Bigg)$$

The proof is given in Appendix B. It can be seen that valuation gains are welfare improving in so far as that they relax the external budget constraint. Whether they do so depends on the financial transactions: Buyers of expensive assets are hurt while the sellers benefit. Relative to the closed economy there are new channels, driven by the exchange rates. The exchange rate revalues foreign assets and dividends, but also affects consumption directly via goods prices.[25] The first three components capture the welfare effects induced through *financial* channels, i.e. the revaluations of assets and dividends. The final component allows for a comparison of these financial effects to the *real* effects of exchange rate movements on the price of imports. To first order, the effect of the dollar appreciation on import prices is given by the share of dollar-invoiced imports. A further discussion of the interpretation and extensions to the sufficient statistic is provided in section 5 after I implement it.

In the world economy, an aggregation result holds for the welfare gains from revaluations: For every buyer there is a seller, so the worldwide welfare gains coming from these terms are zero. Corollary 2 formalizes this.

Corollary 2 (Aggregation in the World Economy) *Suppose initial prices* $\{ds_t, \{dP_{t,k}\}_k, \{dP_{t,k}\}_l\}_{t=0}^{\infty}$ *clear markets. Then the aggregate welfare gains from asset revaluation are 0.*

[25]The increase in goods prices is the same as in the real income channel in Auclert et al. (2021) or Zhou (2022)

The corollary follows directly by noting that when taking the sum over all countries $c = 1 \dots C$ including the U.S., asset trades sum to 0, i.e $\sum_{c=1}^{C}(N_{ck,t} - N_{ck,t-1}) = 0$ for any asset k.

4.3 Implementation of the Sufficient Statistic

I now discuss how to measure the sufficient statistic from proposition 1 in the data. To do so, we need data on price deviations and import structure. Asset transactions are constructed directly together with valuation gains using the accumulation equation 1.

First-order Approximation. Conceptually, the sufficient statistic from equation 1 applies to infinitesimal deviations of prices and exchange rate. To operationalize this, I use a first order-approximation $\{\Delta s_t, \{\Delta P_{t,k}\}_k, \{\Delta P_{t,k}\}_l\}_{t=0}^{\infty}$:

$$\text{Welfare gain} = \sum_{t=0}^{\infty} R_{0\to t}^{-1}\Bigg(\sum_{k=1}^{K}(N_{t-1,k} - N_{t,k})(\Delta P_{t,k} + \Delta s_t) + D_{t,k}N_{t-1,k}\Delta s_t + \sum_{l=1}^{L}(N_{t-1,l} - N_{t,l})\Delta P_{t,l} + C_t^{\$}P_t^{\$}\Delta s_t\Bigg)$$

Price Deviations and Exchange Rate Deviations. The sufficient statistic considers changes in prices relative to a baseline scenario while holding dividends constant. To approximate this concept, I define price deviations from a path with a constant price dividend ratio, following Fagereng et al. (2023). Therefore, I consider welfare gains relative to a world in which the ratio of prices to payouts remained constant. Importantly, the U.S. equity market has seen a large increase in prices relative to fundamentals, as I show below (see also Greenwald et al. (2019)). Alternatively, the baseline scenario could be defined as one in which prices are constant, I show that this yields similar conclusion in appendix .

In practice there is also a complication with using the price dividend ratio as a measure of valuation, which arises from retained corporate earnings (Bauluz et al., 2022; Fagereng et al., 2023). A firm can decide to pay out its profits in terms of dividends or to keep them, which will then be accounted as retained earnings. To abstract from this, I use the *price to earnings*

ratio as my measure of valuation, which is invariant to the corporate dividend policy.[26] I use the cyclically adjusted price earnings ratio (CAPE) from Robert Shiller's data as a measure of the price to earnings ratio, which has the advantage of averaging over past earnings so that it is robust to large earnings swings or negative earnings.[27]

I consider price deviations starting from January 2010, the start of the 'end of privilege' period. The implementation considers price deviations relative to a fixed price-earnings ratio. Given the baseline value $\overline{PE}$ of the price earnings ratio in 2010, the price deviation is equal to

$$\Delta P_{k,t} = P_{k,t} - \overline{PE} \times E_{k,t}. \tag{4}$$

The U.S. equity boom between 2010 and 2021 was characterized by a strong increase of prices relative to earnings. I illustrate this in figure 5, which shows the S&P 500 together with a counterfactual stock index where earnings move but the price to earnings ratio its fixed to its value in January 2010. The difference between the lines is the price deviation as defined in equation 4. I construct similar measures for foreign equity price indices, which I also show in figure A.15. For bonds and exchange rates, I consider price deviations as differences to January 2010 bond price indices, i.e. $\Delta P_{k,t} = P_{k,t} - \overline{P_{k,2010}}$. Further details and illustrations of the asset prices employed are given in appendix A.10. I also show welfare gains using the pure equity price deviations (not the deviation from a constant PE ratio) in appendix A.11, they are similar to my baseline results.

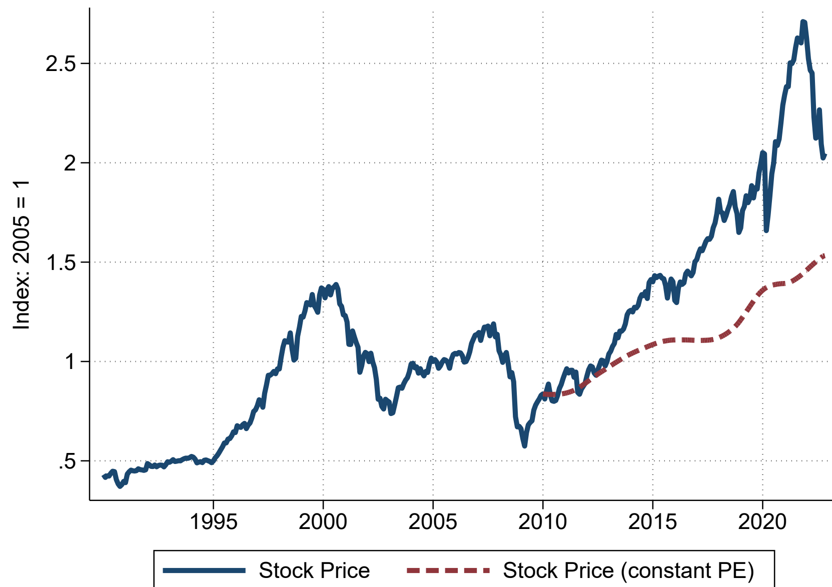
In my baseline results I exclude FDI in the calculations, as portfolio choice consideration in FDI are likely driven by very different factors (cross-border mergers, acquisitions etc.), than the ones considered in my setup and there exist large measurement issues with the dividend payments from FDI related to profit shifting (Guvenen et al., 2022). Welfare gains including FDI are in appendix figure A.17, they are very similar.

Goods Prices and Dividends. The sufficient statistic also considers the cost of imports and dividends. For dividends, I consider dividends on portfolio equity and interest on portfolio debt

[26] Fagereng et al. (2023) employ a similar measure for Norway, which they note is close to the P/E ratio.

[27] For foreign countries, I use a similar measure from Global Financial Data, see appendix A.10.

Figure 5: Illustration of the Price Deviation for U.S. equity



Notes: This figure illustrates the price deviation as defined in equation 4. Stock prices refer to the S&P 500 indexed so that January 2005 is set to 1. The stock price under a constant PE ratio shows a counterfactual stock index in which the price to earnings ratio is fixed to its value in January 2010 and earnings (compute as in Robert Shiller's CAPE) grow as in the data. The difference between the lines is the price deviation from equation 4.

paid to foreigners as recorded in the BEA's current account. I then distribute these to equity and bond holders according to their portfolio shares in these asset categories. For consumption, the value of imports over GDP in each country is taken from the World Bank. I then compute the value of total imports priced in dollars using data on currency invoicing patterns by country from Boz et al. (2022).[28] I show summary statistics on all inputs to the sufficient statistic for each country in table A.4 in the appendix.

Infinite and Finite Horizons. The sufficient statistic from proposition 1 refers to an infinite horizon economy. In practice, horizons are finite, so I truncate the sum after 2021. The sufficient statistics can still be interpreted as the welfare gains up to 2021, or as the welfare gains if price deviations revert to 0 after 2021. The natural limitation of this approach is that future asset sales are not considered. However, given the fall in equity prices after 2021, price deviations for equity are currently dropping towards their 2010 values, as shown in figures 5 and A.15. I discuss how to

[28] I extend invoicing shares forward and backward in time where necessary, assuming that they remain constant.

account for future asset price movements using forecasts in section 5.3.

5 Welfare Gains

The sufficient statistic from proposition 1 can now be used directly to quantify welfare gains. I do this for all countries without missing data and that have holdings of all asset categories.

5.1 Sufficient Statistic Results

The sufficient statistic is

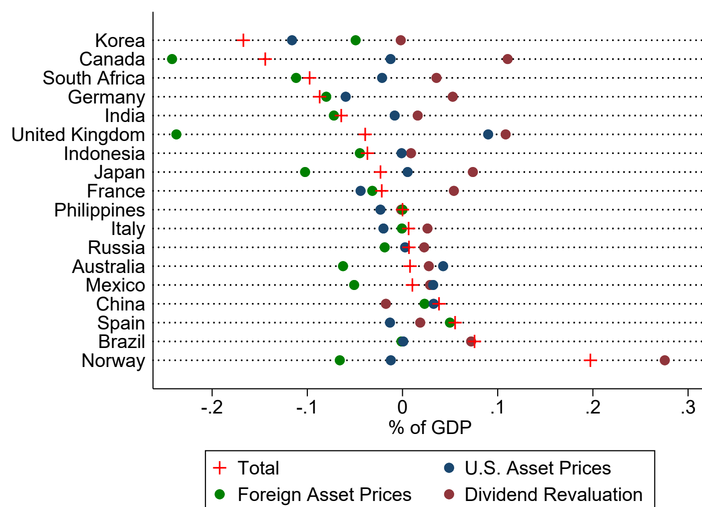
$$\text{Welfare gain} = \sum_{t=0}^{T} R_{0\to t}^{-1}\Bigg(\underbrace{\sum_{k=1}^{K}(N_{t-1,k} - N_{t,k})(\Delta P_{t,k} + \mathrm{d}s_t)}_{\text{Asset Revaluation (Foreign in U.S.)}} + \underbrace{D_{t,k}N_{t-1,k}\Delta s_t}_{\text{Dividend Revaluation}}$$
$$+ \underbrace{\sum_{l=1}^{L}(N_{t-1,l} - N_{t,l})\Delta P_{t,l}}_{\text{Asset Revaluation (U.S. in Foreign)}} - \underbrace{C_t^{\$}P_t^{\$}\Delta s_t}_{\text{Goods Prices}}\Bigg).$$

The discounting is calibrated to a annual value of $\beta = .96$. I divide the total welfare gain by GDP and average across years, consistent with my treatment of valuation gains. Figure 6 presents the welfare gain together with a decomposition across channels for a number of countries.

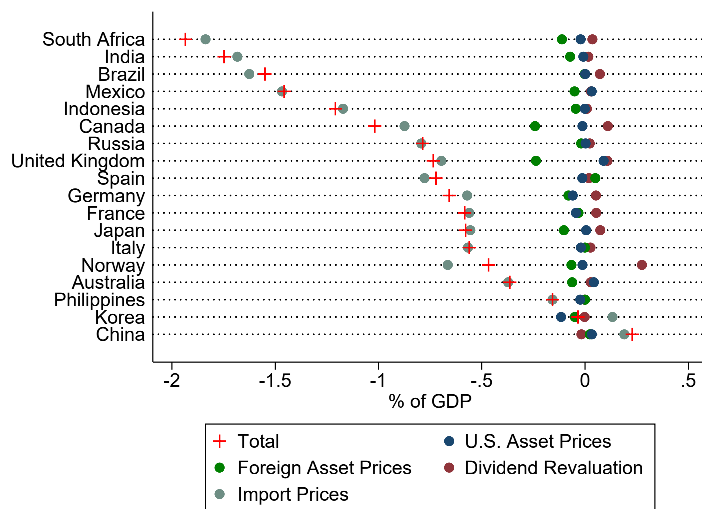
In panel (a), I show only the welfare effects through financial channels, as captured in the first three components of the sufficient statistic. Most countries experienced some welfare gains through financial channels. However, total welfare gains are small and an order of magnitude lower than the wealth gains documented previously. The reason is simple: Most countries did not rebalance their positions during this period and financial transactions were much smaller than capital gains. Some countries, such as Germany or Korea, even kept buying U.S. assets at a premium so that the increases of prices of U.S. assets effectively tightened their budget constraint. Welfare effects through dividends are generally positive, as the dollar appreciation increased the value of the dividends on U.S. holdings in real terms. However, even for the largest gainers in terms of

wealth, Canada and Norway, total welfare gains from these financial channels are a small fraction of GDP compared to capital gains exceeding 8% of GDP annually.

Figure 6: Welfare Gains from Price Changes



(a) Welfare Gains excluding Goods Prices



(b) Welfare Gains including Goods Prices

Notes: This figure presents welfare gains computed through the sufficient statistic from proposition 1. The red crosses represent the aggregate welfare gain, while the dots represent the components of the welfare gain as shown in proposition 1. Panel (a) presents the welfare gains from the first three components, while panel (b) adds the fourth component, the effect on goods prices.

Panel (b) adds to this the real effects of the dollar appreciation on prices of import goods, the fourth component of the sufficient statistic. For most countries, the welfare gains now become

negative because of the welfare losses from higher import prices. This may seem surprising in light of the large valuation gains for many countries documented in section 3. This result follows from the dominance of the dollar in trade invoicing – around the globe often more than 50% of imports are invoiced in dollars. Therefore a dollar appreciation translates directly into higher prices for a large fraction of the imports of these countries.[29] As most wealth gains are so far unrealized, real channels working through increases in the price of goods dominate. Emerging markets are more affected, as they tend to have weaker currencies over this time period, while also invoicing more in dollars. For the EM's with the largest welfare losses, these can be up to 2% of GDP.

Results for the other countries are shown in Appendix A.11, where I also show welfare gains including FDI and when using a different measure of price changes in figure A.17. In both versions, the direct welfare gains from increasing asset prices are small.

Discussion. In general equilibrium, changes in asset prices are the result of shifts in the economy (for instance increases in factorless payments as suggested by Atkeson et al. (2023)), while in the sufficient statistic price movements are exogenous. Importantly, the sufficient statistic holds irrespective of the ultimate causes of the high valuation gains. Of course, the sources of these price movements may carry further welfare implications themselves. Fagereng et al. (2023) show that modeling the source of asset price fluctuations would result in direct effects that are added as additional terms to the sufficient statistic from proposition 1. In this case the sufficient statistic does not capture the full welfare consequences but rather the part pertaining to the effects on asset prices. My approach is agnostic and I do not take a stance on the underlying cause of price movements.[30]

The sufficient statistic abstracts from direct effects on output, for example increasing exports through expenditure switching channels. However, recent research argues that the output effects of a depreciation, already small under dollar currency pricing, may even be negative through strong real income channels (Auclert et al., 2021). Therefore, I do not include direct effects of currency

[29]Note that my analysis does not depend on the pass-through of border prices into store prices. As I do not account for household heterogeneity, this distinction is not important, as all imports of the country need to be purchased at the border. Within a heterogeneous agent framework the pass-through into store prices matters, as consumers purchase goods at the store while importers pay for these goods at the border.

[30]Additionally, Del Canto et al. (2023) show how to derive a similar sufficient statistic in the closed economy in an environment with risk, this could also be extended to my setting.

or other asset price movements on output.[31]

My approach is only accurate up to first order and may thereby miss important second order effects. An example of such a second order effect is if a country, backed by its valuation gains on U.S. holdings, sees its borrowing constraints relaxed and borrows from other countries. A similar concern is that countries might already be consuming against valuation gains in anticipation of future asset sales. In either case, the current account should be decreasing in economies with high capital gains.. In section 5.2, I will show that if anything, countries with more valuation gains *saved more* externally over this time horizon.

