The End of Privilege: A Reexamination of the Net Foreign Asset Position of the United States*

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Abstract

The U.S. net foreign asset position has deteriorated sharply in the years following the Global Financial Crisis and is currently negative 65 percent of US GDP. This deterioration primarily reflects changes in the relative values of large gross international equity positions, as opposed to net new borrowing. In particular, a sharp increase in equity prices that has been U.S. specific has inflated the value of U.S. foreign liabilities. We develop an international macro finance model to interpret these trends, and argue that the rise in equity prices in the United States likely reflects rising profitability of domestic firms rather than a substantial accumulation of unmeasured capital by those firms. Under that interpretation, the revaluation effects that have driven down the U.S. net foreign asset position are associated with large unanticipated transfers of US output to foreign investors.

JEL Classification Numbers: F30,F40

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*The views expressed herein are those of the authors and not necessarily those of the Federal Reserve Bank of Minneapolis or the Federal Reserve System.

1 Introduction

Figure 1 plots the net foreign asset position of the Unites States, as a fraction of GDP, from 1992 until 2020. This position is measured as the market value of the assets US residents hold abroad minus the market value of US assets held by foreigners. For the period from 1992 to 2007, and in the decades before 1992, the United States maintained a relatively small negative net position. In sharp contrast, over the past decade, from 2010 through 2020, the U.S. net foreign asset position (henceforth NFA) has declined precipitously — by more than 45 percentage points of U.S. GDP. In this paper, we examine two questions regarding this decline. The first is a data question: what, in a purely accounting sense, has driven this steep downturn in the U.S. NFA position? The second is a question of interpretation: what does this downturn imply for the welfare of Americans?

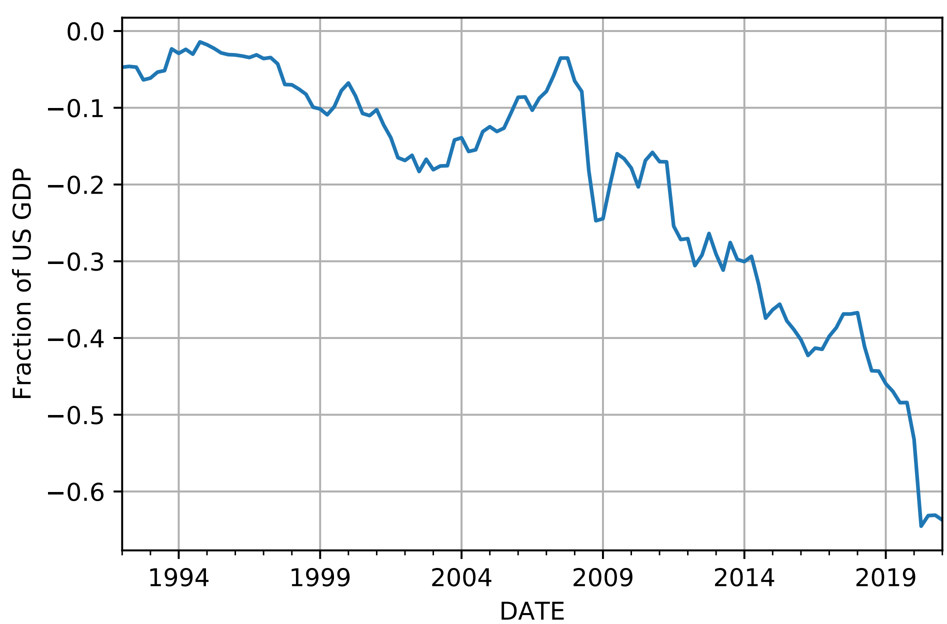

Figure 1: The US Net Foreign Asset Position: 1992-2020

In answering our first question, the data question regarding what factors have driven the rapid deterioration of the U.S. NFA, we build on the seminal work of Gourinchas and Rey (2007) and Gourinchas and Rey (2014) in decomposing the change in the NFA position into a component due to the flows of trade and factor incomes measured by the Current Account, a component due to flows of purchases and sales of financial assets, a statistical discrepancy term, and a component due to measured revaluations of the market values of outstanding gross assets of U.S. residents held abroad less revaluations of the market values of gross U.S. assets held by foreigners. We update the Gourinchas and Rey analysis, and benefit here from the recent work that the U.S. Bureau of Economic Analysis and the U.S. Treasury have done in improving their measures of U.S. cross border asset flows and positions and the incorporation of these improved data in the *Financial Accounts of the United States* and the associated *Integrated Macroeconomic Accounts*.

These new data lead us to reassess the conventional wisdom from a decade ago regarding the drivers, in a purely accounting sense, of the U.S. NFA position. Gourinchas and Rey (2007) documented that during the decades leading up to 2007, the United States seemed to enjoy a special "privilege" shaping its NFA position. In particular, despite the fact that the U.S. ran significant current account deficits for decades, its NFA position did not deteriorate, and even improved in the early 2000's, because realized net revaluation effects consistently favored U.S. residents. Research following Gourinchas and Rey (2007) attributed this pattern of favorable realized revaluations of the U.S. external balance sheet as arising from an asymmetry in the composition of the U.S. gross external asset position: in earlier data, U.S. residents appeared to be long equity assets abroad while foreign claims on the U.S. appeared to consist primarily of low-return bonds; see, for example, Mendoza, Quadrini, and Rios-Rull 2009.

The data newly available in the *Integrated Macroeconomic Accounts* overturn both aspects of this conventional wisdom. Over the past decade, foreigners have enjoyed a dramatic boom in the value of the assets that they hold in the United States while U.S. residents have enjoyed only modest revaluations of the assets that they hold abroad. As a result, the net impact of asset revaluations on the U.S. NFA position account for the majority of the deterioration of that position over the past decade shown in Figure 1. In fact, as we show below, the negative impact of these revaluations on the U.S. NFA position has been so large as to erase any "privilege" that U.S. residents enjoyed from 1992 to the present. The U.S. NFA position is now slightly worse than it would have been if no asset revaluations had occurred at all over this time period. Given this reversal of fortunes for U.S. residents, we see the past decade as signaling "the end of privilege" in the external position of the United States.[1]

The newly available data also lead us to reassess the conventional wisdom regarding

[1]This is only one among various possible notions of privilege. One alternative notion is that the U.S. enjoys persistently higher returns on its foreign assets relative to the return it pays on its liabilities. Higher relative returns might show up in the international accounts as stronger valuation gains for U.S. owned assets abroad relative to liabilities. But they might alternatively present as higher income yields on U.S. assets relative to liabilities. We discuss relative income yields in detail in Appendix F. For equity we find that it is difficult to measure relative returns, primarily because of important open questions about how to interpret high income yields on U.S. outward FDI. For non-equity assets and liabilities, we find little evidence of persistent rate of return privilege: yields on U.S. non-equity assets and liabilities appear to be very similar throughout our sample period.

the composition of U.S. gross external assets and liabilities. In the new data on the U.S. external balance sheet, the U.S. gross external equity assets have roughly the same market value as U.S. gross external equity liabilities (see also Setser 2018, Setser 2019, and Milesi-Ferretti (2021)). The gross revaluations of U.S. external assets and liabilities are almost entirely driven by revaluations of these gross equity positions. This implies that, in a purely accounting sense, whether revaluation effects in the US NFA position favor U.S. residents depends on whether U.S. equities outperform foreign equities in dollar terms. In the early 2000's, U.S. residents enjoyed favorable revaluations of their NFA position because foreign equities substantially outperformed U.S. equities in dollar terms, with a large part of the revaluation of U.S. residents holdings of equity abroad due to changes in the dollar exchange rate. In contrast, over the past decade, U.S. residents have suffered unfavorable revaluations of their NFA position because U.S. equities have boomed while foreign equities have enjoyed only modest gains.

These data lead us to our second question: what does the deterioration of the U.S. NFA position over the past decade mean for the welfare of Americans? To address this question requires a theory of the forces behind the boom in the valuation of U.S. corporate equity over this time period. Here we turn to the growing macro-finance literature on this question, including work by Caballero, Farhi, and Gourinchas (2017), Guitierrez and Philippon (2017), Crouzet and Eberly (2021), Greenwald, Lettau, and Ludvigson (2021) and many others.

In particular, we extend the work of Farhi and Gourio (2018) by building an open-economy model to account for changes in key macroeconomic and asset pricing ratios in the past decade relative to the period before 2007. These ratios include, for the U.S. corporate sector, the ratio of the market value of U.S. corporations to U.S. GDP, Tobin's Q, their total payout yield, and their price-earnings ratio. We use this model to explore the implications of alternative theories for the boom in the valuation of U.S. resident corporations in the past decade not only for these key macroeconomic and asset pricing ratios, but also for the U.S. current account, for cross border financial flows and for the revaluations of U.S. gross external assets and liabilities.

We use the model to examine specifically the implications of two candidate hypotheses regarding the primary drivers of the boom in valuations of U.S. resident corporations in the past decade. These are first, a large, unanticipated, rise in the markup of price over marginal cost for U.S. corporations together with a decline in the expected return on equity and the expected growth rate of the economy. See, for example, Crouzet and Eberly (2019), De Loecker, Eeckhout, and Unger (2020), Akcigit et al. (2021) and many others.

The second hypothesis that we consider is an unexpected rise in the importance of unmeasured capital in the production function for U.S. corporations together with the same decline in the expected return on equity and the expected growth rate of the economy. See, for example, Hall (2001), McGrattan and Prescott (2005), McGrattan and Prescott (2010), Crouzet and Eberly (2019), Belo et al. (2021) and many others.

Both specifications of our model account well for the observed changes in the key macroeconomic and asset pricing ratios that we study. In fact, we find that these two hypotheses for the rise in the valuation of U.S. corporations may be difficult to distinguish based solely on those metrics. We find, however, that these two specifications have strikingly different implications for changes in the U.S. current account, gross financial flows, revaluations of U.S. gross and net external asset positions, and for the welfare of U.S. residents.

In the specification of our model with an unexpected rise in markups, the boom in the valuation of U.S. corporations is the result of a large, unexpected shift in the share of U.S. GDP available to be paid to investors in U.S. corporations. Similar to the argument in Greenwald, Lettau, and Ludvigson (2021), this boom in asset values is also associated with a large decline in the share of U.S. GDP paid to labor. Thus, if residents of the U.S. owned all of U.S. equity, this shock to markups would, to a first order, have offsetting effects on the total wealth of U.S. residents and their welfare. Overall, the shock does have a small, second-order, impact on U.S. consumption, labor supply, investment, and welfare due to the distortions coming from an increased monopoly wedge. But absent international portfolio diversification, a boom in U.S. asset values due to an unexpected increase in markups would not have a significant impact on the U.S. NFA position.

But the implications of the model with this shock to markups for the U.S. international position and U.S. residents' welfare are very different if foreign residents own a great deal of U.S. equity, as they do in the data. In this case, after the shock to markups occurs, foreigners enjoy higher dividends from their investments in U.S. corporations, and that benefit is reflected immediately in a large positive revaluation of their equity claims in the U.S. The welfare of U.S. residents falls substantially as, after the shock to markups, they now command a smaller share of U.S. GDP. In fact, our model, with a shock raising markups and significant foreign ownership of U.S. equity, is isomorphic in terms of its welfare implications to a model in which the U.S. government levies a value added tax and then transfers a significant share of the tax revenue to foreigners as a gift. Thus, the negative impact of this shock to markups on the welfare of U.S. residents is increasing in the share of U.S. equity held by foreigners.

At the same time, after the shock to markups, the market value of foreigners equity claims on U.S. corporations rises by the product of their share in total U.S. equity times the rise in the value of U.S. corporations. In our calibration, we set this foreign share of total U.S. equity to 30% and the rise in the value of U.S. corporations is 150% of U.S GDP, so this specification implies a revaluation of foreigner's holdings of U.S. equity of 45% of U.S. GDP.

This direct revaluation effect accounts for most of the dynamics of the U.S. NFA position implied by the model with rising markups as the implied cumulated current accounts and the implied revaluation of U.S. residents' holdings of equity abroad are both small.

Now consider the second specification of the model in which the boom in the valuation of U.S. corporations is a result of a shift in the production function that increases the importance of unmeasured capital.[2] Following this shock, the value of U.S. corporations rises because they invest in and accumulate a much larger stock of this unmeasured capital. The implications of this shock to the production function for the welfare of U.S. residents are small, regardless of who owns U.S. corporations. This is because no one experiences an unexpected capital gain when the shock to the production function occurs. Instead, corporate valuations rise only because their owners finance a large increase in investment in this unmeasured capital. Thus, to a first order, in terms of welfare, the investment required in the transition following the shock offsets the higher dividends earned in the long run after this transition is complete.

At the same time, in the model, after the shock to the production function, the U.S. trade balance deteriorates sharply as U.S. corporations dramatically raise expenditures on unmeasured investment. In fact, in the model, the US NFA position relative to GDP deteriorates nearly one for one with the increase in the value of US corporations relative to GDP, regardless of the extent of foreign ownership of U.S. equities. Thus, this specification of the shock in our model yields dramatically counterfactual implications for the US NFA position.

We argue that the different implications of the two alternative specifications of our model for the U.S. NFA position and U.S. welfare are driven, economically, by the different assumptions embedded in these alternative hypotheses for whether the boom in the value of U.S. corporations was the result of an unexpected and large positive excess return on U.S. equity for incumbent shareholders (as implied by an unexpected rise in markups) or alternatively whether the boom reflected accumulated unmeasured investments with no excess returns on U.S. equity properly measured (as implied by the unmeasured capital hypothesis). We conjecture that this distinction is critical for assessing the welfare implications for U.S. residents of any contemplated shock driving asset booms.

The remainder of the paper is organized as follows. In section 2, we present data on the U.S. NFA position and the drivers of changes in that position since 1992. Here, and in the Appendix, we also discuss several concerns with the data presented in the *Integrated Macroeconomic Accounts* with a particular focus on concerns regarding the treatment of assets owned by offshore hedge funds, concerns regarding tax motivations behind U.S. direct investment abroad, and concerns regarding the valuation of direct investment both by the

[2]The capital has to be unmeasured. If it was measured the boom in equity prices should be accompanied by a boom in capital output ratio, which is not observed in the data

U.S. into the rest of world and foreign direct investment into the U.S. In section 3, we present our model with markups and develop its implications for the valuation of the U.S. corporate sector and key asset price ratios as well as for the US Current Account and NFA position, both on a balanced growth path and in response to a shock. In section 4 we discuss our financial data which are then used in section 5, to calibrate the model with markups and obtain results from our model experiments shocking markups, as well as the discount factor and the growth rate. In section 6, we present the model with unmeasured capital, compare its implications for asset prices on a balanced growth path to our model with markups, and report results from our model experiment shocking the importance of unmeasured capital as well as the discount factor and the growth rate.

We describe our data sources and present alternative data in the Appendix.

2 The evolution of the US NFA: 1992-2020

In this section we briefly discuss some measurement concepts and then document the evolution of the US NFA in more detail, focusing on the changes in NFA arising from the current account versus valuation effects, and on the source of valuation effects.

Measurement of Gross and Net Foreign Assets Our data analysis benefits tremendously from the work that the Bureau of Economic Analysis has done over the past ten years in assembling the *Integrated Macroeconomic Accounts*. In these data, for various sectors of the economy including the rest of the world, economic and financial flows and balance sheet positions are integrated so that all changes in positions between two points in time are fully explained by the recorded flows, changes in valuation, and other volume changes. Regarding the key distinction between US versus foreign assets, we follow Bureau Of Economic Analysis (2014) and focus on the definition of *residence*.[3] The main source of data for this section is Table S9 of the Integrated Macroeconomic Accounts which we use to measure the gross and net foreign assets and liabilities held by residents of the United States (both individuals and institutions).[4] The source data for this table are primarily from the Bureau of

[3]For individuals, those who reside or intend to reside in the United States for one year or more are considered U.S. residents. Business enterprises and nonprofits are treated as residents of the country in which they are located, operated, organized, or incorporated. U.S. resident entities consist of all for-profit and nonprofit institutions established under U.S. laws; their foreign affiliates — subsidiaries, branches, partnerships, and sole proprietorships — are considered residents of the countries in which they are located. Similarly, all affiliates — subsidiaries, branches, partnerships, and sole proprietorships — of foreign for-profit and nonprofit institutions that operate in the United States are considered U.S. residents. As described below, the application of the residence principle to measurement has a significant impact on our measurement.

[4]Table S9 is presented from the point of view of the Rest of World (ROW) as an economic sector, so we multiply all data by -1 to present it from the perspective of U.S. residents.