A further concern might be that my sufficient statistic mechanically leads to small welfare effects from valuation gains. I show that this is not the case in Appendix B.4, in which I calculate the implied welfare gains for the U.S. from 1973-2004. During this period, the U.S. was earning structurally high valuation gains on their NFA while also running a substantial current account deficit. The sufficient statistic implies that the average annual welfare gains are on the same order of magnitude as the average annual wealth gains.

5.2 Response of the Current Account to Valuation Gains

To address the issues outlined above, I test a milder hypothesis. As stated above, capital gains could also work through collateral channels, allowing countries to borrow against these gains. Thus, I test a simple hypothesis: Did countries respond to valuation gains by decreasing their current account position?

To analyze this, I estimate panel local projections of the response of the current account to valuation gains vis-a-vis the U.S.. This addresses limitations in the setup underlying proposition 1, as it does not rely on a first order approximation and considers the full current account, not just transactions with the U.S.. I estimate a local projection of the current account evolution (normalized by GDP) in response to the valuation gain that I measured. Here, I consider the entire current

[31] Direct effects on output could be added however by incorporating expenditure switching or even calibrating directly to the response of output to a depreciation, obtained from a structural model or empirical estimates.

account, not just financial transactions with the U.S.. Concretely, I estimate

$$CA_{i,t+h} - CA_{i,t-1} = \alpha_i + \beta_h \text{Val}_{i,t} + \gamma_h X_{i,t} + \epsilon_{i,t+h}, \quad h = 0 \dots 5 \tag{5}$$

where CA_{t+h} is a country's current account relative to GDP at time $t+h$, $\text{Val}_{i,t}$ is the country's valuation gain and $X_{i,t}$ is a vector of macro controls. Time is annual and the included controls are contemporaneous and two lags of log-GDP and the net foreign asset position over GDP, which are known to influence the current account (Gourinchas and Rey, 2014), as well as country fixed effect controlling for differences, such as financial structure or the openness of the capital account. The coefficient β_h measures the response of the current account to a valuation gain of one percent of the country's GDP at horizon h.

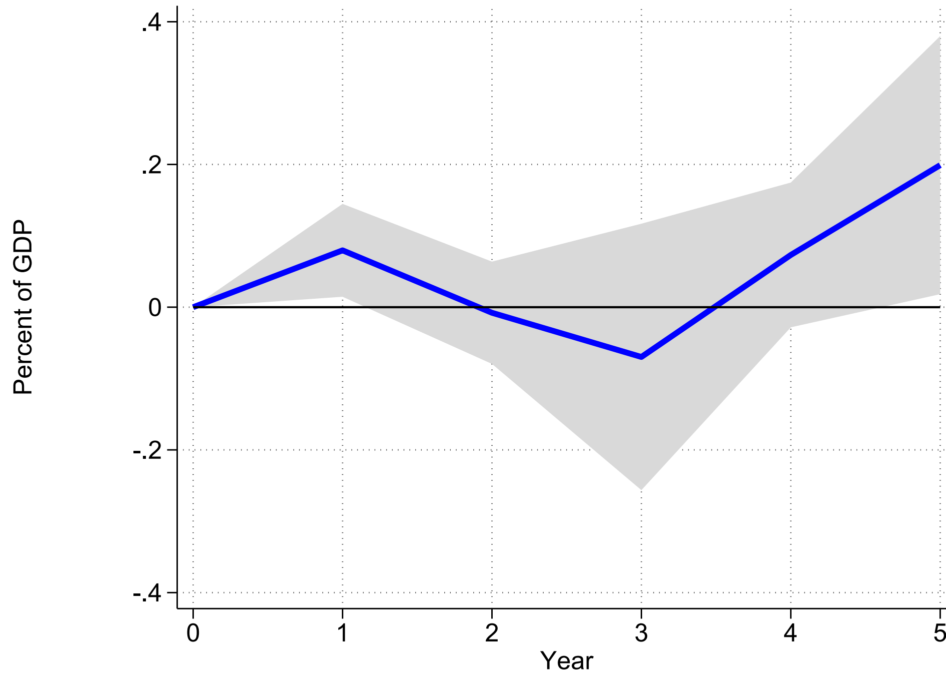
Figure 7 presents the results. Due to the short sample, coefficients are estimated imprecisely. For most horizons they are positive, which means that countries with high valuation gains did not see a deterioration of their current account. If anything, their current account balance increased – countries with high valuation gains on their U.S. assets respond by saving *more* externally. Taken together, this supports the claim that welfare gains from asset price movements are small. It means that countries with high valuation gains did not cash in by decreasing their current account positions – They did not sell their U.S. equities, nor did they decrease net foreign saving.

In appendix A.12, I show the robustness of this result with respect to the different estimates of valuation gains as well as a specification without controls. Results are very similar - countries tend to increase their current account balance after earning valuation gains. The results also hold when I extend the sample backwards to the period 2001-2021. This addresses concerns about truncation as I can study a longer time horizon.

5.3 External Adjustment and Welfare Going Forward

The sufficient statistic only covers asset price movements up to 2021. A natural question is what will happen to welfare going forward. In the long run, terminal conditions embedded in most

Figure 7: Response of the Current Account to Valuation Gains



Notes: This figure presents the coefficients β_h from regression equation 5. The coefficient β_h measures the response of the current account to a valuation gain (vis-a-vis the U.S) of 1% of GDP, with the gray area indicating 90% confidence intervals. The sample is 2010-2021 and excludes tax havens. Data on current accounts and GDP comes from the Lane-Milesi Ferreti Database and the valuation gains are constructed as outlined in section 2.

economic models suggest that the consistently negative valuation gains and current account deficit that shaped the U.S. external position in the past decade cannot continue forever. The needed adjustment may happen either through positive valuation gains for the U.S. or through a U.S. current account surplus (Gourinchas and Rey, 2007b). The sufficient statistic clarifies that the nature of the adjustment process carries important welfare implications: Adjustment through the current account (trade channel) means that foreigners will eventually realize their capital gains. Adjustment through valuation gains (financial channel) means that foreigners will see their asset price gains melt away over the next few years without gaining in welfare terms.

In this setting, there is a natural way of forecasting the magnitude of these channels. I briefly describe the intuition of this forecast here, which is introduced in Gourinchas and Rey (2007b), details are in B.2. The core idea is that external imbalances must be eventually restored. This

process can work through two channels: asset price movements and changes in the trade balance. For the present situation this means that either foreign asset markets have to outperform the U.S. (for instance through a dollar depreciation) or the U.S. closes its current account deficit. The mathematical core is the following equation, in which r_t is the return on the U.S. net foreign asset position, Δnx_t is the change in the trade balance and nxa_t is the cyclical external imbalance. Roughly speaking, nxa_t describes the imbalance in the U.S. external position that needs to be closed. Currently nxa_t is very negative because of the large valuation losses and continued U.S. current account deficit, as I show in figure B.1. Under minimal assumptions, it holds that

$$nxa_t \approx -\sum_{j=1}^{\infty} \rho^j E_t\left[r_{t+j} + \Delta nx_{t+j}\right], \tag{6}$$

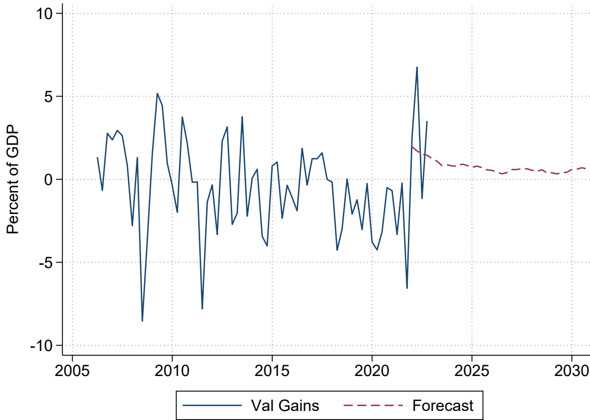
which shows that the current imbalance is the sum of returns and future export surpluses.[32]

Thus, the cyclical external imbalance nxa forecasts future adjustments of asset prices and movements in net exports with high accuracy, as is shown in Gourinchas and Rey (2007b). Extending nxa up to the present day, I obtain forecasts for the returns and net exports in the next years. The forecasts are shown in figure 8. Table B.1 compares the estimates of my forecasting regressions to Gourinchas and Rey (2007b). They indicate that at short horizons, external imbalances are closed through movements in valuation gains while at medium term horizons the trade channel becomes stronger. For the present situation, this means that world markets are predicted to outperform U.S. markets, with a mild adjustment in the U.S. current account. As the forecast starts in 2022Q1, we can evaluate its performance since then using recent data. The forecast performs well for the valuation gains and the net exports. For exchange rates, it misses the large dollar appreciation in 2022, but captures the same trends thereafter.

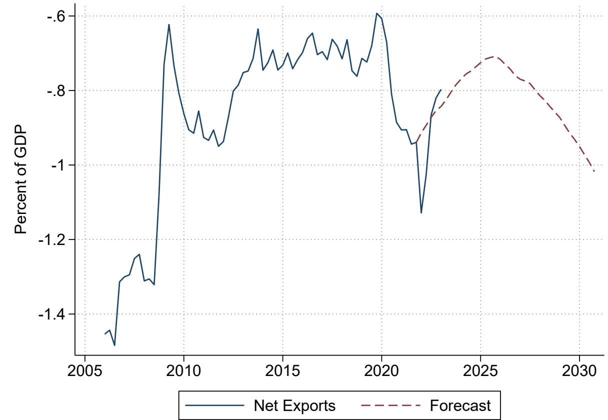
I then apply the sufficient statistic to determine the implied welfare gains for the rest of the

[32]Note, that in this part I consider net exports rather than the current account. The difference between the two is (mainly) the net foreign income balance, which corresponds to the yield component of the returns. This makes no difference as the construction of nxa is the same under both formulations and I only use nxa as a predictor in my forecasting regression. The framework I use for assessing welfare gains in this part only is laid out in Appendix B.3 and abstracts from differences between the current account and net exports. In practice, net exports and the current account track each other closely.

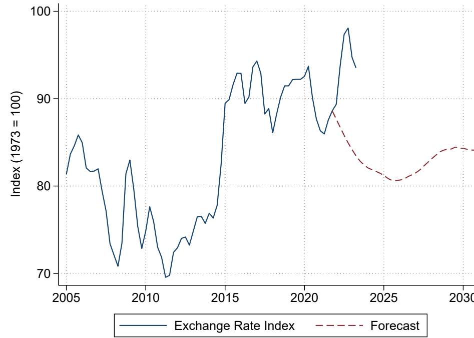
Figure 8: Forecast Input into the Sufficient Statistic



(a) Forecast for the Valuation Gains



(b) Forecast for Net Exports



(c) Forecast for the Exchange Rate

world. Appendix B.3 presents the details of the sufficient statistic in this setting. As the forecast does not predict returns and adjustment within specific asset classes or countries, I only predict the adjustment of net foreign asset position.

The welfare gains for the rest of the world taking into account the future adjustment are presented in table 2. For the period considered in the main part of the paper, welfare gains are negative, driven by losses from increasing goods prices. When extending the time period forward, aggregate welfare gains remain relatively unchanged. Welfare gains from valuation changes average only 0.043% of GDP annually up to 2030, much smaller than the wealth gains, which often exceeded 1% of GDP in the period I study (2010-2021). Welfare gains from valuation changes are slightly larger, with foreigners realizing more of their asset price gains, while welfare losses from

Table 2: Welfare Gains for RoW Going Forward

Time Horizon	Welfare Gain (% of GDP)	Of this: Valuation Changes	Of this: Goods Prices
2010–2021	–0.258	0.006	–0.264
2010–2030	–0.215	0.043	–0.257

Notes: This table shows the average annual welfare gains for the rest of the world using the forecast. The first line shows the aggregate welfare gain for the time period considered in the main part of the paper. The second line shows welfare gains when also taking into account the period up to 2030 using the forecast as an input in future years as explained in the text.

the dollar appreciation recede a bit as the forecast indicate a dollar depreciation going forward.[33]

In summary, this forecast suggests that it is unlikely that foreigners will see large welfare gains going forward. To generate these welfare gains, foreigners would need to run large current account deficit, cdapitalizing on their wealth gains and turning the U.S. into a surplus country. Although the U.S. current account deficit is forecast to shrink, the magnitudes are quantitatively not large enough to generate large welfare gains.

6 Conclusion

In a financially integrated world, asset price changes redistribute wealth at a global scale. The global footprints of the U.S. asset price boom can be traced primarily to wealthy countries where the exposure to equity markets is largest. My analysis however also suggests that so far, the welfare impacts of these asset price changes have been small or even negative as countries failed to capitalize on their valuation gains. Most economies realized little of their valuation gains and were also hurt by movements in the exchange rate that made consumption more expensive.

In future work, it is be important to understand how the valuation gains are distributed within countries. Some countries produce statistics on foreign asset holdings by sector, which could be used as a first benchmark. This could as provide some insights as to why foreigners seem to not have reacted much to the large valuation gains they have earned.

[33]If my forecast captured the dollar appreciation in 2022 more accurately, this would imply larger increases in goods prices, leading to larger welfare losses for foreigners.

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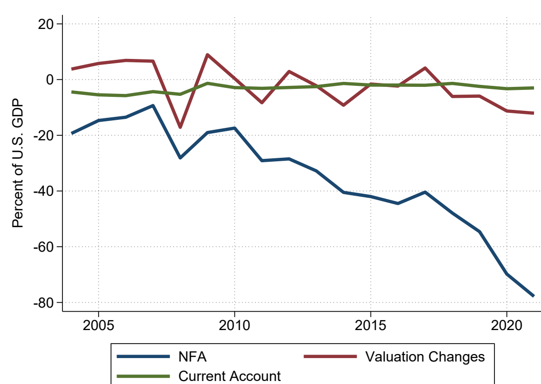
A Data Appendix

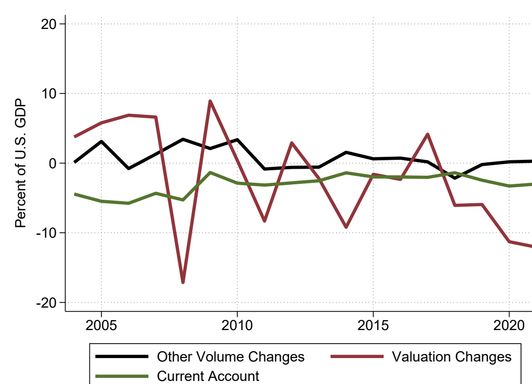
A.1 Macro-Environment

In the aggregate data, the valuation losses on the U.S. NFA are clearly visible. Figure A.1 presents the U.S. NFA, together with the current account and the valuation changes. Data is taken from the BEA's IIP table 1.3, so the valuation changes exclude the so-called 'Other Changes in volume'. Panel (b) of the figure shows the other changes, together with the valuation changes and the current account. Other changes are small in the period after 2010, so that the decision whether to allocate them to flows or capital gains has little influence on the results.

Figure A.1: Macroeconomic Context



(a) Evolution of the U.S. net foreign asset position



(b) Evolution of other changes compared to current account and valuation changes

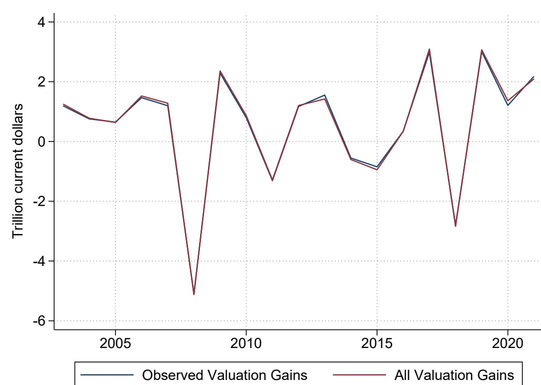
Notes: Panel (a) displays the U.S. NFA, current account, and valuation changes as a percentage of GDP (excluding other changes in volume). In Panel (b), other changes are presented alongside valuation changes and the current account.

A.2 Details on the Data Sources

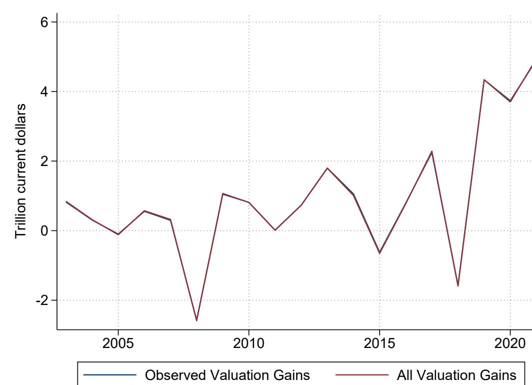
Valuation effects by asset class. The bilateral data I construct only contains portfolio and direct investment. The other parts of the U.S. external balance sheet (mostly bank loans) do not experience large valuation effects in general. Figure A.2 shows this explicitly by comparing the valuation gains on portfolio and direct investment (observed) to all valuation gains (including the rest of the

balance sheet, which is not observed in the bilateral data). The difference between the lines is negligible, which shows that valuation gains on assets that are not covered are small.

Figure A.2: Valuation Gains on observed asset categories and on all asset categories



(a) Valuation gains on observed assets and on all assets



(b) Valuation gains on observed liabilities and on all liabilites

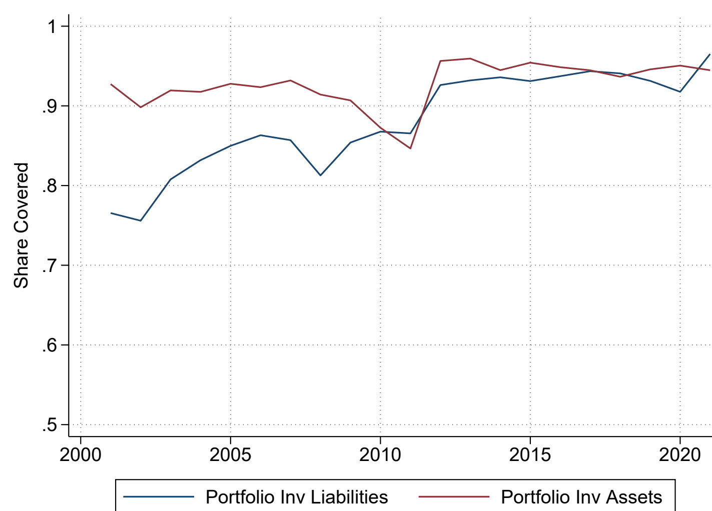
Notes: This figure shows the valuation gains on the asset categories covered in my bilateral data and and on all asset categories. Data is shown separately for assets (U.S. holdings abroad) and liabilities (foreign holdings in the U.S.). The main asset category not covered in the bilateral data is 'other investment', mostly comprised of bank loans.

Country Coverage. I cover all countries which are included in both the bilateral FDI and the TIC data. In total, there are 82 countries which I am able to cover, these are listed in table A.1. As the country coverage varies over time, I aggregate British and Dutch tax havens in the Caribbean to achieve consistency. These countries include all major economies and tax havens. Taken together, they also make up the vast majority of the U.S. external balance sheet. I compare the bilateral data to the aggregate position in portfolio investment in figure A.3. For portfolio investment, I am also able to cover more than 90 % in the years after 2010, the period most critical for my study. Holdings in small countries are not covered in the TIC and therefore missing.

In figure A.4 I further show that the capital gains on the U.S. net foreign asset position and the (aggregated) bilateral capital gains are consistent. There are small discrepancies, mostly related to the coverage across countries, which make my capital gains a bit smaller. Bertaut et al. (2023) estimate returns in portfolio assets from the security level data underlying the TIC, without relying on asset price indices. In general, they find that returns obtained from the security level data

and aggregates are quite similar. Aggregate valuation gains are also very close across methods, although they are a bit less negative in the security-level data. Concretely, cumulative aggregate valuation gains in portfolio investment decline by 18 p.p. from around 8% of U.S. GDP in 2007 to -10% of GDP in 2020 in the security-level data but by 22 p.p. from 12% to -10% in the aggregate data.[34] Adjusting for this would likely decrease the capital gains made in the rest of the world in portfolio investment, but still leave sizable capital gains remaining.

Figure A.3: Share of the Net Foreign Asset Position Covered in Bilateral data



Notes: This figure shows the share of the aggregate IIP that is covered in the bilateral data. This is constructed by aggregating all covered countries and dividing by the headline position in the asset category as reported in the U.S. international investment position.

[34] These numbers are taken from figure 5 in the 2023 working paper.

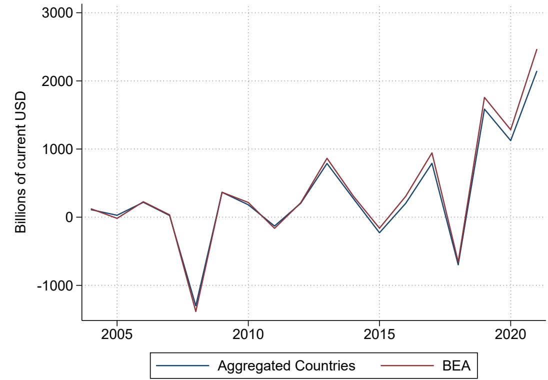
Table A.1: Country Coverage in FDI and TIC Data

Country	TIC Coverage	FDI Coverage	Country	TIC Coverage	FDI Coverage
Argentina	1994–2021	1994–2021	Kuwait	2012–2021	1994–2021
Australia	1994–2021	1994–2021	Latvia	2012–2021	1994–2021
Austria	1994–2021	1994–2021	Lebanon	1994–2021	1994–2021
Bahamas	1994–2021	1994–2021	Liberia	1994–2021	1994–2021
Bahrain	2012–2021	1994–2021	Luxembourg	2000–2021	1994–2021
Barbados	2012–2021	1994–2021	Malaysia	1994–2021	1994–2021
Belgium	2000–2021	1994–2021	Malta	2012–2021	1994–2021
Belize	2012–2021	1994–2021	Marshall Islands	2012–2021	1994–2021
Bermuda	1994–2021	1994–2021	Mauritius	2012–2021	1994–2021
Brazil	1994–2021	1994–2021	Mexico	1994–2021	1994–2021
British Carribean [a]	2000–2021	1994–2021	Morocco	1994–2021	1994–2021
Canada	1994–2021	1994–2021	Netherlands	1994–2021	1994–2021
Channel Islands and Isle of Man	2000–2021	1994–2021	New Zealand	2000–2021	1994–2021
Chile	1994–2021	1994–2021	Norway	1994–2021	1994–2021
China	1994–2021	1994–2021	Panama	1994–2021	1994–2021
Colombia	1994–2021	1994–2021	Peru	1994–2021	1994–2021
Croatia	2012–2021	1994–2021	Philippines	1994–2021	1994–2021
Cuba	2012–2021	1994–2021	Poland	1994–2021	1994–2021
Cyprus	2012–2021	1994–2021	Portugal	1994–2021	1994–2021
Denmark	1994–2021	1994–2021	Romania	1994–2021	1994–2021
Dominican Republic	2012–2021	1994–2021	Russia	1994–2021	1994–2021
Dutch Carribean [b]	1994–2021	1994–2021	Saudi Arabia	2012–2021	1994–2021
Ecuador	1994–2021	1994–2021	Serbia and Montenegro	1994–2021	1994–2021
Egypt	1994–2021	1994–2021	Singapore	1994–2021	1994–2021
El Salvador	2012–2021	1994–2021	South Africa	1994–2021	1994–2021
Finland	1994–2021	1994–2021	Spain	1994–2021	1994–2021
France	1994–2021	1994–2021	Sri Lanka	2012–2021	1994–2021
Germany	1994–2021	1994–2021	Sweden	1994–2021	1994–2021
Greece	1994–2021	1994–2021	Switzerland	1994–2021	1994–2021
Hong Kong	1994–2021	1994–2021	Syria	1994–2021	1994–2021
Hungary	1994–2021	1994–2021	Taiwan	1994–2021	1994–2021
India	1994–2021	1994–2021	Thailand	1994–2021	1994–2021
Indonesia	1994–2021	1994–2021	Trinidad and Tobago	1994–2021	1994–2021
Ireland	1994–2021	1994–2021	Turkey	1994–2021	1994–2021
Israel	1994–2021	1994–2021	Ukraine	2012–2021	1994–2021
Italy	1994–2021	1994–2021	United Arab Emirates	2012–2021	1994–2021
Jamaica	1994–2021	1994–2021	United Kingdom	1994–2021	1994–2021
Japan	1994–2021	1994–2021	Uruguay	1994–2021	1994–2021
Kazakhstan	2012–2021	1994–2021	Vietnam	2012–2021	1994–2021
Korea	1994–2021	1994–2021			

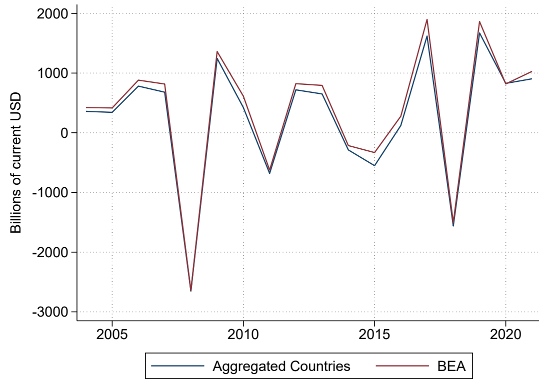
[a] Aggregate of Cayman Islands, British Virgin Islands, Montserrat and Turks and Caicos
[b] Aggregate of Aruba, Netharlands Antilles, Bonaire, Curacao and Sint Marteen

Figure A.4: Comparison of Capital Gains: Aggregated Country-Level Data vs. BEA

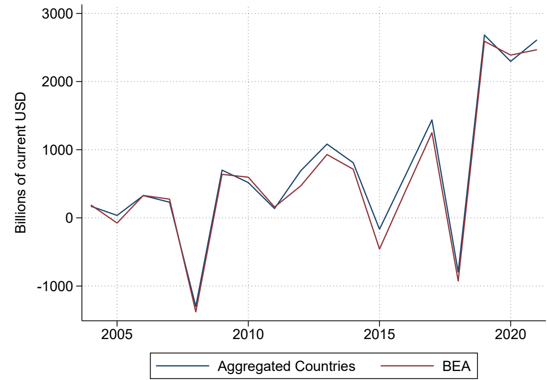
(a) FDI: Assets



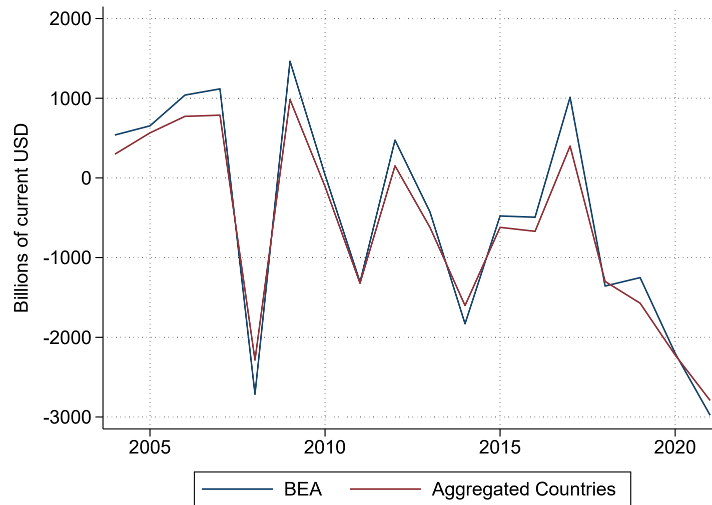
(b) FDI: Liabilities



(c) Portfolio Investment: Assets



(d) Portfolio Investment: Liabilities



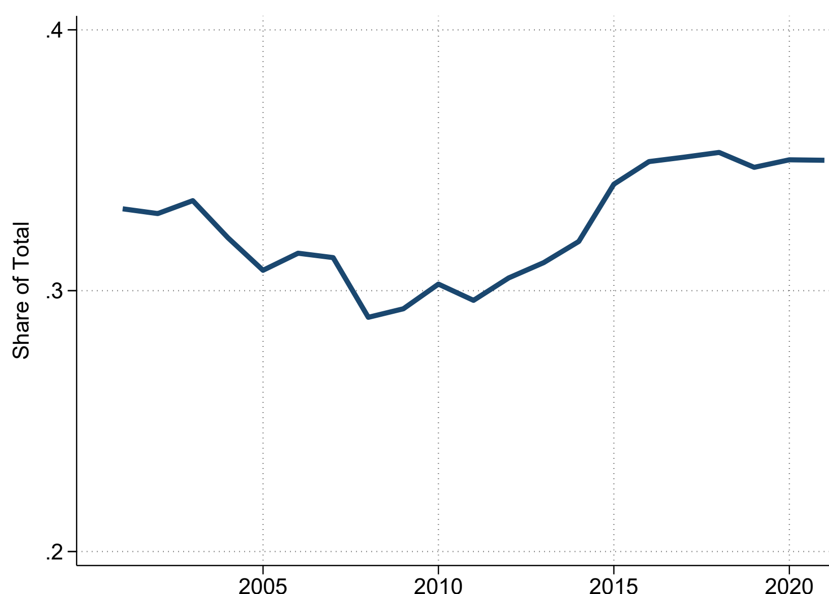
(e) Total Capital Gains

Notes: This figure compares the capital gains in the BEA's international economic accounts to the aggregated bilateral data (corrected for tax evasion). Panels (a)-(d) compare capital gains across asset classes and different sides of the U.S. external balance sheet. Panel (e) shows the total capital gains.

A.3 Details on Tax Havens

Classification of Tax Havens. I follow the classification of Coppola et al. (2021) to classify tax havens in my data, but add Switzerland. In Coppola et al. (2021), Switzerland is excluded because it is not a major hub for shell companies to issue bonds – what matters for my analysis is also tax havens used to hold foreign assets. Figure A.5 shows the share of foreign assets held in tax havens, which is around 30% in recent years.

Figure A.5: Share of Liabilities held in Tax Havens



Notes: This figure shows the share of total assets held by foreigners in the U.S. that are recorded in tax havens. It also shows the proportions for different asset classes. The classification of tax havens follows Coppola et al. (2021) with the addition of Switzerland.

FDI through Shell Corporations. Many corporations decide to invest abroad through Special Purpose Entitities (SPEs) located in tax havens. For example, a German company may find it more profitable to set up a shell company in the Cayman Islands and conduct its investment activity from the Caribbean. Fortunately, the BEA produces data on inward investment by 'ultimate beneficial owner' (UBO), the final owner of the tax haven affiliate. The UBO is reported in the BEA's foreign direct investment surveys. Any affiliate operating in the U.S. is asked to report the owner ($> 50\%$

voting stake) of its parent.[35] The data on FDI by UBO allows me to restate FDI to the ultimate country of ownership.[36] In general the estimates for many large countries such as Germany, the U.K. and China are revised upwards, while tax haven positions are revised downwards. This also accounts for round-tripping, direct investment from the U.S. into itself channeled through a tax haven. Thus some of the supposed foreign investment into the U.S. and the associated valuation gains on these investments are correctly attributed back to Americans. The data by UBO is only available for the stock of FDI. To restate flows and valuation gains, I assume the asset price gains in tax havens are distributed proportionally to the non-tax haven countries and obtain the restated flows as a residual. This ensures that I remain consistent with the aggregate valuation gains on FDI. I provide evidence in support of this assumption below.

For the outflow of FDI from the U.S. I rely on data collected by Damgaard et al. (2019). For the years 2013 to 2017[37], they collect data produced by tax haven statistical agencies, augmented with Orbis firm data to restate international FDI positions. I use their data as it pertains to FDI from the U.S. into foreign economies, again reassigning the valuation gains on restated assets proportionally to non-tax havens.