Economic Analysis' *International Transactions Accounts*, *International Investment Position Accounts*, and *Activities of Multinational Enterprises*. In principle, whenever feasible, these U.S. international economic accounts use market prices as the basis for valuation.

The NFA and its components The starting point of our analysis is accounting identity 1 below, showing that the change in the NFA position between the end of periods $t-1$ and t is the sum of three components. The first (CA_t) is the balance of the current account during period t: this term captures the net US lending abroad, measured as the sum of net exports and net income receipts. The second term (VA_t) captures the net change in the valuations of the existing assets that comprise the gross positions. The third term is the statistical discrepancy, which reconciles the changes in NFA resulting from measured financial transactions and asset positions with the ones resulting from current account transactions.[5]

$$NFA_t - NFA_{t-1} = \underbrace{CA_t}_{\text{net lending abroad}} + \underbrace{VA_t}_{\text{Valuation Effects}} + \underbrace{SD_t}_{\text{Statistical Discrepancy}} \tag{1}$$

Summing up 1 from period 1 to period t yields

$$NFA_t = NFA_0 + \underbrace{\sum_{j=1}^{t} CA_j}_{\text{Cumulated CA}} + \underbrace{\sum_{j=1}^{t} VA_j}_{\text{Cumulated Valuations}} + \underbrace{\sum_{j=1}^{t} SD_j}_{\text{Cumulated SD}} \tag{2}$$

showing that the NFA position in any period can be expressed as the cumulated sums of the three terms described above.

Figure 2 shows the evolution of the three components in equation 2 divided by U.S. GDP in each year t, from 1992 until 2020. The figure shows three different phases in the evolution of the U.S. NFA position. During the first phase (1992-2002), the NFA position closely tracked current account dynamics. The NFA went from 0 to -20% of GDP and most of this decline reflects cumulated current account deficits. During the second phase (2002-2010) the current account continued to deteriorate, but the NFA position remained roughly stable, due to a combination of positive valuation effects and positive statistical discrepancies. This period was the focus of Gourinchas and Rey (2007) and Gourinchas and Rey (2014)), who noticed that valuation effects, which increased the value of foreign assets held by U.S. residents, relative to the value of U.S. assets held by foreigners, acted as a stabilizing counterweight to growing current account deficits. During this period the U.S. enjoyed the privilege of being

[5] Suppose, for example that in a given period the measured increase in NFA is \$3 million, and over the same period changes in valuation of assets account for an increase of \$1 million and the current account increases by \$1 million as well. In that period the statistical discrepancy would be \$1 million. Below we evaluate how results change when we consider a narrower measure of statistical discrepancy.

able to finance its trade deficits using the high returns it was earning on investments abroad. The third and final phase (2010-2020) shows the end of this privilege. Over these 10 years the U.S. NFA position declined by more than 40% of GDP, despite a relatively stable (relative to GDP) cumulated current account, so that by 2020 the U.S. NFA was *more* negative than cumulated current accounts over the entire 1992 to 2020 period. The decline in this phase was largely driven by cumulated negative valuation effects, meaning that over these 10 years U.S. residents experienced consistently lower capital gains on their foreign asset holdings than those enjoyed by foreigners on their U.S. assets.

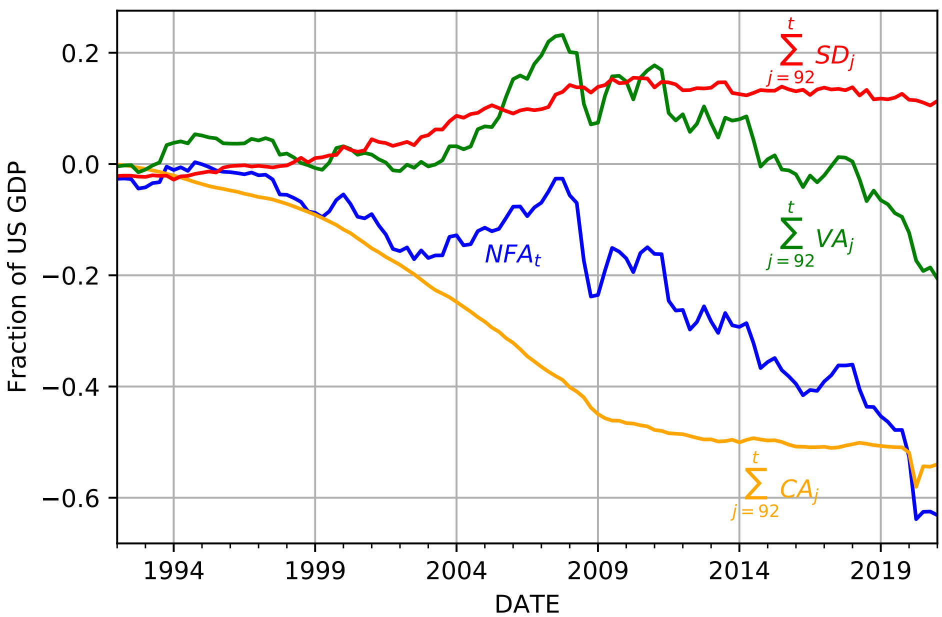

Figure 2: Decomposition of Changes in US Net Foreign Assets over GDP

In the appendix, in Figure 24 we show an alternative decomposition of the cumulated change in the US Net Foreign Asset Position into

$$NFA_t - NFA_{t-1} = \underbrace{NFT_t}_{\text{net financial transactions}} + \underbrace{OV_t}_{\text{other volume changes}} + \underbrace{VA_t}_{\text{Valuation Changes}}$$

This decomposition replaces the current account with net financial transactions that are directly measured. Likewise, the statistical discrepancy is replaced by the entry on Table S9 corresponding to *Other Volume Changes*. Note that this decomposition reduces the decline in the NFA position due to U.S. borrowing from abroad (here measured as net financial transactions) but does not change the overall measure of the NFA. So overall it makes the end of the privilege appear even starker.

Decomposing valuations Since cumulated valuation effects are an important determinant of the evolution of the U.S. NFA position we now proceed to analyze in more detail the sources and the impacts of valuation changes. First it is useful to divide U.S. foreign positions into two broad categories: equity and non-equity investments. Equity investment includes portfolio investment in corporate equities and the equity component of direct investment.[6] At the beginning of our sample, when international equity markets were still relatively underdeveloped, direct investment was the main component of both inward and outward equity investment, accounting for 80% of both positions. Toward the end of our sample, with large and active international equity markets, portfolio and direct equity investment have roughly equal shares.

Non-equity assets include debt securities, loans, and currency and deposits. Over the period 1992-2020, debt securities and loans account for 61% of the non-equity U.S. assets abroad and 85% of the non-equity foreign assets in the U.S.. Figure 3 plots the evolution of these categories of US assets and liabilities, as fractions of U.S. GDP.

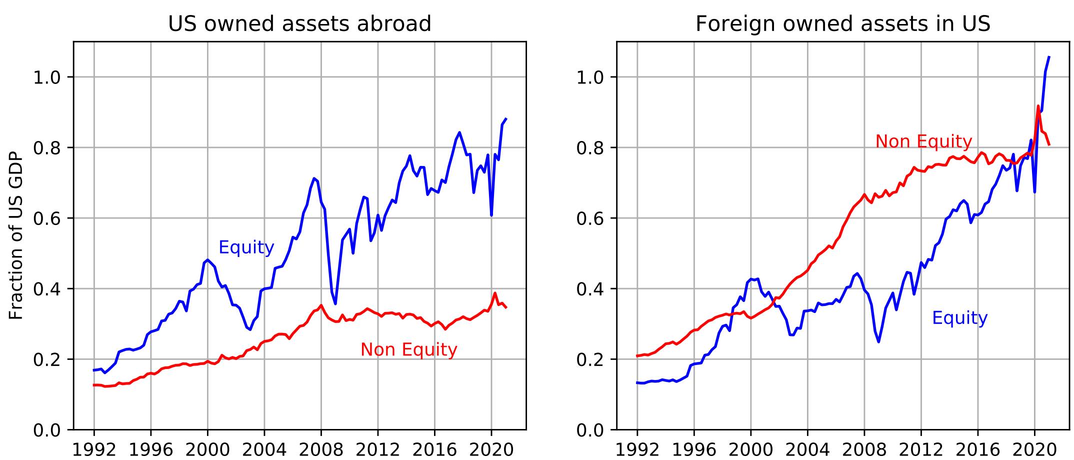

Figure 3: Gross equity and non equity positions

The first key message from figure 3 is that by 2010 all the gross positions are large (ranging from 30 to 70% of US GDP) and thus changes in the prices of the assets comprising these

[6]Bureau Of Economic Analysis (2014) writes: "Direct investment is related to control or a significant degree of influence and is usually associated with a lasting relationship. In contrast, portfolio investors typically have a much smaller role in the operations of the enterprise, with potentially important implications for future flows and for the volatility of the price and volume of positions."

positions can produce significant valuation effects. The second key message from the figure is that U.S. equity liabilities have always been large, are similar in magnitude to U.S. equity foreign assets, and now exceed non-equity liabilities. Foreign equity holdings in the U.S now exceed 100% of U.S. GDP, and thus changes in the price of U.S. equity will have large effects on the U.S. NFA position.

Figure 4 decomposes the cumulated net valuations plotted in figure 2 into the net valuations arising from net equity and non-equity positions. The figure shows that net valuation changes arise almost exclusively from the equity positions. Although in principle both categories are subject to relative valuations changes (due to both price changes and exchange rate movements for assets denominated in different currencies), these effects are quantitatively much more important for the equity positions.[7]

Figure 5 plots the evolution of net positions in equity and non equity, alongside the cumulated valuation changes and the cumulated current account (as plotted in figure 2). The figure shows a striking separation in U.S. NFA dynamics. The net non-equity position mirrors cumulated current accounts, while the net equity position tracks cumulated valuation changes. The figure also shows that the overall composition of the US foreign asset position has changed radically over the past 10 years, mostly because of valuation effects in the equity positions. Before the 2009 crisis the United States had a substantial negative non-equity position (almost 40% of GDP), partly compensated by a positive position (about 20% of GDP) in equity. By 2020, both the positions in equity and non-equity assets are both substantially negative.

[7]In the appendix we break down the cumulated net valuations into those coming from FDI and from portfolio investment in figure 21. Cumulated valuation effects are roughly equally split between FDI and portfolio investment. One reason why valuation effects for bonds are so small is that bond foreign assets tend to be dollar-denominated, as are bond liabilities (see Maggiori, Neiman, and Schreger 2020)

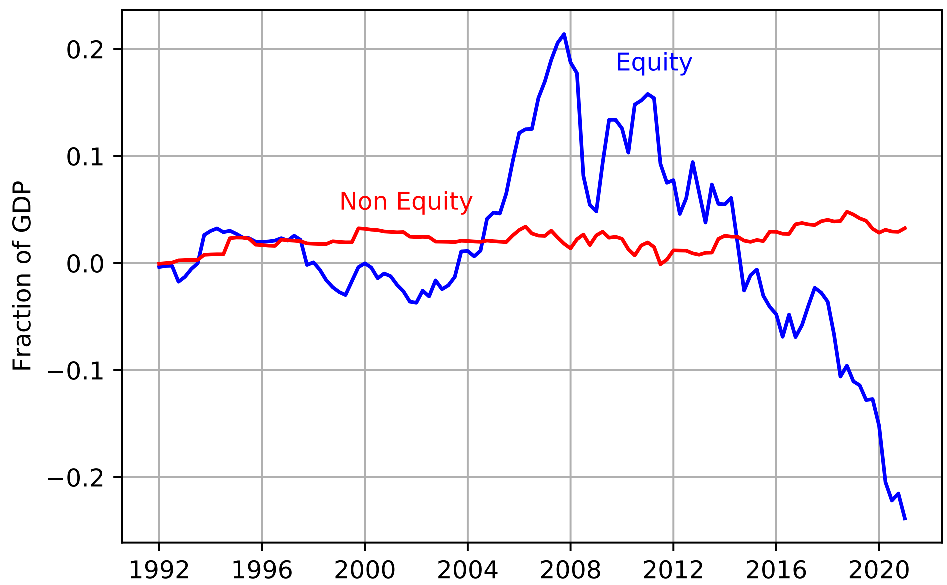

Figure 4: Cumulated valuations changes in equity and non equity positions

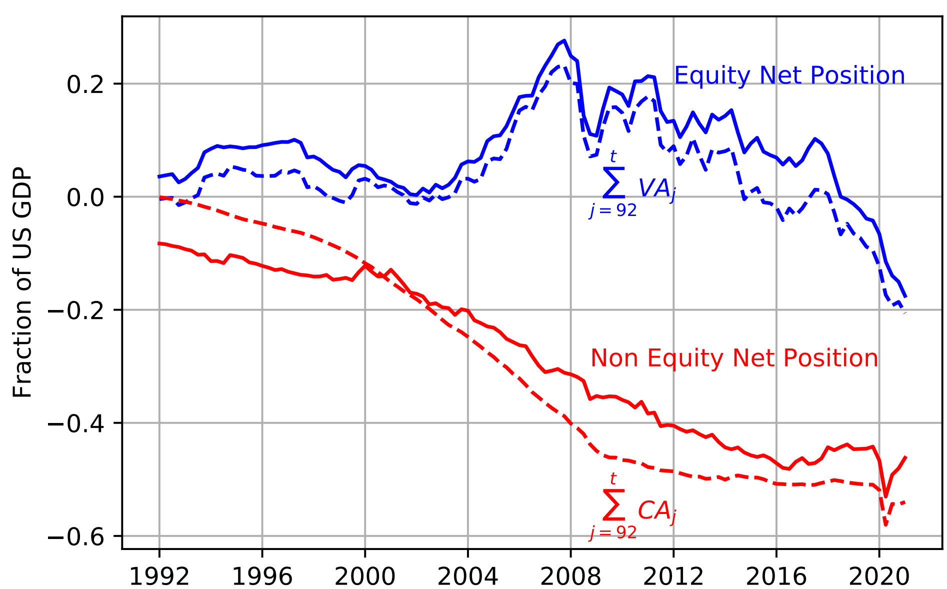

Figure 5: Net Positions, Cumulated Valuations and Current Accounts

Valuations, exchange rates and stock prices As discussed in Bureau Of Economic Analysis (2014), changes in net valuations arises from two possible sources: changes in the prices of the underlying assets, and changes in exchange rates, if assets and liabilities are denominated in different currencies. In this subsection we show the role played by these two prices in the two salient valuation episodes we have documented: the positive valuation effects experienced by the United States before the 2008 crisis (2002-2007), and the negative valuation effects after the crisis (2010-2020). The top panels in Figure 6 plot cumulated equity valuation effects in those two episodes, and show that in both cases they were large. The bottom panels plot three stock prices indexes: the first is a price index for the U.S., the second and third are price indexes for foreign stocks, in local currency and in U.S. dollars, respectively.[8] These indexes help us understand the contributions of asset price movements in local currency versus exchange rate changes in determining valuation effects.

Focus first on two left panels, describing the early valuation episode. The panels show that US equity and foreign equity performed similarly in local currency, but the foreign equity index in dollar terms substantially outperformed the US index. This means that the devaluation of the US dollar against the basket of currencies that comprise the foreign equity index was largely responsible for the positive valuation effect experienced by the US. Moving now to the right panels, we can see that the later valuation episode was different. During that period the foreign and U.S. equity indexes diverged dramatically when measured in their respective currencies. Comparing the foreign indexes in local currency and dollars shows that they performed similarly, reflecting only a modest appreciation of the U.S. dollar. We conclude that exchange rate movements did not play a major role in the negative valuation effects experienced by the United States over the past 10 years.

[8]For the United States we use the Morgan Stanley Capital Index (MSCI) U.S. index. For the rest of the world we use the MSCI all countries except US index, which comprises stock market indexes for 22 developed economies and 27 emerging markets, in dollars and in local currency, weighted by market capitalization.

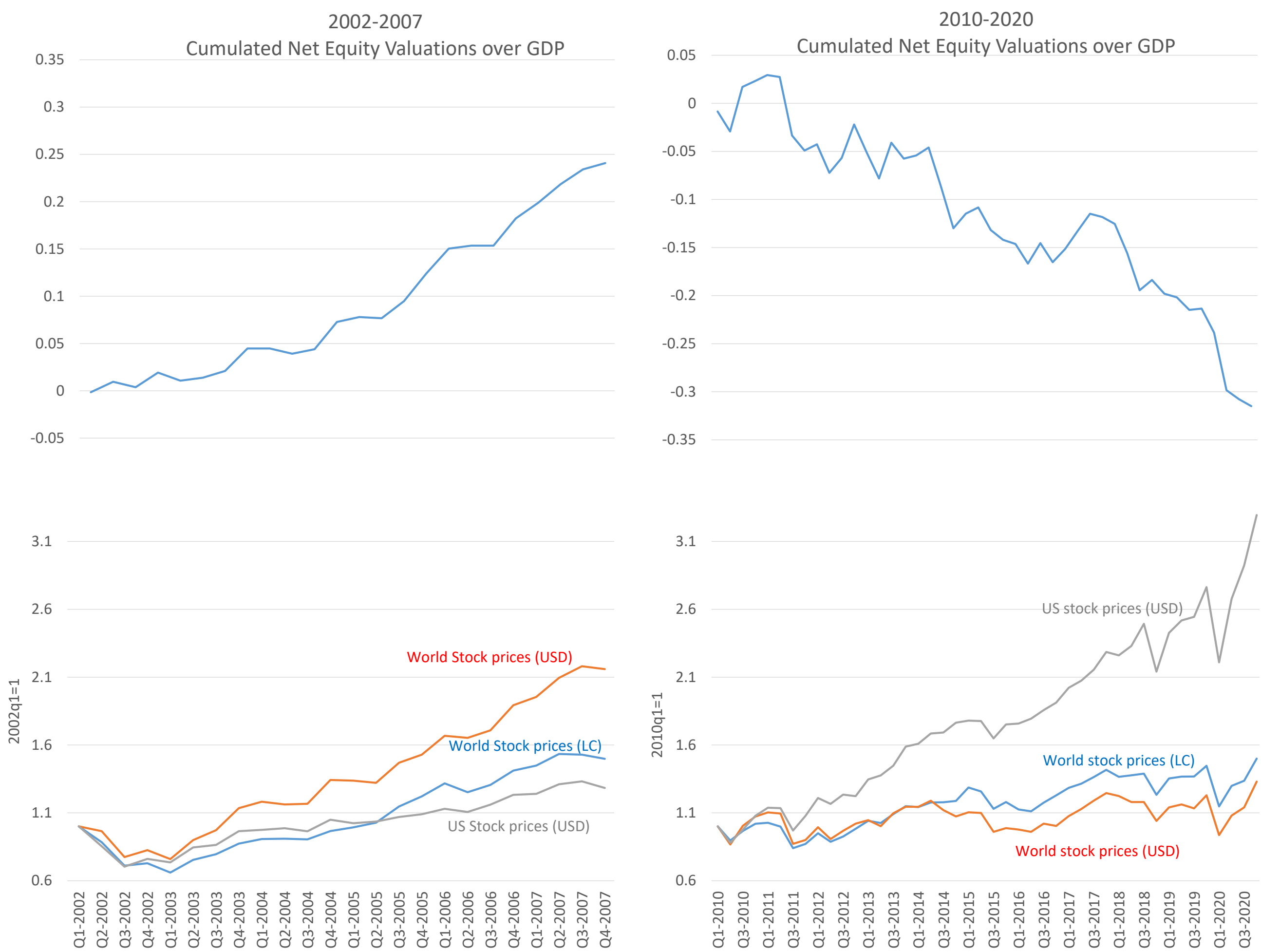

Figure 6: Two valuation episodes

Data issues The findings documented so far rely on standard BEA data. The BEA continues to refine its methodology, and now focuses on estimates at market prices for its headline net foreign asset position presentations. However, there are many challenging measurement issues, which we now briefly discuss.

First, while valuing traded assets such as bonds and public equity is relatively straightforward, valuing foreign direct investment is more difficult. The BEA's valuation model uses U.S. stock price indexes to revalue foreign firms' direct investment into the United States. The idea is that if Toyota owns a subsidiary in the United States, the value of that subsidiary should track the value of a U.S owned car producer. That assumption will be consistent with the economic model we develop in Section 3. Milesi-Ferretti (2021) argues that it may be more appropriate to value foreign firms' direct investment in the United States using foreign stock indices and vice-versa for U.S. direct investment abroad. In the Appendix G Figure

21, we show the cumulated net valuation effects for portfolio equity and direct investment equity separately. In Figure 22, we show the US NFA position relative to GDP with direct investment equity measured at market value and current cost respectively. In these figures we see that the approach to measuring the value of direct investment equity does have a substantial impact on the magnitude of the measured decline in the U.S. NFA position over the past decade. This measurement question merits further study.

A second related issue is the long-standing puzzle that while the U.S net foreign asset position is large and negative, U.S. primary income from abroad as measured in the current account remains positive. That discrepancy would be concerning if it indicated mismeasurement of the U.S net foreign asset position. We discuss this issue in Appendix F where we show that strong net primary income mostly reflects (1) relatively low income on foreign holdings of U.S. portfolio equity, and (2) relatively high income on U.S. direct investment abroad. A natural and innocuous explanation for the first finding is that an important way in which U.S. firms return income to shareholders is via stock buybacks, which do not show up as primary income on the current account. The income discrepancy for direct investment remains an active topic of research in the literature, but a consensus is emerging that a significant portion of this discrepancy reflects U.S. multinationals over reporting income from their overseas subsidiaries for tax purposes. See, for example, Setser (2017), Setser (2019), Torslov, Weir, and Zucman (2020), Guvenen et al. (2021), and Garcia-Bernardo, Jansky, and Zucman (2021). The upshot of some of these papers is that that these concerns affect the division of the current account between net exports and net foreign income but do not distort the measurement of the U.S. Current Account overall.

A third issue has to do with offshore financial centers, such as the Cayman Islands. Accurately measuring the U.S. net foreign asset position requires understanding whether the owners of these offshore accounts are foreigners or Americans. In Appendix H, we show that while these accounts are quite large, there is no evidence of an increase in the offshore share of foreign asset holdings in the US over the 2013-2020 period. So the decline in the U.S. NFA position on which we focus is not a statistical artifact of Americans shifting their money offshore.

Summing up This section has documented the evolution of the US NFA over the past 30 years. The novel observation is that over the past 10 years the US NFA position has fallen by a very large amount (over 40% of GDP) and most of this fall can attributed to negative cumulated net revaluations of international equity positions. These revaluations in turn have been driven by growth of US equity prices that has been much faster than the growth of equity prices in the rest of the world. So fast growth in U.S. equity prices, which is typically interpreted as good news for U.S. residents, has also contributed to a large negative external imbalance, which is typically seen as a worrying sign. In order to better understand the implications of this feature of the data, in the next section we present a simple of model of equity pricing in an open economy.

3 Model

We now develop a simple international macro finance model that we can use to simulate the effects of an increase in US asset prices. The model builds on Farhi and Gourio (2018) and Greenwald, Lettau, and Ludvigson (2021), but extends those frameworks to an international setting to include international positions and flows in the model. The objective is to construct a model that can accommodate a variety of alternative rationales for rising domestic asset values, and to trace out their implications for the US current account, the US net foreign asset position, and welfare for American households.

To illustrate the economic mechanisms as transparently as possible we will focus on an economy without uncertainty and make assumptions on preferences such that the equilibrium can be characterized in closed form. We will then consider the impact of one-time unanticipated shocks that change asset prices, consumption, investment, and the current account.

Also before we go into details, we highlight to key assumptions of the model: the first is that we consider a one good real economy so we abstract from real and nominal exchange rate changes. The second is that we consider fixed international equity portfolio, so we abstract from diversification decisions. These assumptions are justified by our focus on the past 10 years of data, where the U.S. dollar has remained relatively stable against foreign currencies and international equity portfolio have also not changed.

The model has two regions: a domestic economy we think of as the United States, and a foreign economy that stands in for the rest of the world. Each region is populated by a continuum of identical households. We will use stars to denote foreign variables.

3.1 Firms

Heterogeneous firms in each economy produce a continuum of non-tradable intermediate varieties. These intermediates are combined to produce a single composite final good that is traded internationally and used for consumption and investment. Intermediates-producing firms enjoy pricing power and make monopoly profits. Households can potentially trade equities and a risk free bond that is in zero net supply.

In each country there is a unit mass of different intermediate varieties indexed by $i \in [0,1]$. Let Y_{it} denote total production of variety i at date t. Domestic output of the final good is given by

$$Y_t = \left(\int_0^1 Y_{it}^{\left(\frac{\varepsilon-1}{\varepsilon}\right)} di \right)^{\frac{\varepsilon}{\varepsilon-1}}, \tag{3}$$

where $\varepsilon > 1$ is the elasticity of substitution in production between different varieties.

This measure of domestic output Y_t corresponds to GDP for the United States in our model. We have the usual accounting identity relating domestic consumption, investment, and net exports of goods and services to GDP,

$$C_t + K_{t+1} - (1-\delta)K_t + NX_t = Y_t.$$

Note that we assume that this single final good is traded internationally, so that the terms of trade, measured as the relative price of U.S. exports and U.S. imports, is always equal to one. Hence, we abstract from the impact of shocks to monopoly power and/or productivity on the terms of trade.

Within each country there are two sorts of firms that can produce a given variety of intermediate good: a single leader firm with productivity z_{Ht}, and a fringe of identical follower firms, each with productivity $z_{Lt} \leq z_{Ht}$. An intermediate firm with productivity z_{jt} that rents capital k_{jt} and labor l_{jt} produces output y_{jt} given by

$$y_{jt} = z_{jt} k_{jt}^{\alpha} \left(Z_t l_{jt} \right)^{1-\alpha},$$

where Z_t is economy-wide labor productivity. These productivity values for leader and follower firms are common across all varieties.

Bertrand price competition between the leader firm and the follower firms for each variety determines the markup of price over marginal cost charged by the leader firm as in Bernard et al. (2003), Atkeson and Burstein (2007), and Peters (2020). Specifically, let R_t and W_t denote the domestic rental rates for capital and labor. Cost-minimizing unit production costs for intermediate-variety producing firms are given by

$$cost_t(z_{jt}) = \frac{1}{z_{jt}} \left(\frac{W_t}{Z_t(1-\alpha)} \right)^{1-\alpha} \left(\frac{R_t}{\alpha} \right)^{\alpha}.$$

Leader firms producing each variety move first and set a price p_{it}. If these firms did not face any latent competition from follower firms, they would solve the standard monopolistic competition profit maximization problem,

$$\max_{p_{it}} \{p_{it} y_{it}(p_{it}) - cost_t(z_{Ht}) y_{it}(p_{it})\}$$

taking as given the demand curve for variety i implied by the CES specification (eq. 3):

$$y_{it}(p_{it}) = \left(\frac{P_t}{p_{it}}\right)^{\varepsilon} Y_t. \tag{4}$$

However, the leader firm also recognizes that if it sets $p_{it} > cost_t(z_L)$ then latent competitors will be able to profitably enter, and will in fact corner the market. Thus, the leader firm effectively faces an additional constraint on pricing, one which ensures that competitors do not enter and the leader retains a 100 percent market share:

$$p_{it} \leq cost_t(z_{Lt}) \tag{5}$$

There are two possible solutions to the leader's problem, depending on whether the constraint (5) binds. Ignoring that constraint, the first order condition to the firms problem would yield the standard Dixit-Stiglitz optimal price markup to cost expression,

$$p_{it} = \frac{\varepsilon}{\varepsilon - 1} cost_t(z_{Ht}).$$

However, if this solution violates eq. 5 then the limit pricing constraint must bind, implying $p_{it} = cost_t(z_L)$. Thus, the equilibrium markup μ_t is given by

$$\mu_t = \frac{p_{it}}{cost_t(z_H)} = \min\left\{\frac{\varepsilon}{\varepsilon - 1}, \frac{cost_t(z_{Lt})}{cost_t(z_{Ht})} = \frac{z_{Ht}}{z_{Lt}}\right\} \tag{6}$$

We will assume that $\frac{z_{Ht}}{z_{Lt}} < \frac{\varepsilon}{\varepsilon-1}$ for all t, so that markups are always driven by the threat of potential competition, $\mu_t = \frac{z_{Ht}}{z_{Lt}}$.

Note that because all varieties are symmetric, equilibrium prices, markups, labor, capital and output are identical across varieties, $p_{it} = P_t$, $k_{it} = K_t$, $l_{it} = L_t$, and

$$y_{it} = Y_{it} = Y_t = z_{Ht} K_t^{\alpha} \left(Z_t L_t\right)^{1-\alpha}. \tag{7}$$

Without loss of generality we will normalize $P_t = 1$ for all t. Output from intermediate firms is divided between rental payments to labor and capital and pure profits. Profits and the dividends of intermediate goods producers are given by

$$\Pi_t = \left(\frac{\mu_t - 1}{\mu_t}\right) Y_t$$

while the shares of income going to labor and capital are

$$\frac{W_t L_t}{Y_t} = \frac{(1-\alpha)}{\mu_t} \tag{8}$$

$$\frac{R_t K_t}{Y_t} = \frac{\alpha}{\mu_t} \tag{9}$$

In addition to intermediate-producing firms, a second set of competitive firms hold and rent out capital, and make investment choices. These competitive investment firms choose investment to maximize the expected present value of dividends. Dividends from these firms are given by

$$D_{Xt} = R_t K_t - [K_{t+1} - (1-\delta)K_t]$$

Dividends are discounted back to date 0 using the sequence for the world interest rate $\{r_t^*\}$. Thus investment firms solve

$$\max_{\{K_{t+1}\}_{t=0}^{\infty}} \left\{ D_{X0} + \sum_{t=1}^{\infty} \frac{D_{Xt}}{\Pi_{j=1}^{t}(1+r_j^*)} \right\}$$

given an initial capital stock K_0.

For the optimal investment choice to have an interior solution, it must be the case that

$$R_t - \delta = r_t^* \tag{10}$$

for all $t \geq 1$. We will assume that K_0 is such that this condition is also satisfied at $t = 0$.

3.2 Households

Lifetime utility for the domestic representative infinitely-lived household is given by

$$\sum_{t=0}^{\infty} \left(\frac{1}{1+\rho}\right)^t u_t(C_t, L_t) \tag{11}$$

where the flow utility function is given by the following Greenwood, Hercowitz, and Huffman (1988) specification

$$u_t(C_t, L_t) = \frac{\left(C_t - Z_t \frac{L_t^{1+\sigma}}{1+\sigma}\right)^{1-\gamma}}{1-\gamma}.$$

We choose this specification because it is tractable. In particular, it allows us to solve for the allocation of capital and labor independently of the net wealth of the domestic country. The Frisch elasticity of labor supply is $1/\sigma$, and the parameter $\gamma \geq 1$ controls risk aversion and the household's willingness to substitute inter-temporally.

The assets in this economy are shares in domestic and foreign firms and a one period bond denominated in units of the final good. Absent risk, all these assets must pay the same return in equilibrium, and optimal bond-equity portfolios are indeterminate. We will assume that international equity portfolios are diversified, but the extent of diversification is fixed.[9] Domestic households own a fixed fraction λ of shares in domestic intermediate-goods-producing and investment firms (foreign households own fraction $1-\lambda$). Domestic households also own a fixed fraction λ^* of foreign firms. Changes in the relative domestic versus foreign demand for savings are accommodated by free international trade in the bond whose net return is r_t^*. Thus the flow budget constraint for the domestic representative household is

$$C_t + B_{t+1} = W_t L_t + \lambda D_t + \lambda^* D_t^* + (1 + r_t^*) B_t \tag{12}$$

where D_t and D_t^* denotes payouts to domestic and foreign equity holders, and are given by

$$\begin{aligned} D_t &= \Pi_t + D_{Xt} \\ D_t^* &= \Pi_t^* + D_{Xt}^* \end{aligned}$$

Domestic households choose sequences for C_t, L_t and B_{t+1} to maximize eq. 11 subject to a sequence of budget constraints of the form 12, given an initial bond position B_0. Their first order condition for labor supply is

$$L_t = \left(\frac{W_t}{Z_t}\right)^{\frac{1}{\sigma}} \tag{13}$$

and the condition for bond purchases is

$$\left(C_t - Z_t \frac{L_t^{1+\sigma}}{1+\sigma}\right)^{-\gamma} = \frac{1 + r_{t+1}^*}{1+\rho} \left(C_{t+1} - Z_{t+1} \frac{L_{t+1}^{1+\sigma}}{1+\sigma}\right)^{-\gamma} \tag{14}$$

Foreign households are symmetric to domestic ones, except that we assume they have linear utility ($\gamma^* = 0$) and a discount factor ρ^*. Because foreign households are infinitely willing to substitute consumption inter-temporally, the world interest rate is pinned down at[10]

$$r_t^* = \rho^*. \tag{15}$$

[9] As we have noted above, a large portion of international holdings of equity are in the form of FDI for which standard optimal portfolio considerations are likely not first-order determinants of the extent of international diversification.