The data on FDI only considers the stock of assets and not the flows or valuation effects. It becomes clear by looking at the accumulation equation 1 that the restatements for the stock of assets induce changes that could be both captured in flows or valuation effects (or other valuation changes). As explained above, I assume that the restatement for valuation effects is the same (in proportion) as the adjustment for the stock of assets. Then I adjust the asset flows accordingly. To support this assumption, I show the average implied valuation gains for both tax havens and other countries in figure A.6. They are very similar, indicating that asset price changes don't vary systematically between tax havens and other countries.

Portfolio Investment through Tax Havens. Many U.S. securities are held in well known tax

[35]For affiliates with multiple parents and UBO's the position is credited to multiple countries depending on the size of the position towards each parent.

[36]In a few countries, there are gaps in the restatement by ultimate beneficial owner, I interpolate these linearly.

[37]I extend the data forwards and backwards in time assuming that the ratio of 'true' FDI (restated FDI in their paper) relative to FDI by residence is constant.

Figure A.6: Valuation Gains on FDI: Tax Havens vs All Countries

Notes: This figure shows the average valuation return on FDI for tax havens and non tax havens separately. The valuation return is computed as VA_t/A_{t-1} using FDI data. The shaded area shows the 10th and 90th percentile of the valuation distribution every year.

havens. This happens for instance if a French household owns U.S. equity through an offshore Swiss bank account. Guided by the residence principle of the international financial accounts, these assets will be recorded as a U.S. liability towards Switzerland (Zucman, 2013). Tracking the holders of these assets is very hard, as they are never meant to be found in the first place.

I extend the methodology of (Alstadsæter et al., 2018) (henceforth AJZ) to estimate who owns the valuation gains in tax havens. To do so, I construct data on the ownership of bank accounts in tax havens and distribute the TIC securities held in tax havens accordingly using the BIS locational banking statistics to estimate the ownership of tax haven assets. In the BIS data set, banks report the nationality of their cross-border depositors. I use the country composition of depositors to reassign all positions, valuation gains and flows towards tax havens. This assumes that all investors in these tax havens have an equal propensity to invest in U.S. assets. While this is certainly not fully true, it should be noted that many tax havens are tilted towards specific countries, for example Hong Kong for China, Switzerland to the EU or the Cayman islands for the

U.S.. This means that errors are likely not too large as only a few large countries make up the bulk of holdings in most havens.[38] I make one change relative to AJZ, who do not count Ireland as a tax haven. Following Coppola et al. (2021) and Zucman (2013), I consider Ireland as a tax haven.

Of each tax haven from 2001-2015, AJZ then give an estimate of the share of cross-border holdings due to tax evasion and should be restated.[39] As these estimate only change very little over time, I assume that the share of tax evasion is constant after 2015.

For two examples, Ireland and Hong Kong, I show the distribution of deposits in 2021 in figure A.7. For both tax havens, it is clear that they cater towards a certain clientele - China in the case of Hongkong and rich EU countries in the case of Ireland. Further, as AJZ note, many deposits in both countries come from other tax havens. In order to circumvent legislation, tax evaders set up shell companies, who then again hold deposits in other tax havens. As the forensic analysis of tax haven wealth is not the primary goal of this study I take a conservative approach and do not make an attempt reassign the deposits of shell corporations. If I did so, it is likely that restatement of positions to rich economies would increase, as is suggested by the findings of AJZ.

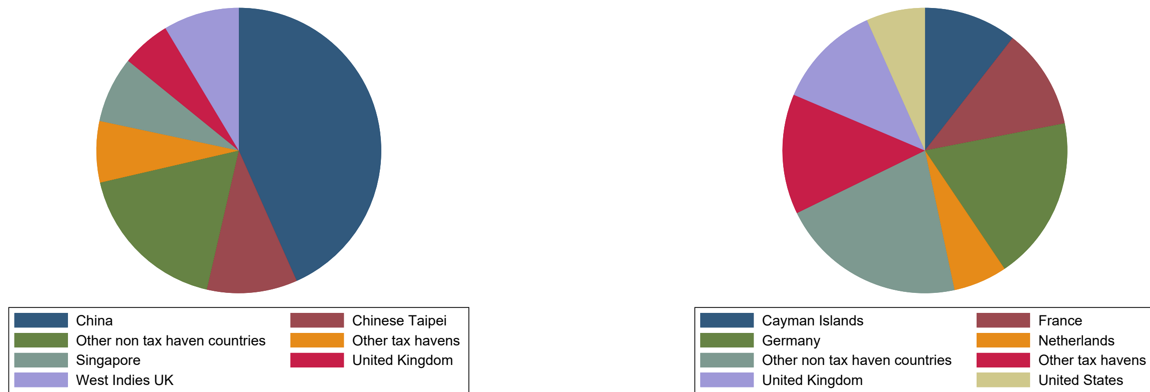
There are two concerns with this approach. The first is that the BIS banking statistics on bank deposits may be imperfectly correlated with holdings of total foreign assets. However, many of these tax havens cater towards specific economies (Alstadsæter et al., 2018), which are reflected by the locational banking statistics. The second issue is that increasingly, bank deposits in tax havens are recorded as coming from other tax haven, creating an even more complex financial architecture for researchers and authorities to pierce. My approach is conservative and I do not attempt to restate these holdings.

Details on adjustment using the data of Coppola et al. (2021). Coppola et al. (2021) provide

[38]While data for many well known tax havens, such as Ireland, Hong Kong, Luxembourg or the Channel Islands is available online, data for some tax havens is only available to access confidentially. As I currently do not have this access, for other these tax havens (most importantly the Cayman Islands) I use the data reported in the appendix of AJZ, who have access to the confidential files. In particular, they only report the composition of tax haven wealth in 'Caribbean tax havens' for the year 2007, which consist mostly of the Cayman Islands and Panama. I use these numbers to restate U.S. liabilities towards all Caribbean tax havens. As in 2007 nearly 70% of Caribbean tax haven wealth is estimated to be held by the U.S., this means means most of the valuation gains earned there are restated towards the U.S..

[39]Following the example of Luxembourg, I assume that all of cross border banking activity in Ireland is tax evasion.

Figure A.7: The ownership structure of tax haven wealth in 2021



(a) Ownership of tax haven wealth: Hongkong

(b) Ownership of tax haven wealth: Ireland

Notes: This figure shows the foreign ownership shares of deposits in Hongkong and Ireland based on the BIS locational banking for the year 2021. The figure shows all depositors accounting for more than 2% of tax evading assets. The other countries are aggregated into tax havens and other non tax haven countries.

restatement matrices, which give the cross-border position in equities and bonds after restatement. For the U.S. assets abroad I apply the restatement matrices using their baseline 'Fund Holdings' methodology.[40] I again assume that flows and valuation gains in tax havens are also redistributed using the reallocation matrices.

I apply this restatement to the asset side of the U.S. external balance sheet, i.e. portfolio investment flowing out of the U.S.. One aspect that is therefore not captured in my estimates is issuance of U.S. corporations in tax havens that is bought by the rest of the world. If U.S. corporations issue assets in tax havens, this means that portfolio investment from the rest of world into the U.S. is larger than in the U.S. national accounts, hence my estimates become a lower bound for the true exposure of the rest of the world to the U.S. equity boom. In practice however, U.S. corporations do not issue many assets in tax havens. Using data from Coppola et al. (2021), I compute that accounting for securities issued by the U.S. in tax havens would increase the U.S. foreign liabilities by around 5%-10%, with valuation gains likely increasing proportionally. In keeping with the U.S. national accounts, I do not make this adjustment to my data.

[40] The TIC data I use only distinguish bonds and equity on the asset side, whereas the restatement matrices distinguish three kinds of bonds (corporate bonds, government bonds and asset backed securities). I use the matrices for corporate bonds to restate bond portfolios, as those are the securities most commonly issued in tax havens.

Details on the tax haven restatement following Gourinchas et al. (2012). As a robustness check, I construct an alternative estimate of holdings in tax havens following the method of Gourinchas et al. (2012). They assume that holdings in tax havens are distributed following the ex-tax haven distribution of asset holdings. The ex-tax haven distribution also considers the U.S. itself, with a weight equal to the home bias in assets, that is the share of assets held by the U.S. itself. For equities, I construct U.S. home bias in assets by dividing foreign investment in equities through U.S. stock market capitalization taken from the World Bank. For home bias in bonds, I construct total bonds outstanding using the BIS' debt securities statistics[41] and then again use foreign investment in bonds as the numerator.

A.4 Custodial Bias and Comparison with the CPIS

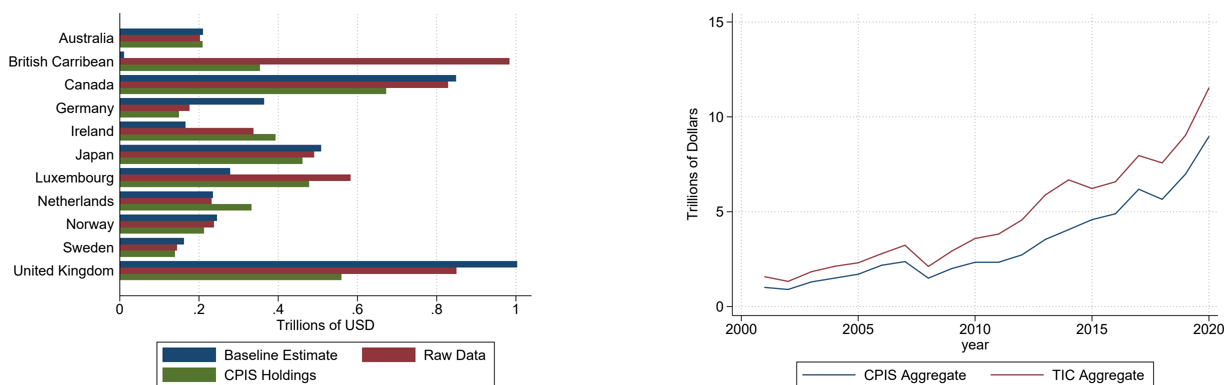
Data from the TIC is subject to a custodial bias. To get an idea of the size of this bias, I compare holdings of specific countries in figure A.8, panel (a). It compares equity holdings of the ten largest holders in the CPIS to TIC data and my preferred estimate, in which TIC holdings in tax havens are restated to the ultimate owners. We can see that both the TIC and the CPIS put large weights on financial centers and tax havens, such as the Cayman Islands (British Caribbean), Ireland and Luxembourg. After restating tax havens to their ultimate owners as described in section 2.3 holdings of tax havens fall strongly, while holdings of non-tax havens such as Germany or Canada increase.

It is noteworthy that even for non tax-havens holdings in the TIC are often larger than in the CPIS. I attribute this to better coverage in the TIC data, which is based on direct reporting of financial institutions. Instead, the quality of data collected by countries reporting to the CPIS can vary and some countries (notably China) only start reporting very recently in 2015. This can be seen quite clearly in figure A.8, panel (b), which compares the aggregate foreign holdings of equity in the CPIS and the TIC. These should be unaffected by custodial bias, but nevertheless aggregate

[41]The debt securities statistics only report total bonds outstanding (including issued abroad) and those issued abroad, so I take the difference. For the U.S., the vast majority of bonds are issued in domestic markets.

equity holdings in the TIC are consistently around 30% higher than CPIS holdings. This means that using CPIS data *understates* foreign equity ownership in the U.S..

Figure A.8: Comparison to the CPIS



(a) Equity Holdings by Country

(b) Aggregate Asset Holdings: TIC and CPIS

Notes: This figure compares my estimates of equity holdings with those in the raw data and the CPIS. In panel (a), numbers are averaged over the period 2010-2021 for the countries considered. Panel (b) compares the aggregate foreign holdings of U.S. equity in the CPIS and the TIC data.

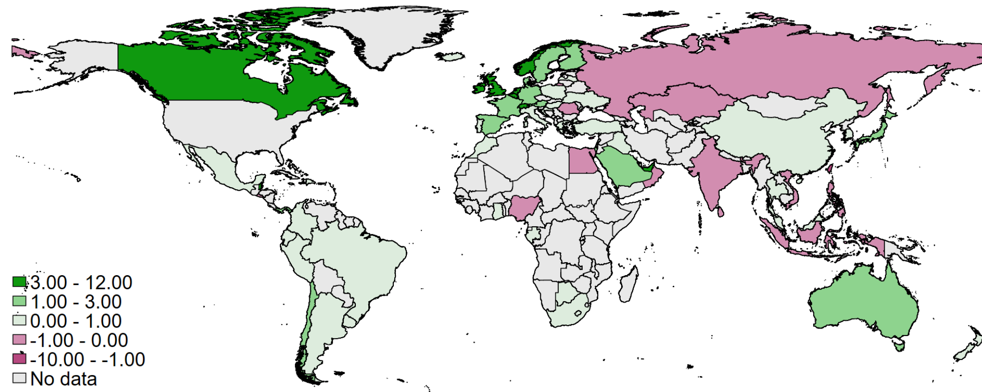
A.5 Additional Results - Geographic Distribution

I offer several other ways to draw the world map presented in figure 1, which I show in figure A.9. These are (i) using raw TIC and FDI data in panel (a), (ii) restating tax haven portfolio investment using the method of Gourinchas et al. (2012) in panel (b) and (iii) measuring portfolio equity using the CPIS in figure panel (c). The estimates of Gourinchas et al. (2012) are constructed by excluding tax havens and redistributing tax haven assets, valuation gains and flows in proportion to the holdings after leaving out the tax havens. The U.S. is included in these proportions via its equity (resp. bond) home bias. For the CPIS data, I revalue equities and bond holdings of other countries in the U.S. using annualized versions of equity and bond price indices in the TIC data.[42]

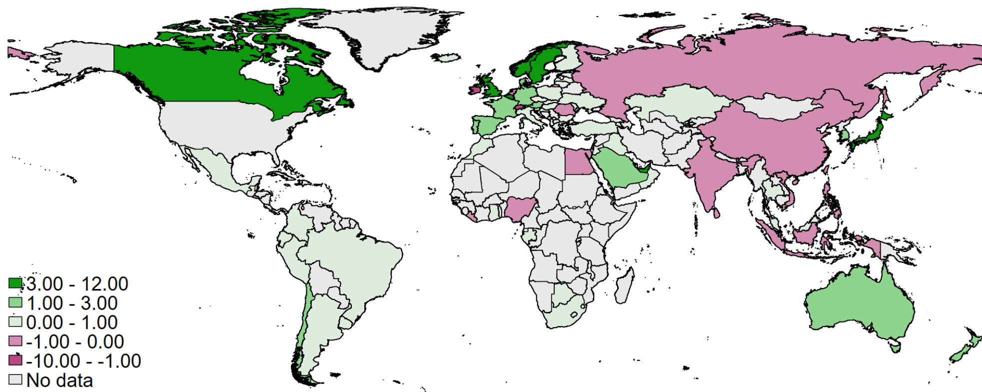
Finally, I compute the valuation gains on both sides of the U.S. external balance sheet. On the asset side, these valuation gains correspond to valuation gains on the assets that the U.S. owns in

[42]As there are multiple categories of bonds in TIC data, the bond price index corresponds to a weighted average for each country.