[10] We have experimented with a specification in which foreign households have the same concave preferences as domestic households. In that economy, shocks that change the equilibrium capital stock induce transitional dynamics.

3.3 Equilibrium

An equilibrium is a sequence for the world interest rate $\{r_t^*\}_{t=0}^{\infty}$ and sequences for domestic and foreign factor prices $\{R_t, W_t\}_{t=0}^{\infty}$ and $\{R_t^*, W_t^*\}_{t=0}^{\infty}$ such that when households and firms take these prices as given and solve their maximization problems, markets clear. Because bonds are in zero net supply, bond market clearing requires $B_t + B_t^* = 0$.

Our assumptions on preferences eliminate wealth effects on labor supply and on the world demand for savings. It is therefore possible to characterize the production side of the model in closed form. In particular, equations 15, 6, 7, 8, 9, 10 and 13 can be used to solve in closed form for r_t^*, μ_t, Y_t, L_t, K_t, R_t and W_t. A similar set of equations pins down the foreign production allocation.

These allocations are given by

$$\begin{aligned}
\frac{K_t}{Z_t} &= z_{Lt}^{\frac{1+\sigma}{\sigma(1-\alpha)}}(1-\alpha)^{\frac{1}{\sigma}}\left(\frac{\alpha}{r^*+\delta}\right)^{\frac{\sigma+\alpha}{\sigma(1-\alpha)}} \\
L_t &= z_{Lt}^{\frac{1}{\sigma(1-\alpha)}}(1-\alpha)^{\frac{1}{\sigma}}\left(\frac{\alpha}{r^*+\delta}\right)^{\frac{\alpha}{\sigma(1-\alpha)}} \\
\frac{Y_t}{Z_t} &= z_{Ht} \times z_{Lt}^{\frac{1+\alpha\sigma}{\sigma(1-\alpha)}}(1-\alpha)^{\frac{1}{\sigma}}\left(\frac{\alpha}{r^*+\delta}\right)^{\frac{\alpha(1+\sigma)}{\sigma(1-\alpha)}}
\end{aligned}$$

$$\begin{aligned}
R_t &= r^* + \delta \\
W_t &= Z_t L_t^{\sigma}
\end{aligned}$$

Note that the capital to output ratio is

$$\frac{K_t}{Y_t} = \frac{z_{Lt}}{z_{Ht}}\left(\frac{\alpha}{r^*+\delta}\right) = \frac{1}{\mu_t}\left(\frac{\alpha}{r^*+\delta}\right) \tag{16}$$

Thus, the equilibrium capital to output ratio is smaller the larger are markups. The intuition is that firms reduce factor demands in order to reduce supply and thus charge higher prices.

3.4 Asset Pricing

The ex dividend price of a share in the domestic investment firm is simply the value of the capital the firm holds, as in the standard growth model:[11]

$$V_{Kt} = \sum_{j=1}^{\infty} \frac{D_{X,t+j}}{(1+r^*)^j} = K_{t+1}.$$

The ex dividend price of a share of all domestic intermediate-goods producing firms is the present value of the future stream of monopoly profits these firms will earn.

$$V_{\Pi t} = \sum_{j=1}^{\infty} \frac{\Pi_{t+j}}{(1+r^*)^j}$$

The market price of all domestic firms is $V_t = V_{Kt} + V_{\Pi t}$.

We will explore our model's implications for these standard firm valuation ratios used in the literature:

1. The ratio of firm value V_t to GDP, V_t/Y_t, which is known as the *Buffett indicator*.

2. The ratio of value to the replacement cost of capital, V_t/K_{t+1}, which is called *Tobin's Q*.

3. The *dividend yield* measured as the ratio of dividends to value D_{t+1}/V_t where dividends are defined as total payouts to firm owners: $D_t = Y_t - W_t L_t - X_t$, and

4. The *price earnings ratio* measured as the ratio of value to earnings V_t/E_{t+1}, where earnings are defined as output less payments to labor and depreciation: $E_t = Y_t - W_t L_t - \delta K_t$.

Note that we are also interested in the *capital output ratio* measured as K_{t+1}/Y_{t+1} which can be computed from the Buffett indicator, Tobin's Q, and the growth rate of output. This capital output ratio is given as a function of parameters in equation 16.

[11] Note that the return to these shares is

$$\begin{aligned} \frac{V_{K,t+1} + D_{X,t+1}}{V_{Kt}} &= \frac{RK_{t+1} + (1-\delta)K_{t+1} - K_{t+2} + K_{t+2}}{K_{t+1}} \\ &= 1 + r^*. \end{aligned}$$

3.5 Balanced growth path

Suppose labor productivity Z_t grows at a constant rate g_Z and that multi-factor productivity for leaders and followers is constant, $z_{Ht} = z_H$ and $z_{Lt} = z_L$. The markup will then be constant, $\mu_t = \mu = \frac{z_H}{z_L}$, and capital, output, profits and the wage will also grow at rate g_Z while hours worked will be constant.[12]

On the balanced growth path, firm values are given by

$$
\begin{aligned}
V_{\Pi t} &= \sum_{j=1}^{\infty} \frac{(1+g_Z)^j}{(1+r^*)^j} \Pi_t = \left(\frac{1+g_Z}{r^*-g_Z}\right)\left(\frac{\mu-1}{\mu}\right) Y_t \\
V_{Kt} &= K_{t+1} = \frac{1}{\mu}\left(\frac{\alpha}{r^*+\delta}\right)(1+g_Z)Y_t
\end{aligned}
$$

and thus the total value of domestic corporations is given by

$$
\begin{aligned}
V_t &= V_{Kt} + V_{\Pi t} \\
&= \frac{1}{\mu}\left(\frac{\alpha}{r^*+\delta}\right)(1+g_Z)Y_t + \left(\frac{1+g_Z}{r^*-g_Z}\right)\left(\frac{\mu-1}{\mu}\right) Y_t.
\end{aligned}
$$

The balanced growth path ratio of dividends to output is

$$
\begin{aligned}
\frac{D_t}{Y_t} &= (r^*-g_Z)\frac{K_t}{Y_t} + \frac{\Pi_t}{Y_t} \\
&= (r^*-g_Z)\frac{1}{\mu}\left(\frac{\alpha}{r^*+\delta}\right) + \frac{\mu-1}{\mu}
\end{aligned}
$$

Our reference valuation measures are thus as follows:

Buffett indicator	$BI_t = \frac{V_t}{Y_{t+1}}$	$= \frac{1}{\mu}\left(\frac{\alpha}{r^*+\delta}\right) + \left(\frac{1}{r^*-g_Z}\right)\left(\frac{\mu-1}{\mu}\right)$
Tobin's Q	$Q_t = \frac{V_t}{K_{t+1}}$	$= 1 + \left(\frac{r^*+\delta}{r^*-g_Z}\right)\left(\frac{\mu-1}{\alpha}\right)$
Dividend yield	$DP_t = \frac{D_{t+1}}{V_t}$	$= r^* - g_Z$
Price to (forward) earnings ratio	$PE_t = \frac{V_t}{E_{t+1}}$	$= \frac{1}{r^*-g_Z+\frac{g_Z}{Q_t}}$

These expressions are readily interpretable.

First, the ratio of next period's dividends to the current ex-dividend stock (the Dividend Yield) is simply $r^* - g_Z$. This corresponds to the inverse of the valuation multiple (the price dividend ratio V_t/D_{t+1}) one would expect given that dividends grow at rate g_Z and are discounted at rate r^*.

[12]The absence of a trend in hours worked, not withstanding growth in wages and the absence of income reflects, reflects the presence of Z_t in the period utility specification.

Second, the value of stocks relative to (next period) output (the Buffett Ratio) is the sum of the capital to output ratio (the value of investment firms) plus the present value of monopoly profits (the value of intermediate producers), which in turn is the share of income going to profits times the valuation multiple implied by the price dividend ratio. Thus, changes in the markup μ have a direct impact on the value of this profits relative to output given by this valuation multiple. Likewise, changes in $(r^* - g)^{-1}$, corresponding to changes in this valuation multiple, have a direct impact on this Buffett Ratio given by the magnitude of markups $(\mu - 1)/\mu$.

Note that the capital output ratio in equation 16 corresponding to the first term in the expression for the Buffett Ratio is much less responsive to changes in markups μ than is the value of monopoly profits relative to output corresponding to the second term in the Buffett Ratio. Thus, increases in monopoly markups μ raise Tobin's Q. The impact of changes in the discount rate r^* and the growth rate g_Z individually on the Buffett Ratio and Tobin's Q depend on the magnitude of monopoly profits μ and the impact of these changes in the capital rental rate $R = r^* + \delta$ and the valuation multiple implied by the dividend yield $(r^* - g_Z)^{-1}$.

Finally, consider the price-earnings ratio. This ratio is equal to the inverse of the discount rate $(1/r^*)$ when there are no monopoly profits so that Tobin's Q is equal to one ($Q_t = 1$) or when the growth rate $g_Z = 0$. But when Tobin's Q exceeds one and there is positive growth ($g_Z > 0$,) the PE ratio is larger than $1/r^*$ and is increasing in Tobin's Q and thus increasing in μ, even if there is no change in the discount rate r^*. The logic is that larger markups translate to a larger fraction of firm payouts representing monopoly profits and a smaller fraction representing returns to capital, where payouts are reduced by net investment. Thus a higher markup economy has a higher ratio of firm payouts of dividends to earnings.

3.5.1 Balance of Payments Accounting

To solve for the current account, we must solve for the consumption of domestic households. We assume that the discount factor for domestic households satisfies

$$1 + \rho = (1 + r^*)(1 + g_Z)^{-\gamma}. \tag{17}$$

Given this assumption, domestic consumption will also grow rate g_Z on the balanced growth path.[13]

[13]The balanced growth path ratio of domestic consumption to output is given by

$$\begin{aligned}\frac{C_t}{Y_t} &= \frac{W_t L_t}{Y_t} + \lambda \frac{D_t}{Y_t} + \lambda^* \frac{D_t^*}{Y_t} + (r^* - g_Z)\frac{B_t}{Y_t} \\ &= \frac{1-\alpha}{\mu} + \lambda \frac{\mu - 1}{\mu} + \lambda^* \frac{\mu^* - 1}{\mu^*}\frac{Y_t^*}{Y_t} + (r^* - g_Z)\left(\lambda \frac{K_t}{Y_t} + \lambda^* \frac{K_t^*}{Y_t^*}\frac{Y_t^*}{Y_t} + \frac{B_t}{Y_t}\right)\end{aligned}$$

The domestic resource constraint is

$$\begin{aligned} C_t + K_{t+1} + NX_t &= Y_t + (1-\delta)K_t \\ &= W_t L_t + D_t + (1-\delta)K_t \end{aligned}$$

where NX_t denotes net exports of goods and services.

Combining this with the domestic households budget constraint gives

$$B_{t+1} - B_t = NX_t + r_t^* B_t - (1-\lambda)D_t + \lambda^* D_t^* \tag{18}$$

where $B_{t+1} - B_t$ is the flow of financial transactions financing the current account surplus (net lending abroad) and $r_t^* B_t - (1-\lambda)D_t + \lambda^* D_t^*$ is net factor income from abroad.

We define the net foreign asset position as the sum of the net bond and equity positions

$$NFA_t = B_{t+1} + \lambda^* V_t^* - (1-\lambda)V_t$$

Thus the change in the net foreign asset position is given by

$$NFA_t - NFA_{t-1} = B_{t+1} - B_t + \lambda^* \left(V_t^* - V_{t-1}^*\right) - (1-\lambda)\left(V_t - V_{t-1}\right) \tag{19}$$

where the first term is the current account surplus, and the second terms capture valuation effects. This is exactly the model analogue of equation 1 with no statistical discrepancy.

3.6 Nature of Experiments

Prior to 2010 we will think of the US as being on the balanced growth path of the economy just described. We then consider a one-time unanticipated shock to model parameters that is designed to replicate observed changes in key valuation metrics.

On the initial balanced growth path, the domestic and foreign economies are assumed to share identical production technologies and to be of equal size. On this initial balanced growth path the only asymmetries between regions are (i) households in the foreign economy have linear preferences and a different discount factor, and (ii) the initial net bond position

where

$$\frac{K_t}{Y_t} = \frac{1}{\mu}\left(\frac{\alpha}{r^* + \delta}\right)$$

and

$$\frac{B_t}{Y_t} = \frac{B_0}{Y_0}$$

is the initial bond to GDP ratio.

is not necessarily equal to zero.

The key component of the shock we simulate is a permanent change in the values for domestic leader and follower productivities, $\{z_H, z_L\}$, which in turn generates a permanent increase in the domestic markup, $\mu = z_H/z_L$. We will assume no change in the foreign markup. In our baseline experiment we will also allow for permanent one-time changes in the world trend productivity growth rate, g_Z, and in the world interest rate, r^*. The change in the latter can be interpreted as reflected a change in the foreign representative household's discount factor ρ^*. Let hat's denote post-shock values for these parameters. When we shock g_Z and r^* we will impose the restriction that changes to these parameters are such that eq. 17 remains satisfied, so that there is a new balanced growth path along which domestic consumption grows at rate $\hat{g}_Z$.

Our timing assumption is as follows. At date T all households and firms suddenly anticipate the new economy-wide growth rate $\hat{g}_Z$ and interest rate $\hat{r}^*$ moving forward. They also anticipate that from date $T+1$ and onward, markups will be given by $\hat{\mu}$. But no productivity values or markups change at T. Thus factor prices and monopoly profits at date T are exactly as households expected at $T-1$. Because foreign households are assumed to have linear utility, they are willing to adjust consumption as needed at date T to finance the jump to the new balanced growth path values for domestic and foreign capital at $T+1$.

Domestic households enter period T with claims to fractions λ and λ^* of domestic and foreign monopoly profits, and they also own B_T bonds and $\lambda K_T + \lambda^* K_T^*$ units of capital. Domestic labor supply at each date is given by eq. 13. To characterize the equilibrium path for domestic consumption we use the intertemporal first order conditions (eq. 14) and the present value budget constraint, which is

$$C_T + \sum_{j=1}^{\infty} \frac{C_{T+j}}{(1+\hat{r})^j} = W_T L_T + \sum_{j=1}^{\infty} \frac{W_{T+j}L_{T+j} + \lambda \Pi_{T+j} + \lambda^* \Pi_{T+j}^*}{(1+\hat{r})^j}$$
$$+\lambda\left(\Pi_T + (1+r)K_T - K_{T+1}\right) + \lambda^*\left(\Pi_T^* + (1+r)K_T^* - K_{T+1}^*\right) + \lambda V_{KT} + \lambda V_{KT}^* + (1+r)B_T$$

where the second line captures dividends at date T plus the ex dividend resale value of investment-producing firms. Note that $V_{KT} = K_{T+1}$ and $V_{KT}^* = K_{T+1}^*$.

Given our balanced growth property, consumption, earnings and profits will all grow at rate $\hat{g}_Z$ from date $T+1$ onwards. Because markups change between T and $T+1$, labor earnings and hours worked grow at a different rate between T and $T+1$. And because hours and consumption enter non-separably in utility, consumption also grows at a different rate between T and $T+1$. Given the solutions for consumption, the path for equilibrium bond holdings is given by the sequential budget constraint, eq. 12.[14].

4 Valuations Metrics for the U.S. Corporate Sector

When mapping our model to data, we will interpret our model as capturing the corporate sector of the US economy.[15] We now describe our empirical measures for the U.S. Corporate Sector corresponding to the model flows of dividends D_t and earnings E_t, the stock of capital K_{t+1}, and the value of these corporations V_t.

We use Tables S5 and S6 of the Integrated Macroeconomic Accounts to measure the flows and balance sheets of the U.S. corporate sector. Table S5 presents data for the Nonfinancial Corporate Business Sector and Table S6 presents data for the Financial Business Sector. We combine these two accounts into an aggregated Corporate Sector to take into account the fact that the overwhelming portion of ROW portfolio and direct investment in the United States is placed in these two sectors.