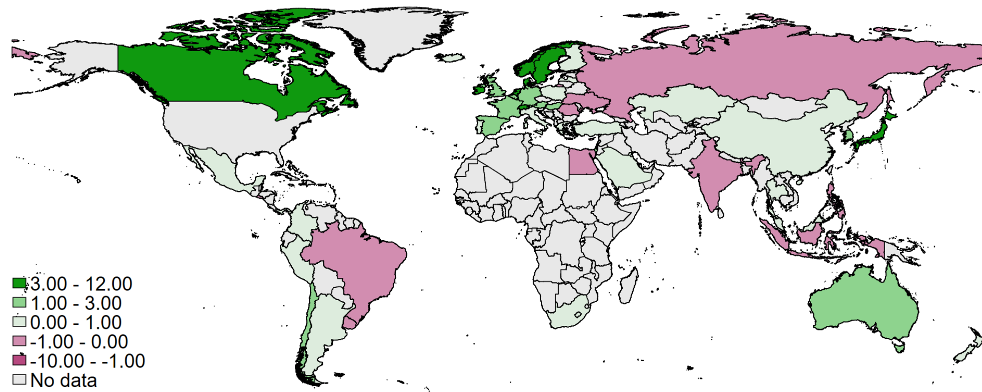
Figure A.9: World Map of Valuation Gains: Robustness



(a) Robustness: Raw data without any adjustment for tax havens



(b) Robustness: Redistributing portfolio investment following Gourinchas et al. (2012)



(c) Robustness: Measuring portfolio investment using the CPIS

Notes: This figure shows the global distribution of valuation gains from figure 1 of the main text under a variety of robustness checks regarding the distribution of tax havens. First, I show the raw valuation gains in panel (a). Next, I redistribute portfolio investment to tax havens using the assumptions of Gourinchas et al. (2012) in panel (b). Finally, I measure portfolio investment using the CPIS in panel (c). In the last two specifications, FDI is distributed by UBO, as in the baseline map. All numbers underlying the figure can be found in table A.2.

countries abroad. On the liability side, these are gains that foreigners make on their U.S. holdings. The net valuation gains for the rest of the world presented in figure 1 are the gains on liability side of the U.S. NFA less the gains on the asset side. As mentioned in the main text, the choice of currency influences the gross valuation gains (but *not* net valuation gains). My data is in dollars, so that exchange rate movements change the valuation gains the U.S. earns abroad. Over my sample period, the dollar appreciation creates valuation losses on the U.S. external assets, but not on external liabilities which are nearly entirely dollarized. If my data was in foreign currency, the appreciation would be recorded as a asset price gain on the U.S. external liabilities. From this it can be seen that currency choice does not matter for net gains, but it will change whether these valuation gains from currency movements are recorded in the valuation gains on the asset or liability side of the U.S. external balance.

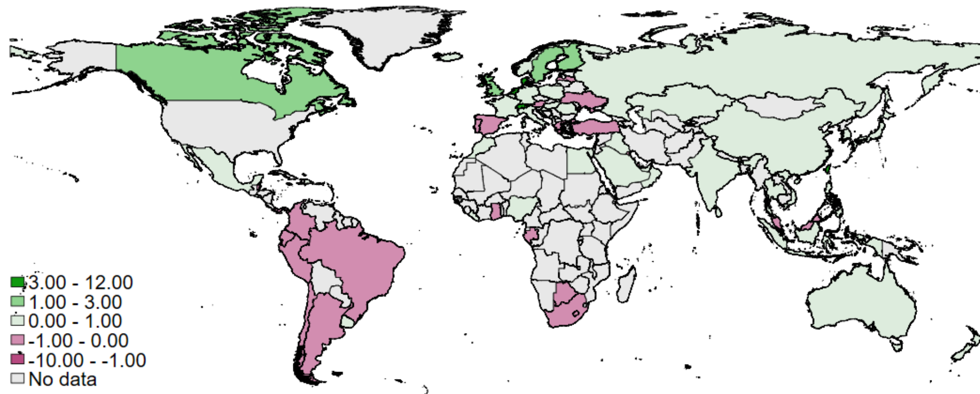
From Figure A.10 reports the result of this exercise. On the asset side, the U.S. made most gains in northern european countries and Canada. Many investments in emerging markets, especially in Latin America yielded negative returns, often linked to exchange rate depreciations in these economies. The highest capital gains for foreign investors investing in the U.S. accrued to investors from rich economies, with emerging markets often getting close to zero valuation gains.

Flows. Flows are computed directly together with the bilateral capital gains using the accumulation equation 1. In figure A.11 I show the bilateral financial transactions. During the time frame I study, the transactions are generally smaller than the capital gains, so I adjust the legend of the map to reflect this. Many emerging countries are observed as having slightly negative financial transactions, which means that they were net sellers vis-a-vis the U.S. over this time period. In contrast, rich countries tend to be net buyers. Overall, the map shows that transactions were generally small relative to the large capital gains made by many economies.

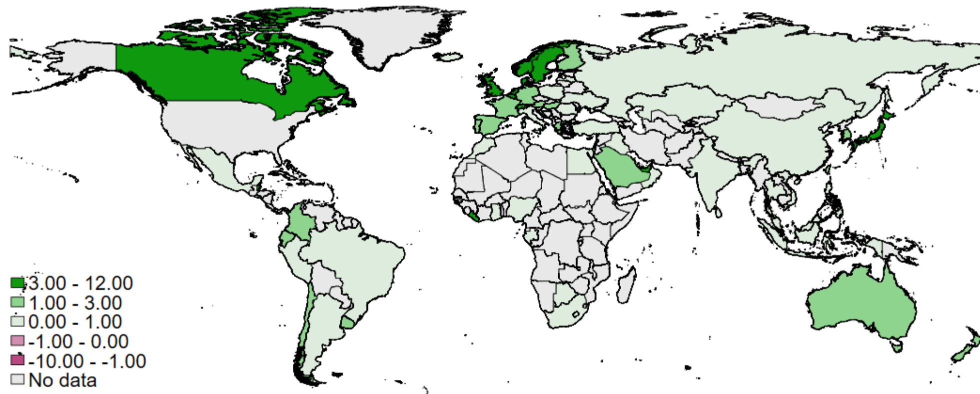
A.6 Heterogeneous Returns

To infer capital gains, I assume that all investor countries earn the same capital gains on their portfolio, which is equal to the capital gain on a benchmark index. In this section, I discuss and

Figure A.10: World Map of Valuation Gains: Asset and Liability Side



(a) Valuation Gains on the Asset Side of the U.S. External Balance Sheet



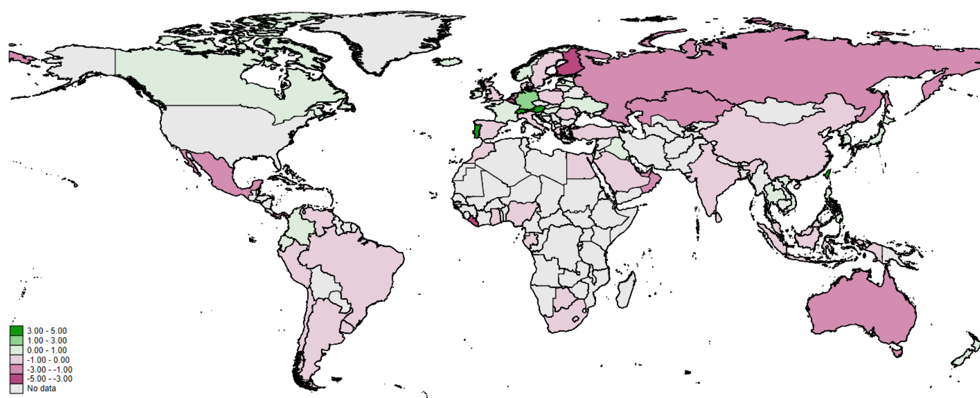
(b) Valuation Gains on the Liability Side of the U.S. external balance sheet

Notes: This figure shows the global distribution of the average annual valuation gains on the asset and liability side of the U.S. external balance sheet, normalized by country GDP. First, I show the valuation gains on the asset side (U.S. holdings abroad) in panel a). Next I show the valuation gains on the liability side (foreign holdings in U.S.) in panel b). Holdings in tax havens are redistributed using baseline adjustment outlined in section 2. Data is recorded in USD, so that valuation changes arising from exchange rate movements are found on the mostly on the asset side, given that nearly all foreign holdings in the U.S. are dollar denominated. Note the difference in color scheme, which is chosen to match size and sign of gross valuation effects. All numbers underlying the figure can be found in table A.2.

provide evidence on the portfolio of international investors.

To study the capital gains different countries earn I rely on evidence from microdata on the portfolios of global investment funds. I obtained these data, which are based on the work in Maggiori et al. (2020) and Coppola et al. (2021), from www.globalcapitalallocation.com. They provide the sectoral allocation of funds from different countries that invest in the U.S. stock market. In figure A.12, panel (a), I show the average sectoral allocation of different countries. On average, portfolios are very similar. Further, these portfolios yield very similar returns to an aggregate stock

Figure A.11: World Map of Flows



Notes: This figure shows the global distribution of the average annual current account transactions, normalized by country GDP. Holdings in tax havens are redistributed using baseline adjustment outlined in section 2. Note the difference in color scheme, which is chosen to match size and sign of flows. All numbers underlying the figure can be found in table A.2.

market index. To show this, I compute the capital gains on the S&P 500[43] using quarterly compustat data and compare them to a portfolio that instead uses the sectoral weights of the different countries in panel (b). The capital gains on these portfolios are very similar and deviate from the market by only a few basis points.[44]

Finally, in figure A.12, panels (c), (d) and (e) , I provide direct evidence on sovereign funds using the portfolio of large sovereign funds. Panel (c) focuses on the Norwegian sovereign wealth fund. The fund publishes its annual returns, with an additional breakdown of returns by geography since 2015. In the figure I compare the returns the fund earns in the U.S. to the total return on the S&P 500, they are nearly identical. Panels (d) and (e) show capital gains for the Japanese Government Pension Fund, one of the worlds' largest pension funds. The fund publishes its holdings at the security level annually. Using the security-level data, I construct a price index for the pension fund[45]. I compare this index with a benchmark market index in panel (d). Panel (e) shows the consequences of applying the capital gains the pension fund earns to Japanese holdings in the U.S.

[43] I compare returns in this section to the S&P 500, as the composisition and data for total returns are most easily available.

[44] These figures only show the average portfolio and capital gain. Comparing portfolios and capital gains in the time series yields very similar results.

[45] To construct the indices, I assume that security holdings are rebalanced at the end of each year and draw on security-level prices from Refinitiv.

in my data. The implied capital gains are very close to benchmark capital gains in my data.

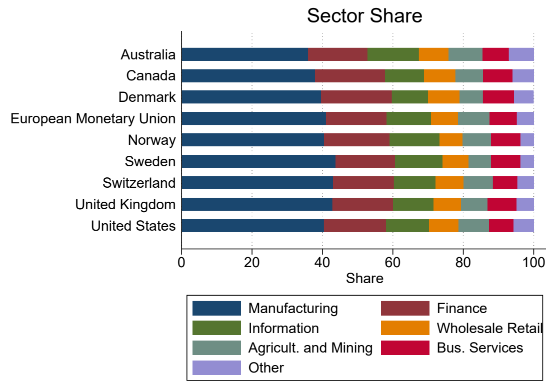
These results are consistent with Alok et al. (2022) who study the allocation of investment funds and find that they track benchmark market indices closely. The correlation between returns on the market portfolio and the fund portfolio is 0.95. Bertaut et al. (2023) use the micro-level data underlying the TIC to study returns on foreign holdings. They also find that index-based returns correlate very strongly with returns computed using security level data. From 2005-2020, index based returns on U.S. assets abroad are 7.78 on average and micro-level returns are 7.97, for foreign holdings in the U.S. the numbers are 6.05 (index) and 6.11 (micro data). Figures 29 and 30 of their October 2023 draft also show that index based returns track the dynamics of micro-level returns extremely closely.

A.7 Additional Results: Comparison to Aggregate Wealth Growth

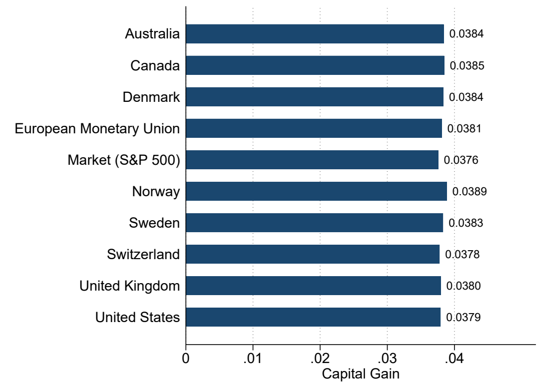
I compare the valuation gains of each country vis-a-vis the U.S. to their aggregate wealth growth in table A.2. Data on wealth aggregates is obtained from the 'World Inequality Database'. For many countries, the valuation gains on their U.S. external assets contributed significantly to aggregate wealth growth. This is most striking in the case of Norway, where the importance of the sovereign wealth fund is clear.

The table also offers a comparison of different estimates of valuation gains. First I show my baseline numbers, accounting for tax evasion as described in section 2. Then, in columns 5, 6 and 7 I show the valuation gains taken directly from the data, without adjusting for tax havens, the valuation gains computed using the assumption of Gourinchas et al. (2012) and finally valuation gains computed from each country's reported positions in the CPIS.

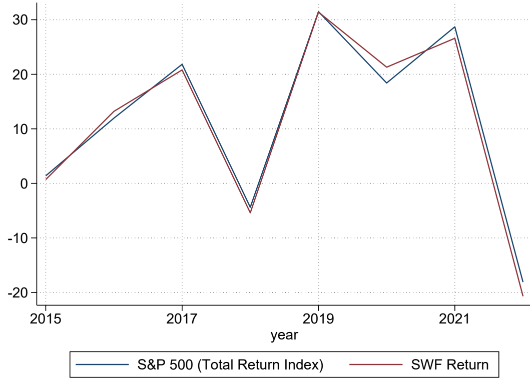
Figure A.12: Evidence on Country Portfolios



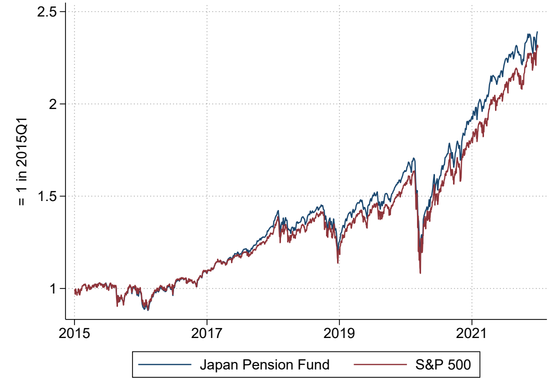
(a) Sector Shares by Country



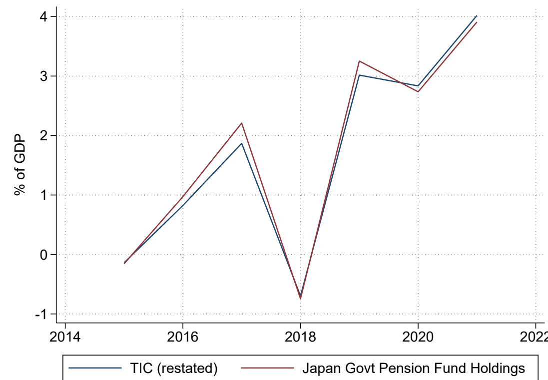
(b) Implied Average Quarterly Capital Gains



(c) Return Comparison SWF



(d) Japan Govt Pension Fund Index



(e) Implied Capital Gains

Notes: This figure provides evidence on the portfolios of different countries investing in the U.S. equity market. Figure (a) plots the sectoral shares of mutual funds from different countries when investing in the U.S. equity market. Panel (b) plots the implied average quarterly capital gain and compares it to the S&P 500. The sample for both figures is 2010-2019, the time period for which portfolios for all countries are available. Panel (c) the returns earned by the Norwegian sovereign wealth fund to the S&P 500. Returns on the Norwegian SWF are taken from the fund's annual reports, returns on the S&P 500 correspond to the S&P 500 total return index. Panel (d) compares a price index implied by the holdings of the Japanese government pension fund with a benchmark index. Finally, panel (e) compares the capital gains obtained by applying this index to the capital gains used in my benchmark analysis.

Table A.2: Aggregate Wealth Growth and Annual Valuation Gains 2010-2021

	W/Y Growth	Val Gains (Base)	Of this: PF Inv	Of this: FDI	Val Gains (Raw)	Val Gains (GRT)	Val Gains (CPIS)	Val Gains (Liab)	Val Gains (Ass)	Net Flows	Of this: PF Inv	Of this: FDI	Net Flows: Raw Data
Russia	–10.55	0.07	0.07	0.00	0.00	-.03	-.05	0.18	0.10	–1.27	–1.14	-.12	-.93
Saudi Arabia	-.86	1.75	1.76	-.00	1.51	1.80	0.68	1.80	0.05	-.25	-.07	-.18	-.14
UAE	0.17	4.63	3.71	0.92	3.78	4.46	0.91	4.88	0.25	–1.70	–1.59	-.10	–1.64
Turkey	0.31	0.49	0.40	0.07	0.36	0.34	0.33	0.20	-.28	-.25	-.15	-.11	-.25
Egypt	0.87	-.10	0.25	-.36	-.12	-.28	-.31	0.23	0.34	-.87	-.21	-.64	-.52
India	1.22	-.31	-.30	-.01	-.28	-.31	-.34	0.05	0.37	-.02	0.11	-.15	0.03
Chile	2.18	1.99	1.58	0.41	1.89	1.84	2.48	1.69	-.31	-.95	-.5	-.46	–1.17
Indonesia	2.24	-.07	-.03	-.05	-.07	-.09	-.11	0.03	0.11	-.30	-.18	-.10	-.30
South Africa	2.41	0.83	0.74	0.10	0.72	0.74	1.00	0.69	-.12	-.47	-.46	-.00	-.31
Thailand	2.91	0.17	0.11	0.05	0.14	0.09	-.11	0.50	0.34	0.75	1.13	-.37	0.87
Argentina	3.07	0.83	0.72	0.11	0.55	0.50	0.75	0.62	-.20	-.05	-.28	0.23	-.34
Mexico	3.54	0.87	0.61	0.27	0.73	0.67	0.28	0.99	0.10	–1.16	-.75	-.41	–1.26
China	4.19	-.20	-.20	0.00	0.31	-.15	-.52	0.41	0.62	-.87	-.80	-.07	-.50
Denmark	–12.85	2.33	1.11	1.23	1.89	2.39	2.07	5.32	2.99	-.11	2.23	–2.33	2.52
Spain	–10.59	1.73	0.72	1.01	1.35	1.5	1.47	1.36	-.37	-.49	-.54	0.03	-.31
Portugal	–3.66	1.72	1.12	0.58	0.43	1.00	1.00	1.58	-.12	3.34	-.18	3.52	-.23
Italy	–3.35	0.75	0.60	0.17	0.41	0.40	0.38	0.82	0.05	-.14	-.05	-.07	-.11
Greece	–1.22	1.84	1.70	0.14	0.91	0.88	0.74	1.21	-.62	-.62	-.64	0.03	-.80
Japan	–1.14	2.79	0.73	2.06	2.49	3.06	2.66	3.56	0.76	0.69	0.31	0.37	0.97
UK	1.29	3.98	4.30	-.31	3.52	3.86	1.75	6.55	2.57	-.57	0.38	-.97	0.20
Austria	3.90	1.62	0.57	1.03	1.13	1.44	1.37	1.25	-.36	4.84	0.34	4.5	0.36
France	6.88	2.11	0.87	1.25	1.22	1.50	0.93	3.02	0.91	0.37	0.00	0.36	0.33
Australia	7.76	2.20	1.58	0.62	2.25	2.45	2.34	2.93	0.73	–1.12	-.72	-.40	-.93
Korea	11.31	0.94	0.37	0.57	0.91	1.12	0.81	1.63	0.68	0.98	0.93	0.02	1.17
Germany	14.51	2.27	0.99	1.28	1.39	1.67	1.5	2.77	0.50	1.89	0.51	1.37	0.73
Canada	18.09	8.88	4.80	4.07	8.39	9.80	7.76	10.26	1.37	0.37	-.28	0.67	0.12
Sweden	23.93	3.40	2.55	0.83	2.96	3.52	2.71	5.53	2.14	-.76	-.21	-.55	0.79
Norway	25.54	8.26	7.46	0.80	8.00	9.35	7.88	8.64	0.37	0.98	1.24	-.25	1.63

This table compares the net valuation effects on the external position of select countries vis-a-vis the U.S. to their aggregate wealth growth. All numbers are expressed as a percentage of GDP and averaged over the period 2010-2021. The first column shows average wealth growth over GDP. The second column shows my baseline estimate of valuation gains as outlined in section 2 (again as a percentage of GDP). The third and fourth columns decompose the baseline estimate into valuation gains in Portfolio investment and FDI. Column five shows the estimates without adjusting the TIC and FDI data for the presence of tax havens. In column six, valuation gains on portfolio equity are distributed following the assumption of Gourinchas et al. (2012). In column seven valuation gains are computed through using the reported portolio equity holdings of different countries in the CPIS. Columns 8 and 9 show the gains on the asset side of the U.S. balance sheet (U.S. holdings abroad) and the liability side (Foreign Holdings in the U.S.) separately. Column 10 shows by baseline estimate for the net flows, with columns 11 and 12 decomposing into portfolio investment and FDI. Column 13 shows flows computed from the raw data, that is making no adjustment for tax havens.

A.8 Construction of Currency Exposure Shares

I now briefly describe the construction of bilateral currency exposure shares.

The liability side of the U.S. external balance sheet is overwhelmingly dollarized. As there is no information on the denomination of equity I assume that all FDI and portfolio equity investment into the U.S. is denominated in dollars, consistent with Lane and Shambaugh (2010). The overwhelming amount of U.S. bonds held by foreigners are dollar bonds, however there are some foreign currency corporate bonds not denominated in dollars.[46] I use data from the Coppola et al. (2021) and Maggiori et al. (2020) for the currency exposure shares.[47]

On the other hand, the U.S. holds significant amounts of foreign currency assets abroad. I use TIC data to determine the currency composition of bond holdings abroad. For equity and FDI I again assume denomination in domestic currency, except for assets issued through tax havens, which are assumed to be dollar denominated in dollars as in Gourinchas et al. (2012).[48] The assumption underlying these construction is that all currency movements are hedged within these countries (e.g. French firms use French banks to hedge currency risk), as in Lane and Shambaugh (2010); Bénétrix et al. (2015).

Figure A.13 shows the world map of valution gains on the net foreign asset position induced by currency movements.

A.9 Additional Results: Decomposition

I show the results of the decomposition of valuation effects in equation 2 in the main text for high income and other countries separately in table A.3. The classification of high-income economies is from the World Bank.[49] We can see that the return effect accounts for most of the difference

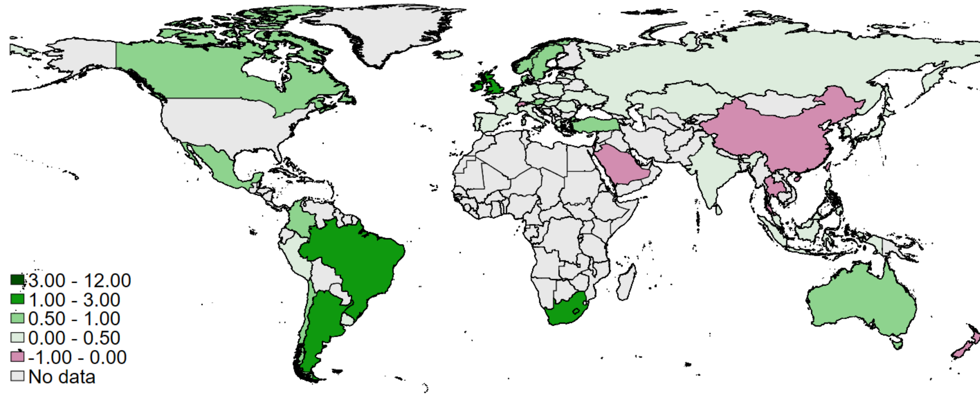
[46]In 2021, the largest non-USD currencies are the Euro (13.7%), and the pound with 2.6%.

[47]They only provide a share for the entire EMU, I assume this share is the same for all EMU members, I further assume that all countries not in MNS sample only hold USD corporate bonds.

[48]Consistent with the fact that I am using TIC data to generate currency exposure shares, I only apply the valuation changes from the exchange rate to assets not held in tax havens. In the TIC data the vast majority of U.S. investments in bonds issued in tax havens is dollarized, supporting this assumption.

[49]High-income economies are: Australia, Austria, Belgium, Canada, Chile, Croatia, Denmark, Estonia, Finland, France, Germany, Greece, Italy, Japan, Korea, Kuwait, Latvia, New Zealand, Norway, Poland, Portugal, Saudi Arabia, Slovakia, Spain, Sweden, United Arab Emirates, United Kingdom, and Uruguay.

Figure A.13: Valuation Gains from Exchange Rate Movements



Notes: This figure shows the annual net valuation effects coming from exchange rate movements vis-a-vis the U.S. from 2010-2021 as a percent of GDP for each country. Note the change in the color scheme made to capture the data better. Data construction and tax haven restatement is as in section 2. The exposure to exchange rate is computed as described in the text.

between those country groups. It is large and positive for both groups, but around double the size for high-income countries. The composition effect is negative for non high-income countries, again hinting at a portfolio tilt towards bonds, which is confirmed in table A.3.

Table A.3: Decomposition Valuation Effects 2010-2021

	Total	U.S. Timing	Foreign Timing	Return Effect	Composition Effect
Other Countries	0.72%	0.08%	–0.08%	1.04%	–0.48%
High-Income Countries	2.28%	–0.22%	–0.32%	2.03%	0.15%

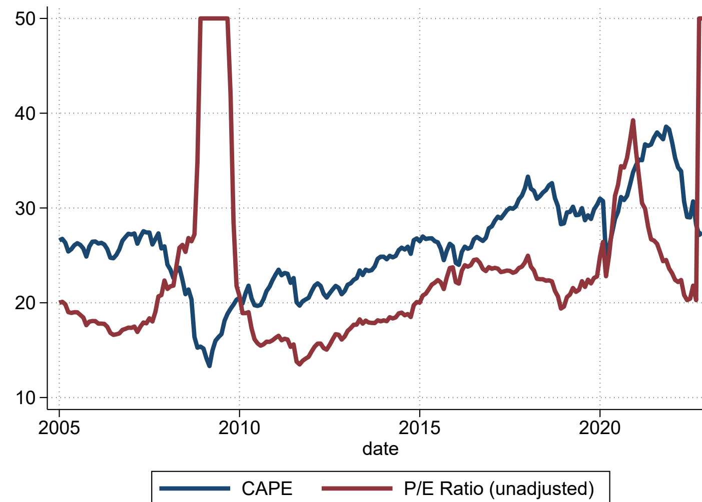
Notes: This table shows the decomposition of valuation effects as in equation 2 for the sample 2010-2021 averaged for high income and other countries. Averages are unweighted averages over countries, with the definition of high-income is taken from the World Bank. Tax havens are excluded. Components of the decomposition are computed as in equation 2 in the main text.

A.10 Details on Asset Valuations

In this section, I further clarify and illustrate the asset price data used for the price deviations in the sufficient statistic from proposition 1.

For the U.S., my main measure of price deviations are computed using the *cyclically adjusted price-earnings ratio (CAPE)* of Robert Shiller. This carries a number of advantages. First, using

Figure A.14: CAPE and Unadjusted PE Ratio



Notes: This figure illustrates two different measures of the valuation of the U.S. corporate sector, the cyclically adjusted price earnings ratio and the price earnings ratio (without adjustment). Without adjustment, the price-earnings ratio can be very high or even negative during times of low profits, so it is truncated at 50. Data is taken from Robert Shiller.

earnings instead of dividends means that my measure is invariant to the corporate dividend decision. Earnings are the sum of dividends and retained earnings, which have been rising strongly around the world in recent decades with many large corporations even paying out no dividends (Chen et al., 2017). Secondly, CAPE constructs effectively a moving average of earnings of the past decade. It is thereby invariant to wild swings in earnings (or negative earnings during crises). Nevertheless, both CAPE and the unadjusted PE ratio have grown strongly over the past decade, indicating rising valuations of U.S. corporations relative to their fundamentals. This is illustrated in figure A.14, where both valuation measures roughly double from 2010-2021.

For foreign equity prices, I take data on the P-E ratio from *Global Financial Data*. One issue is that due to the financial crisis and the associated drop in earnings, Price/Earnings ratios are high in most countries before 2010. CAPE corrects this in the case of the U.S., but a similar measure is not available for foreign countries. The resulting price indices are shown in figure A.15.

Price deviations for exchange rates and bond prices are deviations from the 2010 values. Figure A.15 presents the trends for a categories of U.S. bonds covered in the TIC data in panel (a), foreign bond indices in panel (b) and exchange rates in panel (c). Finally, panels (d) and (e) present

stock market valuation metrics for various foreign stock markets. Panel (d) presents the unadjusted price-earnings ratio taken from global financial data. Next, panel (e) presents the valuation metric I use to construct price deviations, the cyclically adjusted price-earnings ration, which uses the earnings averaged over the past decade in the denominator.

A.11 Details and Robustness of the Sufficient Statistic

In this section I provide further details on the sufficient statistic. Key inputs to the sufficient statistic are shown in table A.4. The asset price deviations for U.S. assets which are not covered in the table can be found in section A.10. Import shares of GDP are taken from the World bank, the share of imports invoiced in U.S. dollar is taken from Boz et al. (2022). For countries which do not report dollar invoicing shares I assign the average dollar invoicing share. I construct the sufficient statistic for all countries in which I observe all components for the full sample, but exclude tax havens and countries which defaulted on their debt.

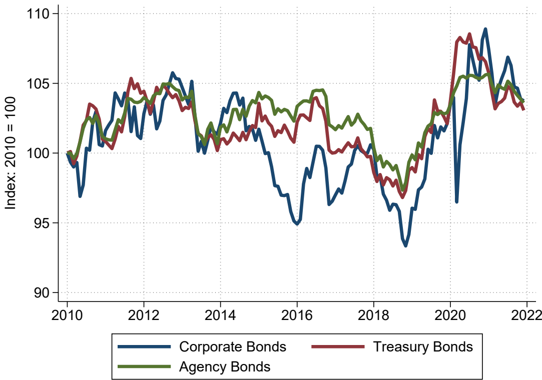
In figure A.16, I separate high-income countries and emerging markets. As suggested by the country-by-country results, the welfare losses are higher in emerging markets. This is mostly due to the fact that they are more exposed to the U.S. dollar appreciation, both because their currencies depreciated more but also because they invoice more imports in dollars. In contrast, high-income countries lose more from the boom in U.S. asset prices. This is because they kept buying U.S. assets, for which they now had to pay higher costs.

In figure A.17, I include purchases and sales of FDI in the sufficient statistic. Consistent with the valuation in the U.S. national accounts and the data presented in section 3, FDI is valued using equity price indices from the respective economies. When including FDI, welfare gains from the U.S. asset price boom generally remain small. The picture changes a bit for some large FDI investors, such as Germany, who have been major buyers of U.S. corporate assets. In welfare terms, this has not benefited them so far however, since they did not realize their valuation gains.

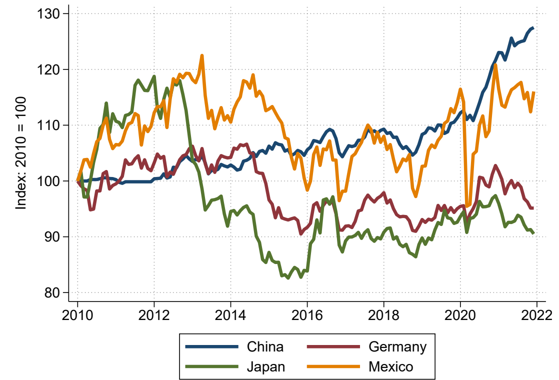
I similarly show welfare gains when using simple asset prices for equity. My baseline estimates use deviations from a constant PE-ratio to measure movements in asset prices, consistent

with my theoretical framework. Alternatively, one could use just the price index to calculate price deviations, which I do in panel (b) of figure A.17. Both charts do not show the welfare gains from rising goods prices, these are unchanged relative to the main text.