The use of the residence principle to measure economic activity has a substantial impact on how one measures the flows of economic activity in the U.S. corporate sector relative to what one would get if one were to instead associate the economic activity of overseas affiliates of multinational enterprises with the location of the headquarters of that enterprise. For example, the BEA reports that in 2018, majority-owned U.S. affiliates of foreign multi-

[14]Equilibrium consumption values are given by

$$\begin{aligned} C_T &= \frac{(\hat{r}-\hat{g})}{(1+\hat{r})}(I_T + A_T) + \frac{1}{(1+\hat{r})} I_{T+1} + \frac{(1+\hat{g})}{(1+\hat{r})} \frac{Z_T}{1+\sigma}\left(L_T^{1+\sigma} - L_{T+1}^{1+\sigma}\right) && (20)\\ C_{T+1} &= \frac{(1+\hat{g}_Z)(\hat{r}-\hat{g})}{(1+\hat{r})}(I_T + A_T) + \frac{(1+\hat{g}_Z)}{(1+\hat{r})} I_{T+1} - \frac{(1+\hat{g}_Z)(\hat{r}-\hat{g})}{(1+\hat{r})} \frac{Z_T}{1+\sigma}\left(L_T^{1+\sigma} - L_{T+1}^{1+\sigma}\right) && (21) \end{aligned}$$

where

$$\begin{aligned} I_T &= W_T L_T + \lambda \Pi_T + \lambda^* \Pi_T^* \\ I_{T+1} &= W_{T+1} L_{T+1} + \lambda \Pi_{T+1} + \lambda^* \Pi_{T+1}^* \\ A_T &= (1+r)(\lambda K_0 + \lambda^* K_0^* + B_0) \end{aligned}$$

These consumption values imply the following path for bonds:

$$B_{T+1} = I_T + A_T - \lambda K_{T+1} - \lambda^* K_{T+1}^* - C_T$$

$$B_{T+2} = I_{T+1} + (1+\hat{r})B_{T+1} + \lambda\left((1+\hat{r})K_{T+1} - (1+\hat{g})K_{T+1}\right) + \lambda^*\left((1+\hat{r})K_{T+1}^* - (1+\hat{g})K_{T+1}^*\right) - C_{T+1}$$

[15]In practice a portion of economic activity occurs outside the corporate sector, where residential real estate and consumer durables are the key assets. But international residential real estate diversification is minimal, implying that changes in house prices will have a minimal impact on the US net foreign asset position.

national enterprises contributed $1.1 trillion or 7.1% of U.S. Business Sector Value Added and accounted for 6.0% of total private industry employment in the United States. Likewise, in 2018, U.S. multinational enterprises produced $5.7 trillion of value added, $4.2 trillion of which was produced by U.S. resident operations with 28.6 million employees and $1.5 trillion of which was produced by majority owned affiliates abroad with 14.4 million employees. Based on the residence principle, the Integrated Macroeconomic Accounts includes that $1.1 trillion of value added by majority owned U.S. affiliates of foreign multinational enterprises as a flow attributed to the U.S. corporate sector and does not include the $1.5 trillion produced by majority owned affiliates abroad of U.S multinational enterprises as part of the value added of the U.S. Corporate Sector.

We use the following flows recorded on Tables S5 and S6 for our measurement. We measure the size of the corporate sector relative to the economy as a whole by comparing the aggregate of gross value added for the non-financial corporate business sector and the financial business sector relative to gross value added for the economy as a whole. The gross value added of these sectors is divided into four categories of income on these tables S5 and S6: consumption of fixed capital (depreciation), compensation of employees, taxes on production and imports less subsidies, and net operating surplus. We measure what we call the *earnings* of the corporate sector as net operating surplus less current taxes on income and wealth as listed on tables S5 and S6. We measure what we call the *dividends* of the corporate sector as net operating surplus less current taxes on income, wealth less net capital formation as listed on these tables.

We interpret this measure of dividends as the after-tax cash flow from operations of corporations resident in the United States that is available to pay out to investors in the debt and equity of those corporations. Note that, in practice, only some of this cash flow is paid out to investors, while the rest of it is used to acquire, on net, financial assets (as accounted for in Tables S5 and S6). As discussed below, following Modigliani and Miller, we assume that the valuation of the corporate sector is invariant to its financial policy regarding payouts (either as dividends or net acquisition of financial assets). Likewise, we interpret this measure of earnings as the after-tax flow of earnings from operations of these corporations resident in the United States. In both cases, these measures correspond to cash flows if these firms were 100% equity financed and maintained no financial assets. In this regard, we also follow Modigliani and Miller in assuming that the financial policy of these firms (in terms of debt and equity) does not impact the overall value of these firms.

Our goal in measuring positions is to place a value on these flows of economic activity that we refer to as earnings and dividends in these corporations resident in the United States. Thus, we make several adjustments to the balance sheet data for the corporate sector presented in Tables S5 and S6. The following stylized balance sheet for the US corporate sector is useful for organizing our discussion of these adjustments. This stylized balance sheet corresponds to the organization of the balance sheets for the U.S. non-financial corporate business and financial business sectors in Tables S5 and S6 of the Integrated Macroeconomic Accounts. Recall that this balance sheet is an aggregate of both US firms (parent firm is in the U.S.) and U.S. resident subsidiaries of foreign multinationals.

Corporate Sector Balance Sheet

Assets	Liabilities
Non-financial assets	Equity
(Replacement or Enterprise Value)	(Measured at Market value)
Financial assets	Financial liabilities
(includes US FDI in ROW)	(debt, bank loans etc including ROW FDI in US)

Our specific aim is to value the non-financial assets held by U.S. resident corporations corresponding to the first entry in the left column of this balance sheet. We consider two measures of this value. The first of these is a measure of the *replacement value* of these non-financial assets. This measure corresponds to the variable K_{t+1} in our model. The second is a measure of what we term the *enterprise value* of these non-financial assets.[16] This measure corresponds to the variable V_t in our model. We describe these two measures in turn. In the appendix, we describe in detail the series that we use in our analysis of flows and positions in the US Corporate Sector.

In the tables S5 and S6, the non-financial assets of the corporate sector are measured at replacement cost using a perpetual inventory method to cumulate investment with the valuation of investment done using an investment price deflator. We use this as our measure of K_{t+1} in the model. Note that this balance sheet is measured at the end of period, so K_{t+1} in the model corresponds to the replacement value of the capital stock at the end of period t in Tables S5 and S6.

The financial assets of these firms listed as the second entry on the left side of this balance sheet include the usual financial instruments as well as the debt and equity components of US parent firms' foreign direct investment abroad. The financial liabilities of these firms listed as the second item on the right side of this balance sheet include the usual financial instruments including the debt and equity components of the direct investment of foreign parent firms into their US subsidiaries.

On Tables S5 and S6, the equity entry that is the first entry on the right side of this

[16]Our measurement concept for the value of corporations is roughly similar to the concept of *enterprise value* used as a valuation benchmark for individual companies.

balance sheet is measured by an estimate of the market value of outstanding corporate equities. Foreign direct investment in the United States is included in the list of financial liabilities of U.S. corporations, and the market value of the equity component of FDI into the US is also estimated using U.S. stock market indices.[17]

Thus, this balance sheet can be used to construct a market valuation of the measured and unmeasured non-financial assets of the U.S. corporate sector under the assumption that all financial entries are measured at market value as follows.

We measure the value attached in financial markets to U.S. corporate non-financial assets, both measured and unmeasured, as the sum of the market value of equities plus the value of the financial liabilities (both on the right side of the balance sheet above) less the value of financial assets on the left side of this balance sheet. We refer to this estimate of value as the *enterprise value* of the U.S. corporate sector. Note that with this approach to valuing the non-financial assets of the U.S. corporate sector, the two sides of the balance sheet above add up in the standard sense of having the sum of the left side and right side equal.

4.1 Flows and Positions for the U.S. Corporate Sector

We now consider our the evolution over time of the data analogs to our key model valuation metrics. We first consider the evolution of the Buffett indicator. In Figure 7, we show the data analog of the Buffett indicator in our model V_t/GDP_t. We use our measure of the *enterprise value* of the non-financial assets of the U.S. Corporate Sector as our measure of V_t. In this figure, the ratio of this enterprise value to GDP is shown as a blue line. We use the measure of the *replacement value* of the non-financial assets of the U.S. Corporate Sector as our measure of K_{t+1}. We show the ratio of this measure to GDP as an orange line.[18] As is clear in this figure, the capital output ratio has been quite stable over time, while the enterprise value of U.S. corporations has risen substantially. A direct implication of the divergence between these two lines is that our measure of Tobin's Q for the U.S. corporate sector has risen substantially over the past decade. We show the evolution of Tobin's Q measured as the ratio V_t/K_{t+1} in Figure 8. Tobin's Q now exceeds its previous peak during

[17]Given this use of market values to measure the equity entries in this balance sheet, the entries on the two sides of this balance sheet does not add up in the standard sense of having the sum of the left side and right side equal. In the Integrated Macroeconomic Accounts, an additional entry called *Net Worth* is included as the bottom of this balance sheet to reconcile the two sides (line 156 on Table S5 and line 151 on Table S6). This entry called Net Worth does not correspond to the standard accounting notion of net worth nor the measure of net worth in Table B.103. This accounting difference occurs because the Integrated Macroeconomic Accounts are compiled under the UN System of National Accounts which differs in several respects from those used in the US NIPA. See `https://www.bea.gov/national/sna-and-nipas` for more information.

[18]We reproduce this figure for the Financial Business Sector and Non-Financial Corporate Business Sector separately in the appendix in Figures 25 and 26 respectively.

the Dotcom stock boom.

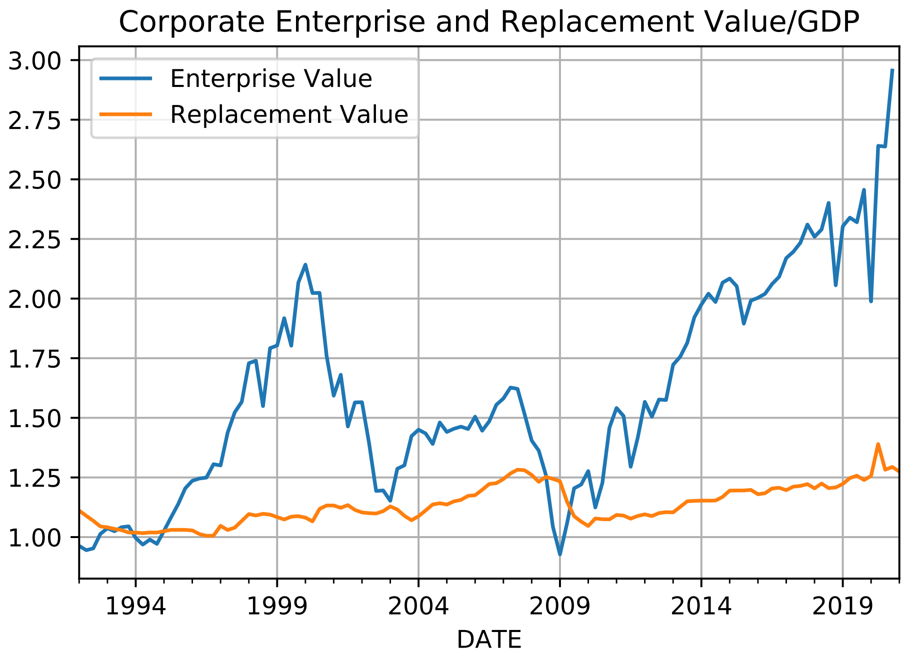

Figure 7: Ratio of Enterprise and Replacement Values of US Corporate Sector Nonfinancial Assets to GDP

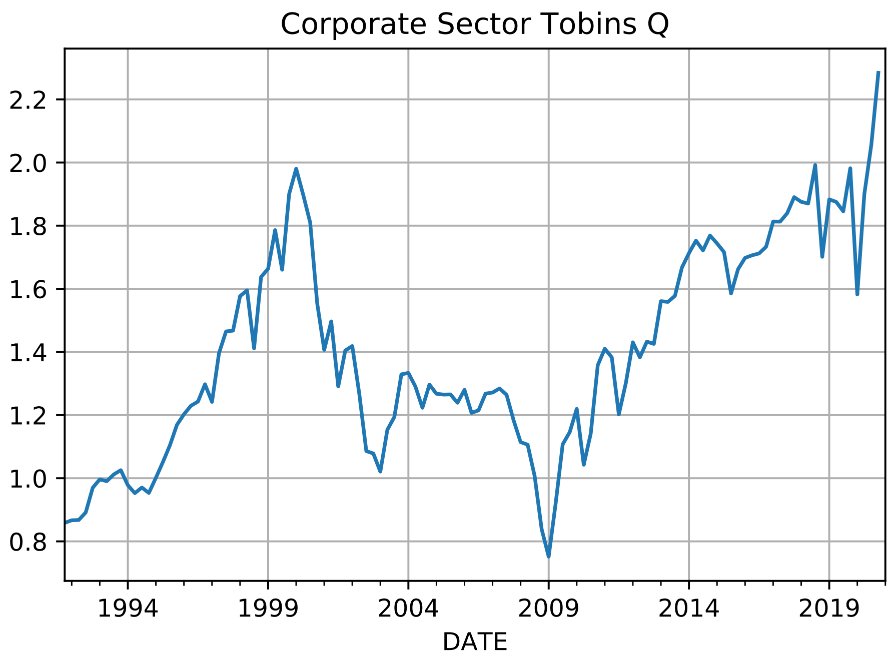

Figure 8: Tobin's Q for the US Corporate Sector

We now consider data on dividend yields corresponding to D_{t+1}/V_t in our model. In Figure 9 we construct a measure of the dividend or payout yield for the U.S. corporate sector based on the ratio of our measure of the after-tax cash available from operations to pay to investors to our measure of the enterprise value of this sector. We map this measure of payouts to the variable D_t in our model. What is striking about this figure is that the ratio of payouts to value has not changed much in recent years relative to the period prior to 2007.

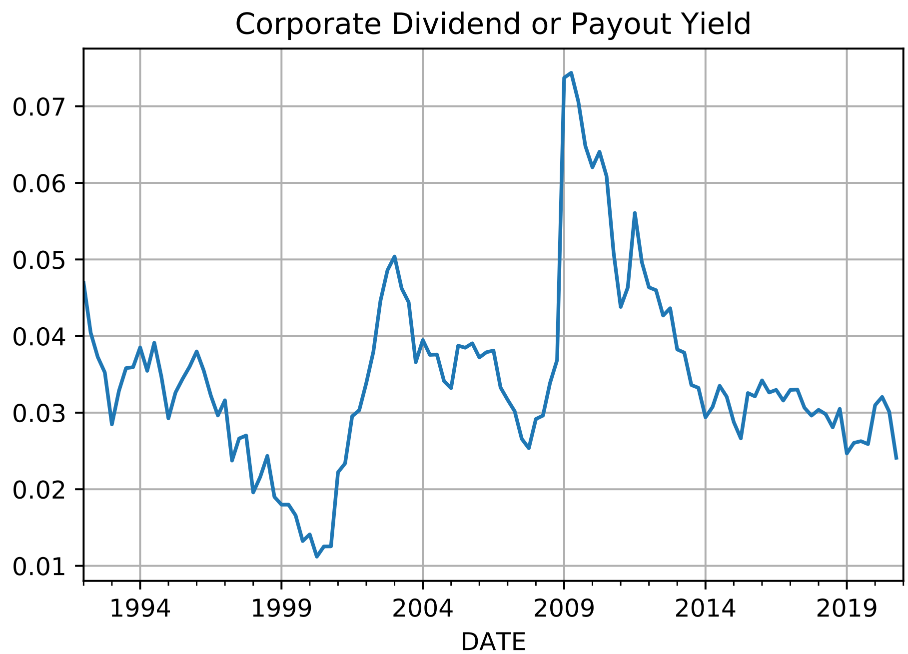

Figure 9: Ratio of Payouts to Investors to Enterprise Value of U.S. Corporate Sector

One immediate implication of Figure 9 is that our measure of dividends relative to GDP must have risen substantially in the past ten years to match the increase in the ratio of the enterprise value of corporations in the US relative to GDP shown in Figure 7.

In Figure 10, we examine the ratio of this measure of D_t to GDP. We see that this ratio has indeed risen substantially over the past ten years relative to the period prior to 2007. Thus, it appears that a substantial portion of the increase in the ratio of the value of U.S. corporations to GDP can be accounted for by an increase in payouts D_t.