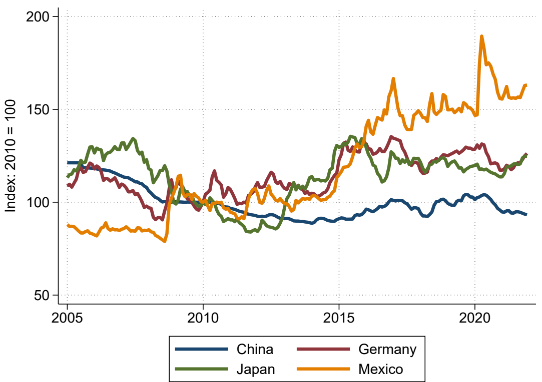
Figure A.15: Price Deviations



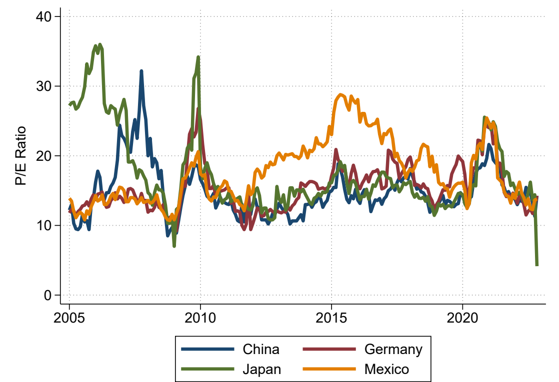
(a) U.S. Bond Price Indices



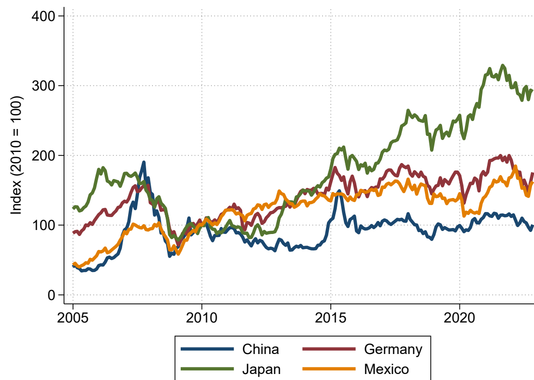
(b) Foreign Bond Price Indices



(c) Exchange Rate Indices



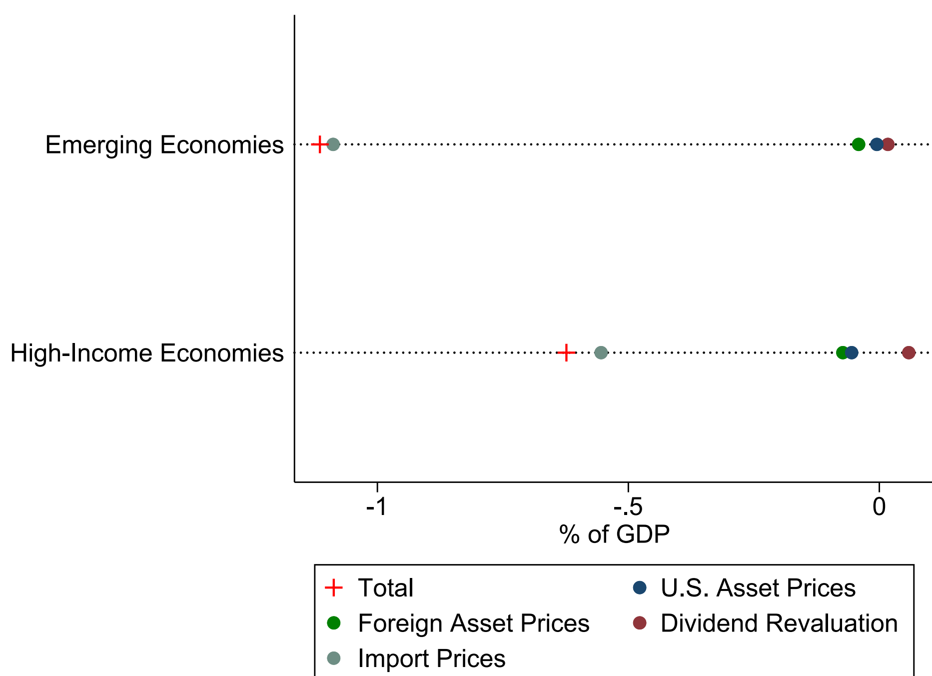
(d) Price-to-Earnings Ratios



(e) CAPE for various countries

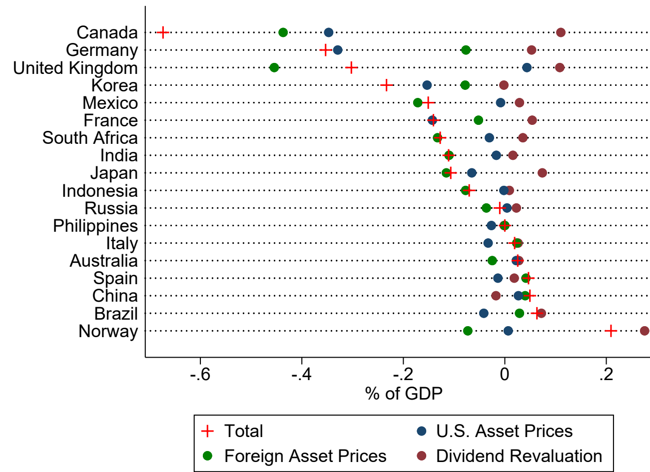
Notes: This figure illustrates price deviations for a number of asset classes and countries. Panel (a) illustrates the evolution of U.S. bond prices for a number of asset categories. Panel (b) shows the local currency prices of bonds for a number of foreign countries. Panel (c) illustrates price movements of exchange rates. Panel (d) illustrates movements in the price/earnings ratio. Panel (e) illustrates movements in the cyclically adjusted price-earnings ratio (CAPE) as a measure of valuation of foreign stock market indices.

Figure A.16: Welfare Gains for Emerging and High-Income economies

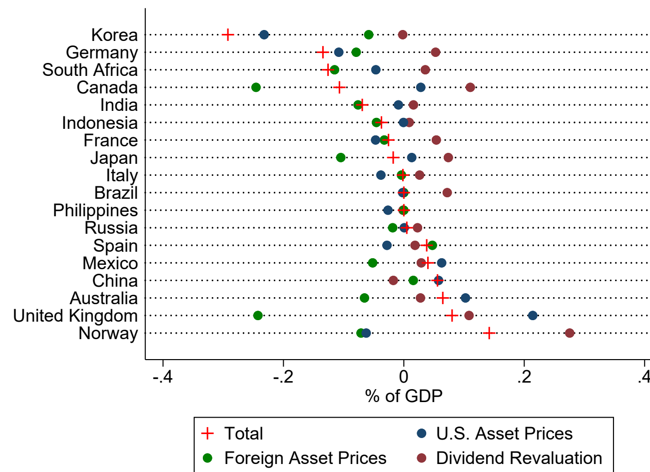


Notes: This figure shows the results of the sufficient statistic from proposition 1 computed seperately for high-income and emerging markets. The numbers are unweighted averages of these country groups. The classification of countries follows the World Bank.

Figure A.17: Robustness: Sufficient Statistic



(a) Welfare Gains from Price Changes, including FDI



(b) Welfare Gains from Price Changes, alternative price index

Notes: This figure presents welfare gains computed through the sufficient statistic from proposition 1. The red crosses represent the aggregate welfare gain, while the dots represent the components of the welfare gain as shown in proposition 1. In panel (a), FDI is included in the revaluations and transactions. In panel (b), I use a pure price index (instead of one based on P/E ratios).

Table A.4: Inputs into the Sufficient Statistic

Country	Equity Flow to U.S.	Bond Flow to U.S.	Equity Flow from U.S.	Bond Flow from U.S.	Price Dev, Foreign Bonds	Price Dev, Foreign Equity	Price Dev, Currency	Import Share	Dollar Invoicing Share
Australia	–0.31	0.13	0.50	0.03	6.87	14.50	8.70	20.87	54.76
Austria	0.28	0.06	0.09	–0.10	2.83	8.84	14.56	50.68	6.80
Brazil	0.03	0.25	0.32	0.27	11.22	–15.49	34.91	13.94	84.59
Canada	0.04	1.56	1.19	0.70	4.50	21.83	11.03	32.60	50.03
Chile	–0.60	0.94	0.12	0.71	8.04	14.39	16.57	30.95	85.25
China	–0.15	–0.22	0.35	0.08	6.28	–10.96	–4.68	19.74	50.03
Denmark	2.55	0.04	0.33	0.02	1.25	43.36	14.65	48.49	28.89
Finland	0.38	0.30	0.45	0.27	1.65	15.60	14.56	38.14	27.53
France	0.05	0.47	0.31	0.20	2.40	16.03	14.56	30.86	23.03
Germany	0.29	0.37	0.31	–0.16	–1.98	30.60	14.56	39.65	19.96
India	0.00	0.59	0.40	0.07	1.81	35.62	24.47	24.71	88.45
Indonesia	0.00	0.09	0.11	0.17	12.77	44.20	21.31	21.19	81.22
Israel	0.70	1.36	0.72	0.16	–1.70	14.42	–2.66	29.38	70.15
Italy	0.09	0.11	0.18	0.08	7.59	–5.09	14.56	27.41	26.32
Japan	–0.08	1.12	0.41	0.31	–4.62	36.40	9.18	17.01	70.29
Korea	0.69	0.53	0.34	–0.06	8.29	20.82	–0.97	40.67	50.03
Malaysia	0.24	–0.20	0.56	–0.06	13.67	22.04	7.58	63.55	60.75
Mexico	–0.17	–0.11	0.06	0.42	8.27	25.75	18.92	36.49	50.03
New Zealand	0.68	0.25	0.32	0.01	7.91	32.76	–0.87	26.88	49.25
Norway	0.36	1.14	0.34	–0.08	6.83	21.02	20.21	30.85	24.86
Philippines	0.02	0.80	0.06	0.01	9.92	0.	1.51	34.49	86.90
Russia	0.02	–0.82	0.11	0.23	8.20	24.54	34.21	20.66	38.80
South Africa	0.18	–0.14	0.32	0.19	4.04	38.93	32.25	27.16	50.03
Spain	0.08	0.01	0.41	0.22	4.11	–21.02	14.56	30.35	31.89
Thailand	0.17	1.21	0.15	0.09	13.29	46.99	–2.81	58.49	78.73
Turkey	0.01	–0.12	0.03	0.00	–1.93	25.17	45.67	29.37	60.98
United Kingdom	–0.58	2.76	1.28	0.51	3.40	22.62	10.34	30.93	42.16

Notes: This table shows inputs to the sufficient statistic for the countries in which I have sufficient data to compute all components. The first two columns display the purchases of U.S. Equity and Bonds as a percentage of the country's GDP. The next two lines show the opposite flows, i.e. U.S. purchases of foreign country bonds and equity. Both account for the presence of tax havens. The next three lines show the price deviations (in percentage points) of the countries equity prices, bond prices and exchange rates. The final two lines show the share of imports in GDP and the share of imports that are invoiced in Dollars. All numbers are averaged over the period 2010-2021.

A.12 Robustness Impulse Responses

Section 5.2 presented evidence that countries with more valuation gains on their U.S. asset do not decrease their foreign saving. I show that this finding is robust with respect to the different methods of constructing valuation gains and also the time period in question in figure A.18.

Table A.5: Sufficient Statistic: Results for All Countries

	Total Welfare	U.S. Asset Valuation	Dom. Asset Valuation	Good Price Changes	Dividend Prices
Turkey	–2.37	0.00	–0.01	–2.37	0.02
Malaysia	–1.95	–0.03	–0.10	–1.83	0.01
South Africa	–1.93	–0.02	–0.11	–1.84	0.04
India	–1.75	–0.01	–0.07	–1.68	0.02
Chile	–1.57	0.10	–0.05	–1.66	0.05
Brazil	–1.55	0.00	0.00	–1.63	0.07
Mexico	–1.46	0.03	–0.05	–1.47	0.03
Denmark	–1.45	–0.44	–0.09	–1.02	0.10
Indonesia	–1.21	0.00	–0.04	–1.17	0.01
Canada	–1.02	–0.01	–0.24	–0.87	0.11
Finland	–0.87	–0.07	–0.05	–0.79	0.04
Russia	–0.79	0.00	–0.02	–0.79	0.02
United Kingdom	–0.73	0.09	–0.24	–0.70	0.11
Spain	–0.72	–0.01	0.05	–0.78	0.02
Germany	–0.66	–0.06	–0.08	–0.57	0.05
France	–0.58	–0.04	–0.03	–0.56	0.05
Japan	–0.58	0.01	–0.10	–0.56	0.07
Italy	–0.56	–0.02	0.00	–0.57	0.03
Norway	–0.47	–0.01	–0.07	–0.66	0.28
Australia	–0.36	0.04	–0.06	–0.37	0.03
Austria	–0.28	–0.06	0.00	–0.25	0.02
Philippines	–0.16	–0.02	0.00	–0.16	0.00
New Zealand	–0.09	–0.14	–0.09	0.13	0.00
Korea	–0.03	–0.12	–0.05	0.13	0.00
Israel	0.00	–0.13	–0.06	0.21	–0.01
China	0.23	0.03	0.02	0.19	–0.02
Thailand	0.67	–0.03	–0.07	0.77	–0.01

Notes: This table shows the results of the sufficient statistic as in figure 6 for all countries. The first column shows the total welfare effect, the other columns show the individual components of the sufficient statistic. The sample is restricted to countries for which all components of the sufficient statistic are available for the entire sample, non tax havens and countries which did not default during this time period.

B Theory Appendix

B.1 Proof of Main Theorem

Proof of Proposition 1. The Lagrangian associated with the household problem is

$$\begin{aligned}\mathcal{L} =& \sum_{t=0}^{\infty} \beta^t U(C_t^{\text{agg}}) + \\ & \sum_{t=0}^{\infty} \lambda_t \bigg(Y_t + \sum_{k=1}^{K} D_{t,k} N_{t-1,k} s_t + \sum_{l=1}^{L} D_{t,l} N_{t-1,l} + B_{t-1} \\ & - C_t^H P_t^H - C_t^{\$} P_t^{\$} s_t - \sum_{k=1}^{K} (N_{t,k} - N_{t-1,k}) P_{t,k} s_t - \sum_{l=1}^{L} (N_{t,l} - N_{t-1,l}) P_{t,l} - B_t Q_t \bigg).\end{aligned}$$

The relevant first order conditions are

$$\beta^t U'(C_t^{\text{agg}}) = \lambda_t P_t^{\text{agg}} \quad (\partial \mathcal{L} / \partial C_t^{\text{agg}})$$

$$\lambda_t Q_t = \lambda_{t+1} \quad (\partial \mathcal{L} / \partial B_t)$$

By the envelope theorem we can compute the derivative of the value function with respect to the asset prices and the exchange rate as the derivative of the lagrangian

$$\mathrm{d}V = \sum_{t=0}^{\infty} \bigg(\sum_{k=1}^{K} \frac{\partial \mathcal{L}}{\partial P_{t,k}} \mathrm{d}P_{k,t} + \sum_{l=1}^{L} \frac{\partial \mathcal{L}}{\partial P_{t,l}} \mathrm{d}P_{t,l} + \frac{\partial \mathcal{L}}{\partial s_t} \mathrm{d}s_t \bigg).$$

Computing each derivative yields

$$\begin{aligned}\frac{\partial \mathcal{L}}{\partial P_{t,k}} &= \lambda_t (N_{t-1,k} - N_{t,k}), \\ \frac{\partial \mathcal{L}}{\partial P_{t,l}} &= \lambda_t (N_{t-1,l} - N_{,l}), \\ \frac{\partial \mathcal{L}}{\partial s_t} &= \lambda_t \bigg(\sum_{k=1}^{K} \big(N_{t-1,k} - N_{t,k} + N_{t-1,k} D_{t,k} \big) + C_t^{\$} P_t^{\$} \bigg).\end{aligned}$$

The first two derivatives make clear that what matters are trades, not holdings. The third derivative shows the dual role of the exchange rate: It is an asset price, which revalues trades and income from abroad, but also a goods price. Using the first order condition for B_t we get that $\lambda_t = \lambda_0 \cdot Q_0 \cdots Q_{t-1}$. We normalize the initial price index P_0^{agg} to 1 and hence we get that $\lambda_t = R_{0\to t}^{-1}\lambda_0 = R_{0\to t}^{-1}U'(C_0^{\text{agg}})$. Putting it all together yields

$$\mathrm{d}V = U'(C_0^{\text{agg}})\sum_{t=0}^{\infty} R_{0\to t}^{-1}\Bigg(\sum_{k=1}^{K}(N_{t-1,k} - N_{t,k})(\mathrm{d}P_{k,t} + \mathrm{d}s_t) + D_{t,k}N_{t-1,k}\mathrm{d}s_t + \sum_{l=1}^{L}(N_{t-1,l} - N_{t,l})\mathrm{d}P_{t,l} + C_t^{\$}P_t^{\$}\mathrm{d}s_t\Bigg)$$

■

B.2 Details on the Forecast

In this section, I describe in detail the construction of the forecast for the valuation gains and the current account. In a first step, I construct the U.S. cyclical external imbalance nxa. To do so, I use quarterly data on imports, exports and the size of the asset and liability side of the U.S. external balance sheet.[50] After taking out slow moving trends in these variables, nxa is given as a composite of the trend deviations in these variables. Figure B.1 shows my estimates of nxa and compares them to GR. Results are close but not exactly the same as the HP filter applied to the data depends on sample. It is notable that current imbalances are almost as large as in the early 2000's, implying significant adjustment going forward.

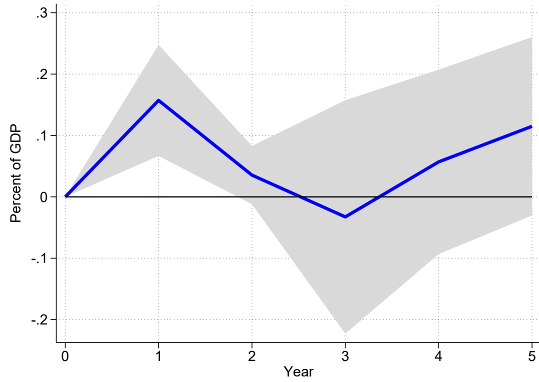
I regress k-horizon averaged outcome variables $y_{t,k} = (\sum_{i=1}^{k} y_{t+i})/k$ between t and $t+k$ on nxa_t. Table B.1 reports the regression results for select horizons and compares them to those of GR. Results in the extended sample are broadly similar, with a slight decrease in forecast power. Yet, forecast accuracy (as measured by R^2) remains large. The trends remain the same: at short horizons, nxa forecasts adjustment through returns, at mid to long run horizons, it forecasts

[50]The pre-2004 data is taken from the replication files of Gourinchas and Rey (2007b), afterwards data is taken from the BEA.

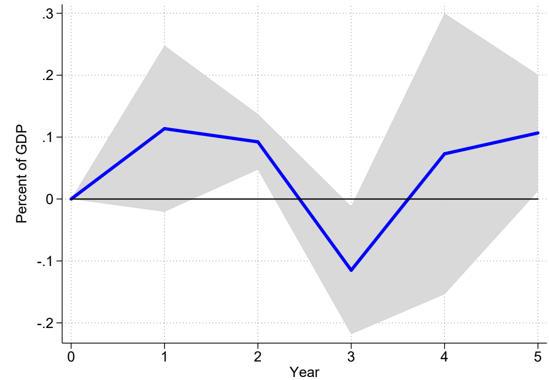
adjustments through the current account. [51]

[51]Consistent with the literature, I use the nominal broad U.S. dollar index against advanced economies as my measure of the exchange rate.

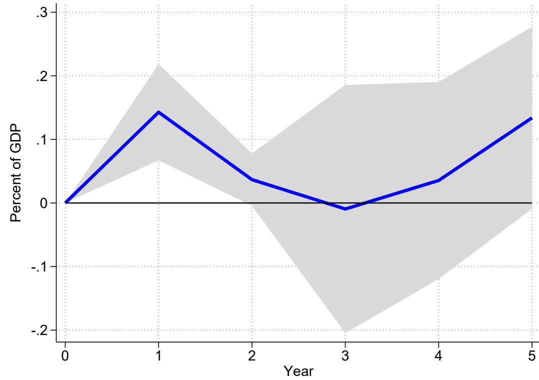
Figure A.18: Robustness: Local Projections from figure 7



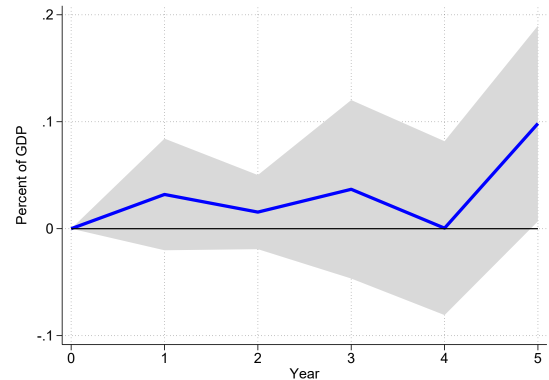
(a) Robustness: Valuation gains from raw data without any adjustment for tax havens



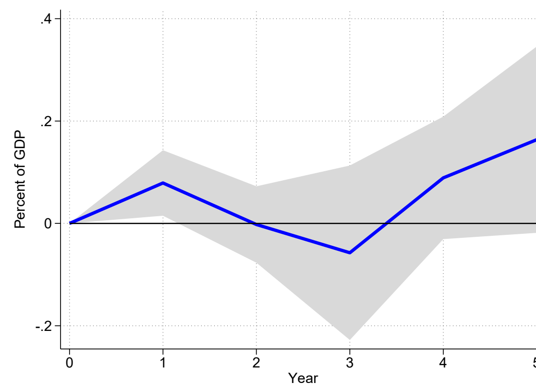
(b) Robustness: Valuation gains from the CPIS



(c) Robustness: Valuation gains constructed using assumptions of Gourinchas et al. (2012).



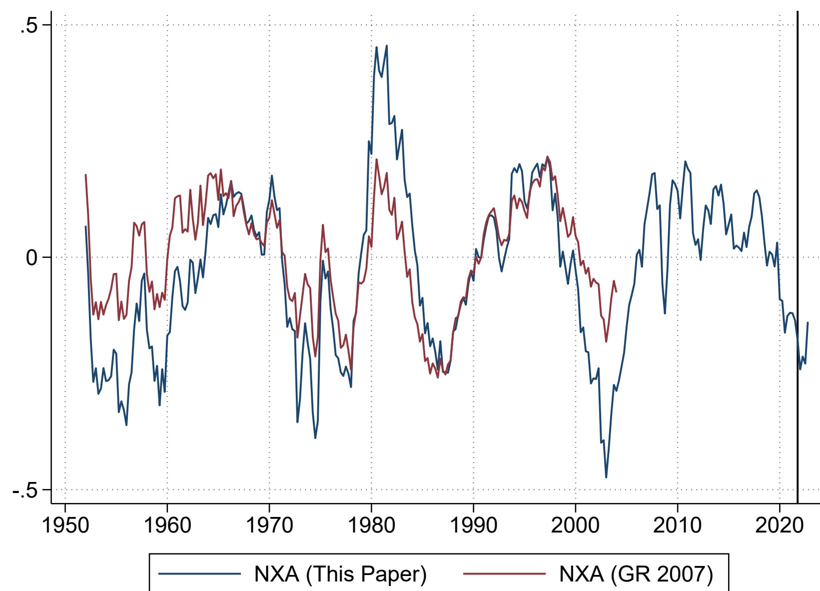
(d) Robustness: Estimation Period 2001-2021



(e) Robustness: No Controls

Notes: This figure shows that the impulse responses from figure 7 are robust to different assumptions on the construction of valuation gains. First, I show the raw valuation gains in panel (a). Next, I show the result with gains on portfolio equity constructed from the CPIS in panel (b) and the assumptions of Gourinchas et al. (2012) in panel (c). Finally, I estimate the local projection on the full sample starting in 2001 in figure (d). Shaded areas indicate 90% confidence intervals.

Figure B.1: Estimate of nxa



Notes: This figure presents the cyclical external imbalance nxa and compares it to the one obtained in Gourinchas and Rey (2007b). The line marks 2021Q4, the end of my sample and the beginning of my forecasts.

Table B.1: Return forecast and comparison with GR

	Forecast Horizon (Quarters)								
	1	2	3	4	8	12	16	24	36
	A. Real Total Net Portfolio Return $r_{t,k}$								
nxa	-0.23	-0.23	-0.22	-0.21	-0.15	-0.11	-0.09	-0.06	-0.04
se	0.05	0.05	0.05	0.05	0.06	0.06	0.07	0.07	0.06
R^2	0.10	0.16	0.19	0.21	0.16	0.12	0.09	0.05	0.03
nxa (GR)	-0.36	-0.35	-0.35	-0.33	-0.22	-0.14	-0.09	-0.04	
se	0.07	0.05	0.04	0.04	0.03	0.03	0.02	0.02	
R^2	0.11	0.18	0.24	0.26	0.21	0.13	0.09	0.02	
	B. Net Growth of the Net Exports $\Delta nx_{t,k}$								
nxa	-0.07	-0.07	-0.06	-0.06	-0.05	-0.05	-0.04	-0.03	-0.02
se	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
R^2	0.05	0.09	0.12	0.15	0.22	0.28	0.34	0.31	0.18
nxa (GR)	-0.08	-0.08	-0.07	-0.07	-0.07	-0.06	-0.06	-0.04	
se	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	
R^2	0.05	0.10	0.13	0.17	0.31	0.44	0.53	0.58	
	C. FDI-Weighted Effective Nominal Rate of Depreciation $\Delta e_{t,k}$								
nxa	-0.05	-0.05	-0.05	-0.05	-0.04	-0.03	-0.02	-0.01	0.00
se	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
R^2	0.11	0.16	0.21	0.25	0.27	0.20	0.17	0.04	0.00
nxa (GR)	-0.08	-0.08	-0.08	-0.08	-0.07	-0.06	-0.04	-0.02	
se	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	
R^2	0.09	0.16	0.28	0.31	0.41	0.41	0.33	0.12	

Notes: This table shows the results of the forecasting regressions of the form $y_{t,k} = \alpha + \beta_k nxa_t + \epsilon_{t,k}$, where $y_{t,k}$ is the k-period mean of the dependent variable. The first row reports the point estimate of β_k, the next row the (Newey-West) standard error and the final row the R^2. The next rows show the results obtained in Gourinchas and Rey (2007b, Table 3).

From these forecasts, we can use the value of nxa at the and of 2021 to predict the future evolution of returns and net exports. To forecast valuation gains, I use the return forecast and apply it to the NFA in 2021q4.[52]

B.3 Welfare Gains in a Model with one asset

In this section, I show how to derive a similar sufficient statistic within a framework without multiple assets and dividends. This will be the setting applied to the forecast. Hence, now consider the RoW net foreign asset position as a portfolio which is long in U.S. assets and short in RoW assets. Buying one unit NFA_t of this portfolio costs P_t^{NFA}. Then the accumulation equation becomes

$$\text{NFA}_{t+1} P_{t+1}^{\text{NFA}} = \text{NFA}_t P_t^{\text{NFA}} + \underbrace{(P_{t+1}^{\text{NFA}} - P_t^{\text{NFA}})\text{NFA}_t}_{\text{VA}} + \underbrace{P_{t+1}^{\text{NFA}}(\text{NFA}_{t+1} - \text{NFA}_t)}_{\text{CA}},$$

with current account $P_{t+1}^{\text{NFA}}(\text{NFA}_{t+1} - \text{NFA}_t)$. The gross return on the net foreign asset position then is defined as $R_{t+1} = P_{t+1}^{\text{NFA}}/P_t^{\text{NFA}}$. For simplicity, there are no dividends in this setting to focus purely on the effect of price changes. Further, as in the baseline model there are transaction costs for the purchase of foreign assets as well as a one-period local currency bond.

Derivation of the Sufficient Statistic. The household problem for the RoW in this economy becomes

$$V = \max_{C_t, B_t, NFA_t} \sum_{t=0}^{\infty} \beta^t U(C_t)$$

subject to the initial holdings B_{-1}, $N_{k,-1}$, $N_{l,-1}$ and the budget constraint

$$\Delta \text{NFA}_t P_t^{\text{NFA}} + Q_t B_t + P_t^H C_{H,t} + C_t^H P_t^H + C_t^{\$} P_t^{\$} s_t + \mathcal{X}_t = Y_t + Q_{t-1} B_{t-1}.$$

[52]Implicitly, this conflates the dividend yield and capital gain component of returns. Gourinchas and Rey (2007a) show that capital gains make up a larger component of returns on the NFA and are more volatile.

Adapting proposition 1 to the present setting yields the sufficient statistic

$$\text{Welfare gain} = \sum_{t=0}^{\infty} R_{0\to t}^{-1}\Bigg(\underbrace{(NFA_{t-1} - NFA_t)\mathrm{d}P_t^{\text{NFA}}}_{\text{Asset Price Movements}} - \underbrace{C_t^{\$}P_t^{\$}\mathrm{d}s_t}_{\text{Import Prices}} \Bigg). \tag{7}$$

As earlier, what is crucial for the welfare gains is the current account. Here, the welfare from valuation gains depends on the change in the price index of the NFA. While this price index is not observed, we can rewrite in terms of the returns R_t on the U.S. NFA

$$\Delta P_t^{\text{NFA}} = P_t^{\text{NFA}} - P_0^{\text{NFA}} \quad \implies \frac{\Delta P_t^{\text{NFA}}}{P_t^{\text{NFA}}} = \frac{R_1 \cdots R_t - 1}{R_1 \cdots R_t},$$

where $R_1 \cdots R_t$ are the cumulated returns on the NFA. Therefore we can measure the first component of the sufficient statistic using the current account and the cumulated returns on the U.S. NFA,

$$(\text{NFA}_{t-1} - \text{NFA}_t) \cdot \Delta P_t^{\text{NFA}} = \underbrace{(\text{NFA}_{t-1} - \text{NFA}_t)P_t^{\text{NFA}}}_{\text{Current account}} \cdot \underbrace{\frac{R_1 \cdots R_t - 1}{R_1 \cdots R_t}}_{\text{Cumulated Returns}}.$$

Note that in the present setting without dividends the current account is equal to net exports.

Parameter Calibration for the Rest of the World. The parameter calibration follows the one for the individual countries in the main section. Concretely, the discount factor β is set to 0.96 at annual frequency, the dollar invoicing share is set to 0.53, the unweighted country average over the period 2010-2021, the import share in the consumption basket is set to 0.4. Moreover, I calculate net exports and valuation gains as a percentage of U.S. GDP, which is translated to RoW GDP by assuming that the ratio of U.S. to World GDP is 1 to 5, the average from 2010-2021.

B.4 Welfare Gains for the U.S. During the Exorbitant Privilege

The sufficient statistic for the one-asset model from equation 7 can be used to determine the welfare gains the U.S. enjoyed during the exorbitant privilege. Here, this refers to the period prior to the

Table B.2: Valuation and Welfare Gains during the 'Privilege' (1973-2004)

Time Horizon	Welfare Gain (% of GDP)	Valuation Gain (% of GDP)
1973–2004	0.33	0.43

Notes: This table presents the average annual welfare and valuation gains for the U.S. from 1973-2004.

financial crisis, in which the U.S. experienced high valuation gains while running a large current account deficit at the same time. Using replication data from Gourinchas and Rey (2007b), I calculate the cumulated returns from 1973Q1 to 2004Q1, along with measures of the current account deficit. I then apply sufficient statistic 7 to compute the average annual welfare gains alongside the average annual valuation gains. As my focus here is on valuation gains, I compute only the part of the sufficient statistic pertaining to these. Effects from rising import prices are likely small as the U.S. invoices nearly all its trade in dollars.

Table B.2 presents the results. It is notable that for this time period the welfare gains are nearly as large as the valuation gains. Whereas the average capital gain was around 0.43% of U.S. GDP over this horizon[53], the average annual welfare gains almost have the same size at 0.33% of GDP annual. This is because the U.S. dissaved against its large capital gains, unlike the countries in my main sample.

[53] This is much smaller than capital gains today as gross positions have become larger over this time period.