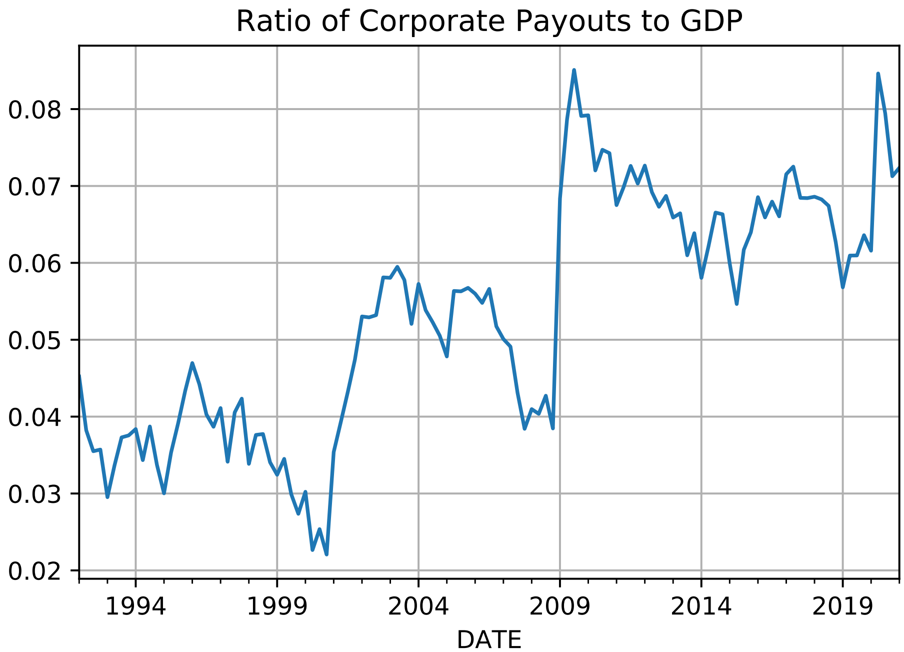

Figure 10: Ratio of Payouts to Investors in U.S. Corporate Sector to GDP

We now consider data on price earnings ratios corresponding to V_t/E_{t+1} in our model. In Figure 11, we examine the ratio of the enterprise value of U.S. corporations to our measure of the after-tax earnings from operations of the U.S. corporate sector. We see that this price-earnings ratio has risen substantially over the past ten years.

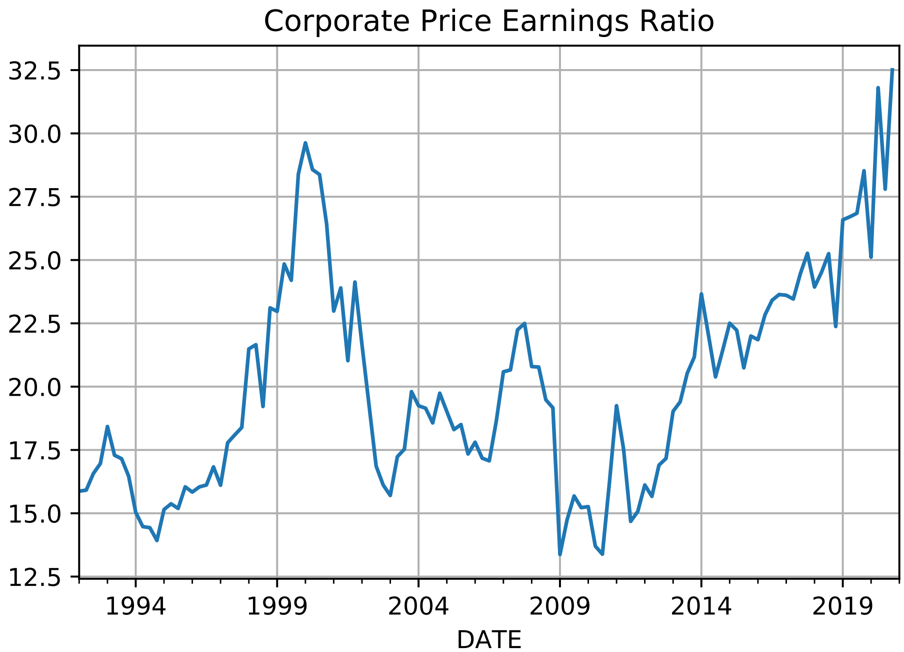

Figure 11: Enterprise Value to Earnings ratio U.S. Corporate Sector

We now consider data relevant for the choice of the parameter λ in our model. In Figure 12, we show the extent of foreign holdings of equity in the U.S. corporate sector. As discussed above, we measure ROW holdings of equity in U.S. resident corporations as the sum of portfolio holdings of corporate equities and FDI equity. The denominator in these ratios is either the enterprise value of the U.S. corporate sector or the sum of corporate equities issued by this sector and ROW FDI equity. We see that the extent of foreign ownership of U.S. portfolio and FDI equity has risen considerably and now exceeds 30%.

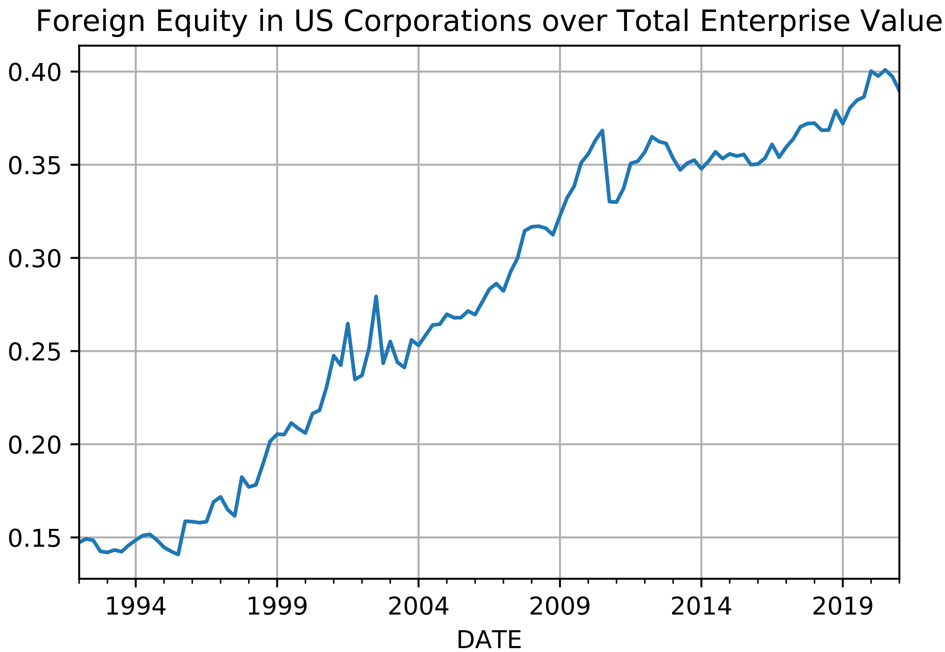

Figure 12: ROW holdings of portfolio and DI equity over total US Corporate enterprise value

5 Calibration and Results

The preference parameters are the domestic risk aversion parameter γ, the domestic and foreign discount rates ρ and $\rho^* = r^*$ (recall that we set $\gamma^* = 0$), and a common labor supply elasticity parameter σ. We set $\gamma = 1$, so domestic household utility is logarithmic in its argument. Given choices for g_Z and r^* we set $\rho = \frac{1+r^*}{1+g_Z} - 1$, so that on the pre-shock balanced growth path domestic consumption will grow at rate g_Z. We set $\sigma = 2$, implying a Frisch elasticity of 0.5.

On the firm side, we normalize $z_H = 1$, which implies $z_L = 1/\mu$. This leaves five parameters that we calibrate internally: (i) trend labor productivity growth g_Z, (ii) the world interest rate r^*, (iii) the markup μ, (iv) the technology exponent on capital α, and (v) the depreciation rate δ.

We set these five parameters to target five balanced growth path ratios: the four asset valuation ratios discussed above, and labor's share of income.

Recall that we interpret our model as capturing the corporate sector of the US economy. In order to report model asset values and the net foreign asset position relative to total US GDP, we will rescale model output by a constant factor κ so that model GDP in any period is equal to Y_t/κ. We set $\kappa = 0.57$, reflecting the fact that the US corporate sector accounts for around 57 percent of US GDP (see Figure 17 in the appendix.)

In terms of initial asset portfolios, we assume a symmetric initial net equity position, so $\lambda^* = 1-\lambda$, and we set $\lambda = 0.7$, so that foreign households hold 30 percent of domestic equity, consistent with figure 12. We set the initial value for B_t to reflect an initial negative net foreign asset position equal to negative 20 percent of US GDP, which is roughly the pre-2010 value.

In our baseline experiment we consider a permanent unanticipated shock to μ, r^* and g_z. We set the new values for these parameters, $\hat{\mu}$, $\hat{r}^*$ and $\hat{g}_z$, so that the model replicates observed changes from the 2000's to 2020 in three of our asset pricing metrics: (i) the Buffett ratio V_t/GDP_t, (ii) the dividend yield D_{t+1}/V_t, and the price earnings ratio V_t/E_{t+1} (see figures 7, 9 and 11.)

The Buffett ratio has roughly doubled, with the value of the corporate sector rising from 150 to 300 percent of US GDP. Our measure of price earnings ratio has also increased, from around 17.5 to 27. In contrast, the dividend yield appears broadly stable over the sample period, at around 3 percent. Recall that on the balanced growth path this yield is $r^* - g_Z$, and the fact that is appears broadly stable suggests $\hat{r}^* - \hat{g}_Z \approx r^* - g_Z$. Given this, we impose $\frac{1+\hat{r}^*}{1+\hat{g}_Z} = \frac{1+r^*}{1+g_Z} = 1+\rho$ so that post shock, equilibrium domestic consumption will grow at rate $\hat{g}_Z$.

There is one more parameter to pin down. The new markup is given by $\hat{\mu} = \hat{z}_H/\hat{z}_L$. The model can generate an increase in markups via an increase in z_H or a decline in z_L or a range of intermediate alternatives. These different alternatives will have identical implications for all the balanced growth path ratios, but will have different implications for the dynamics of the net foreign asset position and for welfare. We have chosen to scale the new values $\hat{z}_H$ and $\hat{z}_H^*$ so that equilibrium output between T and $T+1$ grows at the new trend productivity growth rate: $Y_{T+1} = (1+\hat{g}_Z)Y_T$ and $Y_{T+1}^* = (1+\hat{g}_Z)Y_T^*$.

5.1 Results

First, we explore how the shock changes the net foreign asset position. From eqs. (18) and (19) the change in the NFA position between $T-1$ (pre shock) and T (post shock) is,

$$NFA_T - NFA_{T-1} = CA_T + \lambda^* \Delta V_T^* - (1-\lambda)\Delta V_T$$

where $\Delta V_T^* = V_T^* - V_{T-1}^*$ reflects the revaluation of foreign assets at T and $\Delta V_T = V_T - V_{T-1}$ is the revaluation of domestic assets. Iterating backward to a date 0 far in the past, the NFA

Calibrated Parameters				Target Moments		
	pre 2009		post 2009		pre 2009	post 2009
μ	1.016	$\hat{\mu}$	1.100	Buffett ratio: V_t/Y_t	1.5	3.0
g_Z	0.034	$\hat{g}_Z$	0.019	PE ratio: V_t/E_{t+1}	17.5	27.0
$r^* = \rho^*$	0.064	$\hat{r}^*$	0.048	DP ratio D_{t+1}/V_t	0.03	0.0296
δ	0.010			Tobin's Q: V_t/K_{t+1}	1.25	2.49
α	0.340			Labor share: W_tL_t/Y_t	0.65	0.60
ρ	0.029			BGP cons. growth	g_Z	$\hat{g}_Z$
Other Parameters						
γ	1	γ^*	0			
σ	2	λ	0.7			

Table 1: Parameter Values

position at T reflects the sum of past current accounts and valuation effects.

$$\begin{aligned} NFA_T &= \sum_1^T CA_t + \lambda^* \sum_1^T \Delta V_t^* - (1-\lambda) \sum_1^T \Delta V_t + NFA_0 \\ &= (B_{T+1} - B_1) + \lambda^* (V_T^* - V_0^*) - (1-\lambda)(V_T - V_0) \end{aligned}$$

Our focus is on the change in the NFA to GDP ratio, which we decompose as:[19]

$$\frac{NFA_T}{GDP_T} - \frac{NFA_{T-1}}{GDP_{T-1}} = \underbrace{\frac{B_{T+1}}{GDP_T} - \frac{B_T}{GDP_{T-1}}}_{\text{current account}} + \underbrace{\lambda^* \left(\frac{V_T^*}{GDP_T} - \frac{V_{T-1}^*}{GDP_{T-1}} \right)}_{\text{foreign asset revalution}} - \underbrace{(1-\lambda) \left(\frac{V_T}{GDP_T} - \frac{V_{T-1}}{GDP_{T-1}} \right)}_{\text{foreign liability revaluation}}$$

Figure 13 shows that the model predicts large changes in the net foreign asset position. When $\lambda = 0.7$, the decline in the net foreign asset to GDP ratio is 46.6 percent. Of this

[19] More precisely,

$$\begin{aligned} &\frac{NFA_T}{GDP_T} - \frac{NFA_{T-1}}{GDP_{T-1}} \\ &= \left(\frac{\sum_1^T CA_t}{GDP_T} - \frac{\sum_1^{T-1} CA_t}{GDP_{T-1}} \right) + \lambda^* \left(\frac{\sum_1^T \Delta V_t^*}{GDP_T} - \frac{\sum_1^{T-1} \Delta V_t^*}{GDP_{T-1}} \right) - (1-\lambda) \left(\frac{\sum_1^T \Delta V_t}{GDP_T} - \frac{\sum_1^{T-1} \Delta V_t}{GDP_{T-1}} \right) + \frac{NFA_0}{GDP_T} - \frac{NFA_0}{GDP_{T-1}} \\ &= \left(\frac{B_{T+1} - B_1}{GDP_T} - \frac{B_T - B_1}{GDP_{T-1}} \right) + \lambda^* \left(\frac{V_T^* - V_0^*}{GDP_T} - \frac{V_{T-1}^* - V_0^*}{GDP_{T-1}} \right) - (1-\lambda) \left(\frac{V_T - V_0}{GDP_T} - \frac{V_{T-1} - V_0}{GDP_{T-1}} \right) + \frac{NFA_0}{GDP_T} - \frac{NFA_0}{GDP_{T-1}} \end{aligned}$$

But when either (i) $GDP_{T-1} = GDP_T$, or (ii) B_1/GDP_T, V_0^*/GDP_T and V_0/GDP_T are very small, this decomposition simplifies to the one in the text.

Note that the decomposition plotted in figure 2 is identical to the one presented here.

decline, 41.8 percentage points represents valuation effects, while only 4.8 percentage points reflects a current account deficit. The 41.8 percentage point valuation effect in turn reflects an increase in the value of domestic liabilities relative to GDP of exactly 45 percent minus a 3.2 percent of US GDP rise in the value of foreign assets. Recall that our calibration targeted a balanced growth path rise in US asset values equal to 150 percent of US GDP. When $\lambda = 0.7$, this implies an increase in the liabilities to GDP ratio of $-(1-\lambda)(V_T/GDP_T - V_{T-1}/GDP_{T-1}) = -0.3 \times (3.0 - 1.5) = -0.45$.[20]

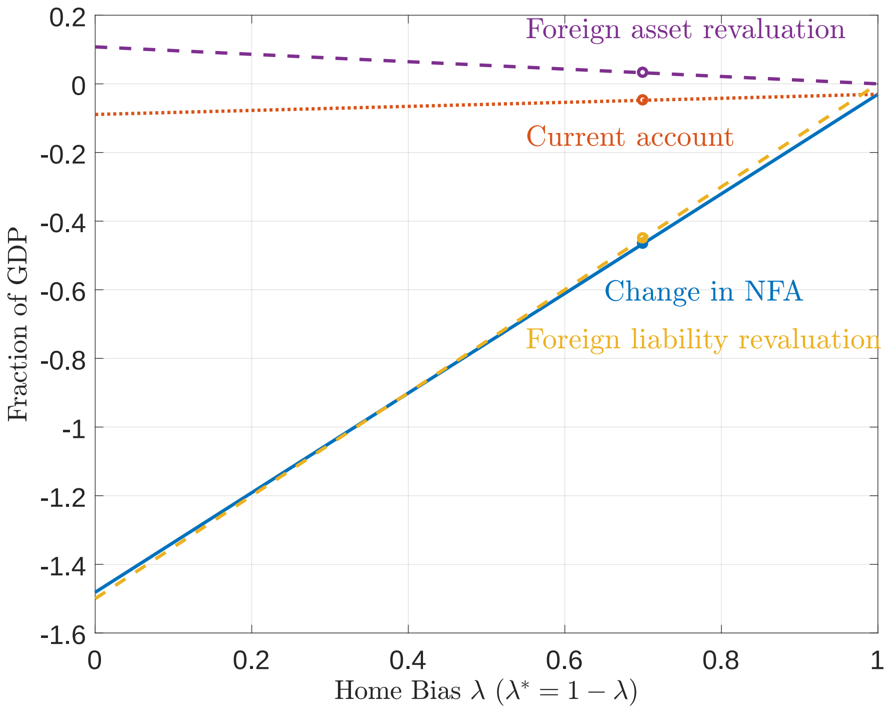

Figure 13: Change in US Net Foreign Assets to GDP

Table 2 indicates that both in terms of overall magnitude and the current account versus valuation effect decomposition, the response of the net foreign asset position in the model is very similar to the response documented for the US economy in figures 1 and 2.

[20]Our calibration targets the change in this ratio from the initial to the final balanced growth path. As we have discussed, while the shock is announced at T, markups do not actually change until $T+1$, so it is not immediate that the ratio V_T/GDP_T is equal to the new balanced growth path value. However, recall that we set the post shock value for leader firm productivity $\hat{z}_H$ so that equilibrium model output grows at the new balanced growth path rate $\hat{g}_Z$ between T and $T+1$. Asset values (ex dividend) jump to their new BGP values at T and thus also grow at rate $\hat{g}_Z$ between T and $T+1$. It follows that $V_T/GDP_T = V_{T+1}/GDP_{T+1}$, which is the new BGP value.

	Δ NFA/GDP	Curr. Acc.	Liability Reval.	Asset Reval.	Stat Disc.
Data	-49	-8	-58	+22	-5
Markup Model	-46.6	-4.8	-45.0	+3.2	0
Unmeasured K	-148.1	-107.1	-45.0	+4.0	0

Table 2: Summary NFA Dynamics: Data, baseline markups model and alternative unmeasured capital economy. Model responses plotted for $\lambda = 0.7$.

The size of the net foreign asset decline is very sensitive to the degree of diversification λ. When $\lambda = 1$, so that stocks are wholly domestically owned, the decline in the NFA to GDP ratio is only 3.0 percent. When there is no diversification, there are no valuation effects, so this change entirely reflects a current account deficit at date T. This current account deficit in turn reflects an increase in domestic consumption at T (see below).

As λ is reduced the decline in the US net foreign asset position rises. The logic is that when a larger share of US equity is foreign owned, the same increase in US asset values translates into a larger increase in the value of US foreign liabilities. There is a mild offset to this effect from the fact that the shock also increases the value of US foreign assets. The mechanism here is that lower world interest rates imply a higher foreign capital to output ratio.

The size of the current account deficit on impact becomes slightly larger as λ is reduced. There are two countervailing forces at work here. On the one hand, the rise in domestic consumption is declining in λ, which tends to shrink the current account deficit. At the same time, however, the equilibrium capital stock increases less in the domestic economy than in the foreign one, because in the domestic economy higher markups depress capital at the same time as a lower interest rate boosts capital. This implies a larger rise in foreign investment than domestic investment at date T. As λ is reduced, domestic agents must finance a larger share of this extra foreign investment. Rather than reducing consumption, they finance this investment by using the bond to borrow from abroad, translating into a larger current account deficit.

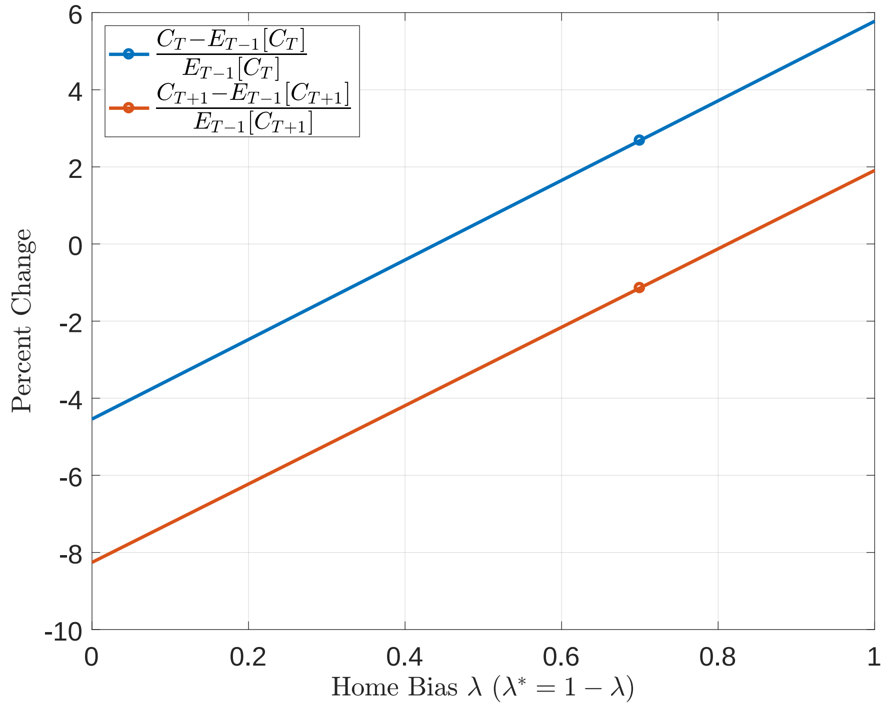

Figure 14: Change in US Consumption

Figure 14 plots the response of domestic consumption to the shock, and illustrates how this response varies with diversification. The blue line plots consumption at date T relative to a no shock counter-factual, while the red line plots the same object at $T+1$. We plot both because our utility function is non-separable between consumption and hours worked, and hours worked do not respond to the shock until $T+1$, which is when markups actually change. The key message from the plot is that while domestic consumption increases when there is zero diversification, the same shock – with the same impact on equilibrium output and factor prices – leads to sizable consumption declines for high levels of diversification. The reason is that higher domestic markups reshuffle domestic output from workers to shareholders. When shareholders and workers are the same people ($\lambda = 1$) this reshuffling does not impact domestic consumption. But when diversification is quite extensive, higher markups are essentially reshuffling output from domestic workers to foreign shareholders, thus reducing domestic consumption. More precisely, one can show (using eq. 21) that the change in consumption at $T+1$ is approximately equal to the equilibrium change, relative to the no shock scenario, in the value of labor earnings plus domestic households' shares of domestic and foreign profit income. When $\lambda = 1$ this change is mildly positive, since higher domestic profits post shock more than compensate for lower labor earnings. But as λ is reduced this change becomes first smaller and then negative.[21]

Next we turn to the welfare effects of the rise in US asset values. Let ω denote the percentage amount by which a planner would need to permanently increase the argument of period utility in the economy with the original values for μ, g_Z and r^* for a domestic household to be indifferent between living in that economy versus learning at date T that those values will change to $\hat{\mu}$, $\hat{g}_Z$ and $\hat{r}^*$. In our economy, given logarithmic utility, ω is given by

$$\log(1+\omega) = \log\left(\frac{\hat{C}_T - \hat{Z}_T \frac{\hat{L}_T^{1+\sigma}}{1+\sigma}}{C_T - Z_T \frac{L_T^{1+\sigma}}{1+\sigma}}\right) + \frac{1}{\rho}\log\left(\frac{1+\hat{g}_Z}{1+g_Z}\right)$$

where $\hat{C}_T$ and $\hat{L}_T$ denote consumption and labor supply at date T under the shock scenario and C_T and L_T denote their counterparts under the no shock scenario. Note that, given our timing assumption, $\hat{Z}_T = Z_T$ and $\hat{L}_T = L_T$. There are two terms in this welfare expression. The first captures how the shock changes flow utility at date T and this effect is summarized by the impact on consumption. The second term captures how the shock changes the expected growth rate of utility moving forward. This second component is large but independent of the level of diversification. Given our baseline calibration, slower growth going forward – holding fixed $\hat{C}_T = C_T$ and thus the level of utility at T – translates to a 40.2 percent loss of welfare.

Figure 15 plots the welfare gain $\omega(\lambda)$ relative to the case $\lambda = 1$.[22]. We plot the difference to highlight how the value for λ mediates welfare gains. The key message is that the higher is diversification (the lower λ), the more negative are the welfare effects of the shock. And the effect is quantitatively large: welfare losses rise by 2.7 percent of consumption when λ is reduced from 1.0 to 0.7. These larger welfare losses directly mirror the larger consumption declines plotted in Figure 14.

[21]Why do income and consumption increase in response to the shock when $\lambda = 1$? Recall that in our calibration, the shock does not change the level of domestic output. However, slower growth on the new balanced growth path implies a lower share of output devoted to investment, and thus a larger share to the sum of labor earnings and profits, which equals consumption.

[22]The total welfare loss is the value plotted plus $\omega(1) = -35.3$ percent

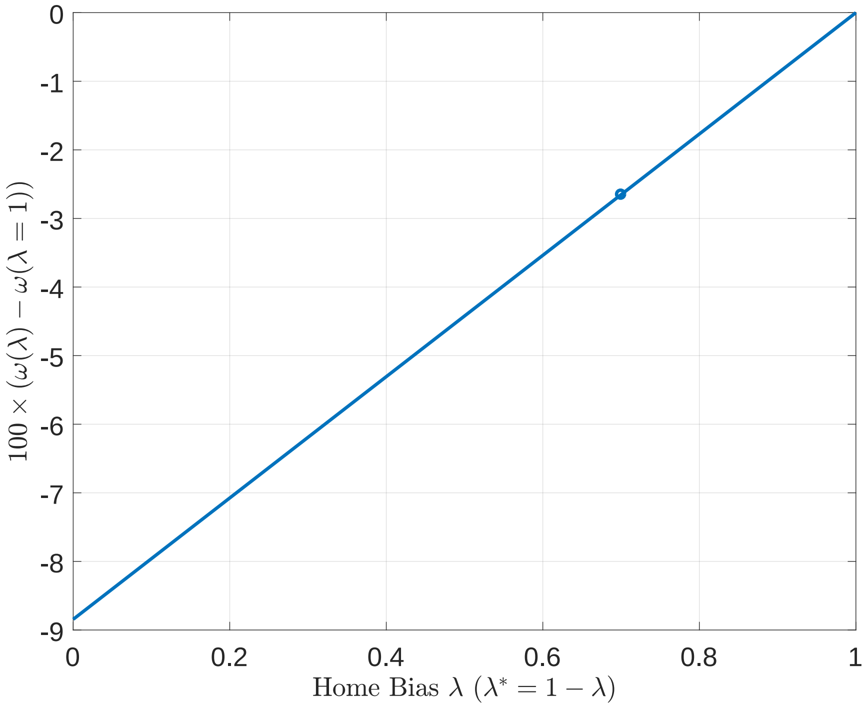

Figure 15: Change in US Welfare

6 Unmeasured Capital Model

An alternative theory of rising US asset values is that they reflect rising investment in forms of productive capital that are not measured in the national accounts. Under such a theory, the observed increase in the enterprise value of US corporations has resulted from the response of firms to a change in the production function to be more intensive in new forms of capital that are not well captured in our current accounting frameworks.

We now describe such a model with unmeasured capital. Output is produced with two types of capital. One type of capital investment is measured, while the other is not. This is a competitive model in which markups are always equal to zero. True corporate output is given by

$$Y_t = A_t K_{tU}^{(1-\upsilon)} \left(K_{tM}^{\alpha} (Z_t L_t)^{1-\alpha} \right)^{\upsilon} \tag{22}$$

where K_{tM} and K_{tU} denote installed measured and unmeasured capital stocks, and $1 - \upsilon$ is the share of income flowing to unmeasured capital. The resource constraint for this economy is

$$C_t + I_{Mt} + I_{Ut} + NX_t = Y_t$$

where I_{Mt} and I_{Ut} denote investments in measured and unmeasured capital, and where investments augment the corresponding capital stocks in the usual way.

$$\begin{aligned} K_{M,t+1} &= (1-\delta_M)K_{Mt} + I_{Mt} \\ K_{U,t+1} &= (1-\delta_U)K_{Ut} + I_{Ut} \end{aligned}$$

Note that under current accounting standards, expenditures on unmeasured investment I_{Ut} are recorded as expenditures by firms on intermediate inputs rather than final investment expenditures. Thus, measured final expenditures and gross value added satisfy

$$C_t + I_{Mt} + NX_t = Y_{Mt} = Y_t - I_{Ut}$$

where Y_{Mt} is measured gross value added.

Investment firms hold both types of capital and make investment decisions to maximize the present value of dividends

$$\max_{\{K_{M,t+1},K_{U,t+1}\}_0^\infty} \left\{ D_0 + \sum_{t=1}^{\infty} \frac{D_t}{\Pi_{j=1}^t (1+r_j^*)} \right\}$$

where

$$D_t = R_{Mt}K_{Mt} + (1-\delta_M)K_{Mt} - K_{M,t+1} + R_{Ut}K_{Ut} + (1-\delta_U)K_{Ut} - K_{U,t+1}$$

Interior solutions to this problem require

$$R_{Mt} - \delta_M = r^* \tag{23}$$

$$R_{Ut} - \delta_U = r^*. \tag{24}$$

Competitive firms rent both types of capital and labor and produce gross output Y_t given the production function 22. The first order conditions for those firms are

$$R_{Mt} = \upsilon\alpha \frac{Y_t}{K_{Mt}}, \tag{25}$$

$$R_{Ut} = (1-\upsilon)\frac{Y_t}{K_{Ut}}, \tag{26}$$

$$W_t = \upsilon(1-\alpha)\frac{Y_t}{L_t}. \tag{27}$$

Households in this economy are identical to those in our baseline economy, implying the same first order condition for labor supply (13). Equations 23, 24, 13 and 25, 26, 27 can be combined to solve in closed form for K_{Mt}, K_{Lt}, L_t, R_{Mt}, R_{Ut}, and W_t. In particular, $R_{Mt} = r^* + \delta_M$ and $R_{Ut} = r^* + \delta_U$.

Because there are no monopoly profits nor any investment adjustment costs in this model, the same argument that delivers the result that Tobin's Q should be one in a standard model delivers the result that the enterprise value of firms in this economy is the total value of the capital of both types that these firms hold:

$$V_t = K_{M,t+1} + K_{U,t+1}.$$

This economy has a balanced growth path, along which both capital stocks, output, consumption and wages grow at the rate g_Z, while rental rates and hours worked are constant.

6.1 Comparing Balanced Growth Paths

Along the balanced growth path, this unmeasured capital model is isomorphic to the economy with markups in terms of its implications for key macroeconomic ratios and asset pricing benchmarks.

Proposition 1 *Consider the implications of the model with markups and that with unmeasured capital for the ratios of labor income to measured output, measured investment to measured output, measured capital to measured output, the Buffett Indicator, Tobin's Q, dividend yields, and earnings yields. Assume that these two models are calibrated to the same values of r^*, g_Z, δ_M and α. Let δ_U in the unmeasured capital model be given separately. Then these two models have the same implications for these key macroeconomic and asset pricing ratios on a balanced growth path if the markup μ in the markup economy and the share of unmeasured capital in the production function υ in the unmeasured capital economy are related by*

$$\frac{1}{\mu} = \frac{\upsilon}{1 - \left(\frac{g_Z+\delta_M}{\delta_U+r^*}\right)(1-\upsilon)}. \tag{28}$$

Corollary 2 *Changes in balanced growth path macroeconomic and asset valuation ratios in the economy with markups that follow from shocks to r^*, g_Z, and μ can be perfectly replicated by the same shocks to r^*, g_Z and the corresponding shock to υ given from equation 28 in the economy with unmeasured capital.*

This proposition is proved by direct comparison of formulas for these macroeconomic ratios and asset pricing implications.

6.2 Comparing Transitions

While the markup economy and the unmeasured capital economy are observationally equivalent in terms of their implications for key macroeconomic and asset pricing ratios along a balanced growth path, the two economies will exhibit different dynamics in response to shocks to r^* and g_Z and μ or υ respectively. We now compare the implications of these two models for the transition from one balanced growth path to another.

In our model experiments, we assume that the model economy in each case is on a balanced growth path for all periods $t < T$ with given values of r^*, g_Z and either μ or υ. In period $t = T$, news arrives that interest rates and growth rates going forward will have new values $\hat{r}^*$ and $\hat{g}_Z$ and that the parameters $\hat{\mu}$ and $\hat{\upsilon}$ in the two alternative economies will also take on new values starting at $T + 1$. Because this is effectively a small open economy, these economies reach new balanced growth paths immediately in period $T + 1$. Hence, the transition from the old balanced growth path which these economies are on for $t < T$ to the new balanced growth path for periods $T \geq T + 1$ occurs entirely in period T.

We assume that the parameters on the old and new balanced growth paths satisfy equation 28 so that these two economies have the same implications for our key macroeconomic and asset valuation ratios on the old and new balanced growth paths. We also assume that these economies share the same paths for labor augmenting technical change Z_t for all dates t and we assume that productivity parameters z_H, $\hat{z}_H$, A, and $\hat{A}$ are chosen such that the levels of measured output Y_{Mt} for these two model economies are identical in all periods $t < T$ and $t \geq T + 1$. We also assume that the two economies share the same value for domestic bond holdings B_T entering the period of the shock.

One can show that, under these assumptions, these two model economies share the same time paths for wages W_t, labor supply L_t, measured investment I_{Mt}, and asset values V_t in the domestic economy for all dates t including the transition date $t = T$. The only observables where the two models differ are measured output at T, Y_{MT}, the trade balance at that date, NX_{MT}, the bond and Net Foreign Asset positions, B_{t+1} and NFA_t for all dates $t \geq T$, and the path for consumption C_t from date T onward.

In particular, in the unmeasured capital economy, the domestic economy sees a collapse in measured output at T. In fact, measured model output goes negative! True output does not fall, but anticipating a higher production weight on unmeasured capital from $T + 1$ onward, domestic firms undertake huge unmeasured investments at T. In the national accounts these are (inappropriately) recorded as huge purchases of intermediate inputs, which drastically reduce measured value added. To the extent that domestic households own domestic firms they must finance these investments, which implies a huge current account deficit at date

T. When $\lambda = 0.7$ the current account deficit at T is 108 percent of expected GDP at T.[23] Note that this is approximately equal to λ times the increase in the balanced growth path capital to output ratio: $0.7 \times 1.5 = 1.05$. Consumption from date T onward is lower than in the markup economy because this larger debt implies larger interest payments for domestic households.

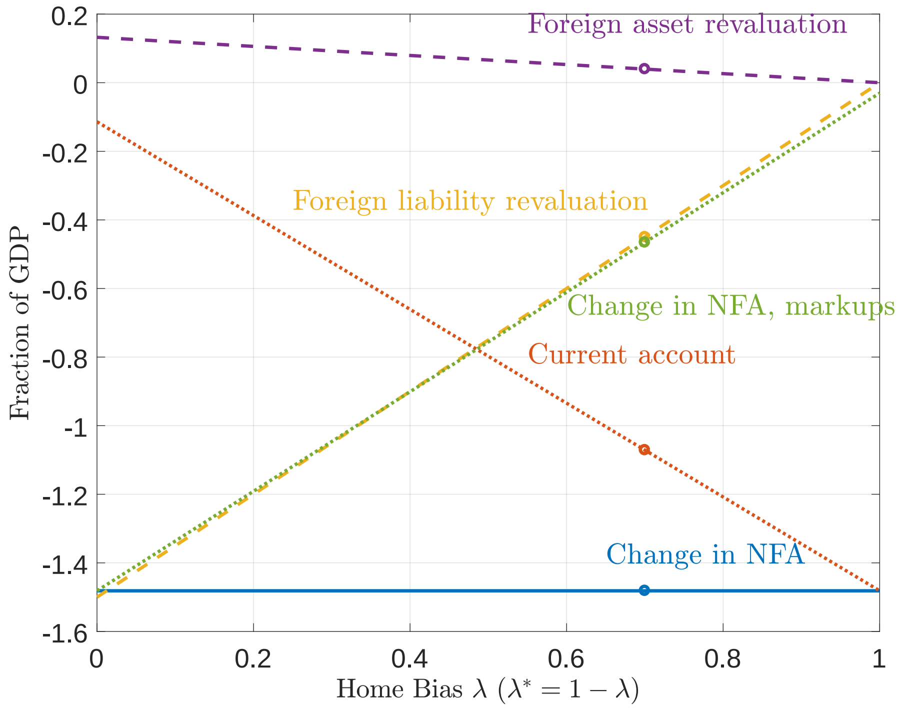

Figure 16: Change in US Net Foreign Assets to GDP, Unmeasured Capital Economy

Figure 16 compares the change in the net foreign asset position at date T in the two economies. To better understand this plot, we combine equations 18 and 19 to express the change in the net foreign asset position at T as

$$\begin{aligned} NFA_T - NFA_{T-1} &= NX_T + r^* B_T - (1-\lambda) D_T + \lambda^* D_T^* \\ &\quad -(1-\lambda)\left(V_T - V_{T-1}\right) + \lambda^* \left(V_T^* - V_{T-1}^*\right). \end{aligned}$$

Absent the arrival of news at T, the values of domestic and foreign firms at T would have been $\tilde{V}_T = (1+g_Z)V_{T-1}$ and $\tilde{V}_T = (1+g_Z)V_{T-1}^*$, with associated values for dividends $\tilde{D}_T =$

[23] We measure this relative to expected GDP at T because actual measured GDP at T is negative.

$(r^* - g_Z)V_{T-1}$ and $\tilde{D}^*_T = (r^* - g_Z)V^*_{T-1}$. We can subtract and add $(1-\lambda)\left(\tilde{V}_T + \tilde{D}_T\right) = (1-\lambda)r^* V_{T-1}$ and $\lambda^*\left(\tilde{V}^*_T + \tilde{D}^*_T\right) = \lambda^* r^* V^*_{T-1}$ from the right side of the above expression to get

$$
\begin{aligned}
NFA_T - NFA_{T-1} \;=\; & NX_T + \underbrace{r^*}_{\text{expected return from } T-1 \text{ to } T} \times \underbrace{NFA_{T-1}}_{\text{wealth at } T} \\
& - \underbrace{\left[\frac{D_T + V_T}{V_{T-1}} - (1+r^*)\right]}_{\text{excess return on domestic equity}} \times \underbrace{(1-\lambda)V_{T-1}}_{\text{foreign holdings of domestic equity}} \\
& + \underbrace{\left[\frac{D^*_T + V^*_T}{V^*_{T-1}} - (1+r^*)\right]}_{\text{excess return on foreign equity}} \times \underbrace{\lambda^* V^*_{T-1}}_{\text{US holdings of foreign equity}} .
\end{aligned}
$$

The first line represents the sum of the trade balance and expected net factor income at T given an expected rate of return r^* on wealth carried out of period $T-1$. The second line captures unexpected excess returns on domestic equity earned by foreign shareholders, while the third line captures excess returns earned by domestic residents on their equity abroad. This decomposition offers an illuminating comparison across the baseline "markup" and alternative "unmeasured capital" economies.

Note first that bond holdings B_T and corporate valuations V_{T-1} and V^*_{T-1} together with the old rate of return r^* are predetermined and identical across the two models. Instead, all differences in the implications of the models for the change in net foreign assets come through their differing implications for the impact of a shock on net exports in the first line and unexpected capital gains or losses in the second.

In the model with markups, the news shock at T generates a large excess return to domestic equity, which drastically depresses the domestic net foreign asset position. The shock has very little impact on net exports.

In contrast, in the model with unmeasured capital, the news shock produces no unexpected excess returns. Because the shock generates no unexpected excess returns, the extent of diversification λ is irrelevant for the impact of the shock on consumption, welfare, and the net foreign asset position (see figure 16). The only respect in which the portfolio position matters is in determining whether the decline in the net foreign asset position reflects a current account deficit or an increase in the value of foreign liabilities. When domestic stocks are entirely domestically owned, the decline in the NFA entirely reflects the current account. As λ is reduced, the current account response is reduced, but the rise in the value of domestic liabilities implies an identical net foreign asset decline.[24]

[24] Note that valuation effects are perfectly consistent with the absence of excess returns. The model

To sum up, while the two models we have considered are indistinguishable along a balanced growth path, they exhibit very different transitions in response to a shock that increases asset values. The transition in response to a risk in markups features a rise in US liabilities that reflect a period of unanticipated excess returns to US firms. The shock induces relatively small responses in investment and net exports. In contrast, an increase in the importance of unmeasured capital generates a transition in which the rise in US equity values reflects a surge in unmeasured investment, with no excess returns. While this unmeasured investment is not measured directly, it shows up indirectly in the form of a period of low or negative measured output, and a huge trade and current account deficit. In historical US time series we do not see current account deficits on the scale predicted by the unmeasured capital economy. Even cumulating current account deficit over the past 10 years, the total deficit is much smaller than the scale of borrowing the model predicts when the economy's capital stock rises by 150 percent of GDP. We conclude that, while rising unmeasured capital might be a factor behind the rise in US asset values over the past decade, it is unlikely to be the dominant factor. In contrast, the rising markups story appears broadly consistent with the dynamics of all standard macroeconomic aggregates.

7 Conclusions

We have shown that the US net foreign asset position has declined sharply in the past ten years. This decline reflects a very large increase in the value of foreign holdings of US corporate assets, which in turn reflects a sharp and U.S. -focussed run up in equity values. We have considered two alternative theories for this rise in equity values, in both of which higher asset values capitalize higher expected cashflows from US businesses. In our preferred model, higher cashflows reflect a rise in market power in the US corporate sector, which reduces the share of value added going to labor and capital, and increases the share going to the owners of monopolistically competitive firms. That model replicates a doubling in asset values relative to GDP when the share of GDP accruing as monopoly rents rises permanently by 7.6 percent of GDP. Given that foreigners own around 30 percent of the US corporate sector, this rise in markups translates to a permanent flow of income abroad of 2.3 percent of US GDP, which is a pure windfall gain to foreign investors. Thus the welfare costs of a rise in market power are much larger in an economy featuring realistic international financial diversification than they would be in a financially closed economy. We also considered an alternative theory for the rise in US asset values, according to which they reflect massive unmeasured investment by US

measured upward revaluation of liabilities is simply offset in the return calculation by very negative cash flows to foreign investors D_T at the date of the shock.

firms. Under this alternative interpretation, there are no windfall gains to foreign investors: higher US asset values simply reflect higher investment, and higher future cashflows reflect a normal return to the shareholders who financed the investment. However this alternative theory implies that in order to finance the large investment the U.S. should be running a current account deficit that is an order of magnitude larger than the observed one.

Our quantitative analysis is designed to offer a simple framework for thinking through the positive and normative implications for alternative drivers of rising US asset values in an open economy. There are many possible directions one can extend our work.

First one could consider a richer set of models for rising US asset values. By considering a larger set of countries and longer time series, one could bring more evidence to bear to differentiate between alternative theories.

Second we do not explicitly analyze the international diversification decision, but rather we take it from the data. In the context of a stochastic environment in which agents understand that the world is subject to country-specific shocks that can generate large and country specific fluctuations in asset values, transfer from US to the rest of the world can be the result of a portfolio decision engineered to achieve international risk sharing (see, for example, Heathcote and Perri (2013)). It would be interesting to assess whether transfers of the size we have highlighted could be consistent with international risk sharing agreements.

Third we do not incorporate valuation stemming from exchange rate changes. This is justified by the fact that over the period we focus on the exchange rate of the U.S. dollar vis-a-vis foreign currencies has been fairly stable. However, as we have shown in the data analysis, in earlier valuation episodes the exchange rate has played a major role, so it would instructive to study the causes and the effects of valuations caused by exchange rate changes.

Finally we abstracted from two additional potentially important impacts of changes in market power or shocks to the production function in the U.S. The first is the impact on the terms of trade. This is a result of our assumption in the model that a single final good is traded between the U.S. and the rest of the world. One implication of this assumption is that it is U.S. workers who bear the full welfare cost of an increase in markups. If we had assumed that U.S. final output and final output in the rest of the world are imperfect substitutes, then, in such a model, foreign consumers of U.S. products would bear some of the welfare cost of increasing markups. The second is the impact on the distribution of welfare across different agents within the U.S. This is the result of our assumption of representative consumer within each country. Likely the ex-ante welfare costs of an increase in mark-up are smaller in our framework than those arising in a framework which explicitly considers within country heterogeneity along capital ownership. We do not believe, however, that these alterations of our model would change the central result that the welfare cost to Americans from increasing markups is substantially higher when foreigners own a large share of U.S. equity.

A Appendix

We use data from the following quarterly version of tables in the Z1 release dated March 2021.

- Table S1 *Selected Aggregates for Total Economy and Sectors* of the Integrated Macroeconomic Accounts
- Table S5 *Non Financial Corporate Business* sector of the Integrated Macroeconomic Accounts
- Table S6 *Financial Business* sector of the Integrated Macroeconomic Accounts
- Table S9 *Rest of World* sector of the Integrated Macroeconomic Accounts
- Table B.103 *Balance Sheet of Non-Financial Corporate Business*
- Table L.230 *Direct Investment*
- Table L.223 *Corporate Equities*

We download data from the FRED database at the Federal Reserve Bank of St Louis. Thus, we include series identifiers in the Federal Reserves publication Z1 and in the FRED database.

We first describe the series we use to measure the levels of the gross and net foreign asset position for the United States and decomposition of changes in those positions into flows and revaluation effects. We then describe our measures of flows for the corporate sector and valuation of the corporate sector. Finally, we present our measure of the extent of foreign ownership of U.S. Equities including the equity for foreign parent firms in their US subsidiaries.

B Gross and Net Foreign Assets, Flows, and Valuations

Gross and Net Foreign Assets: Data on Gross and Net Foreign Assets are taken from Table S9. The total market value of financial claims of the US on the ROW are given in line 125 of Table S9 in series FL264194005 (FRED identifier ROWTLEQ027S). The total market value of financial claims of the Rest of the World (ROW) on the United States (US) is given on line 98 of Table S9 in series FL264090005 (FRED identifier ROWTASQ027S). These two series constitute the gross foreign asset positions used in our study, with the net foreign asset position of the US being the difference between the market value of US claims on the ROW and ROW claims on the US. These gross foreign asset positions are also reported on lines 28 and 25 of Table B1 *Derivation of U.S. Net Wealth*.

We take ratios of these and subsequent series relative to nominal GDP (FRED identifier GDP). Note that this series for GDP is in billions of dollars while many of the other series are in millions of dollars, so we multiply this series by 1000.

The Current Account, the Capital Account, and Valuation Changes: We decompose nominal changes in the US Net Foreign Asset Position according to the following accounting identity

$$NFA_t - NFA_{t-1} = \underbrace{CA_t}_{\text{net lending abroad}} + \underbrace{VA_t}_{\text{Valuation Changes}} + \underbrace{SD_t}_{\text{Statistical Discrepancy}}$$

using data from Table S9. This table is presented from the perspective of the Rest of World. We consider flows and net foreign assets from the perspective of the United States. Thus, we use the negative of each series noted below. The variables NFA_{t-1} and NFA_t are the end of previous period and end of current period net foreign asset position of the US computed as Table S9 line 125 (FL264194005) minus line 98 (FL264090005). The Current Account CA_t corresponding to net lending abroad measured from the goods and services flow side is the negative of line 13 (FA265000905 FRED identifier RWLBACQ027S). Note that this series in FRED is annualized, so we divide the quarterly data by 4. Valuation Changes VA_t is the negative of line 96 (FR265000005). What we term the Statistical Discrepancy SD_t is given by the negative of line 66 (FV268090185 FRED identifier BOGZ1FV268090185Q). Note that line is comprised of the official statistical discrepancy between net lending abroad measured from the goods and services flow side and from observed net financial flows in line 68 and "other volume changes" in line 67. But as indicated on line 97 of Table S9, the accounting identity above uses lines 13, 66, and 96. Thus we use line 66 as our measure of SD_t.

Note that in this accounting identify the sum of the terms

$$\underbrace{NFT_t}_{\text{net financial transactions}} + \underbrace{OV_t}_{\text{other volume changes}} = \underbrace{CA_t}_{\text{net lending abroad}} + \underbrace{SD_t}_{\text{Statistical Discrepancy}}$$

corresponding to the sum of lines 13 and 66 of Table S9 is equal to the measured net transactions in the financial account reported in line 65 (FA265000005 FRED identifier RWLAAFQ027S) plus "other volume changes" in line 67 (FV268090085 FRED identifier BOGZ1FV268090085Q). Note that line 65 is annualized in quarterly data just as is the case for line 13, so we divide it by 4.

We show an alternative decomposition of the cumulated change in the US Net Foreign Asset Position into

$$NFA_t - NFA_{t-1} = \underbrace{NFT_t}_{\text{net financial transactions}} + \underbrace{OV_t}_{\text{other volume changes}} + \underbrace{VA_t}_{\text{Valuation Changes}}$$

This decomposition of cumulated changes in the US net foreign asset position is invariant to measurement issues in the current account relating to the measurement of U.S. exports and factor income discussed in Guvenen et al. (2021).

The Equity Component of Gross and Net Foreign Assets: We measure the equity component of Gross and Net Foreign Assets of the US using the sum of portfolio investments in equity and the equity component of foreign direct investment. The market value of US portfolio equity investment in the ROW is given on line 141 of Table S9 Corporate Equities (LM263164100, FRED identifier BOGZ1LM263164100Q). The market value of ROW portfolio equity investment in the US is given by the sum of lines 116 Corporate Equities (LM263064105, FRED identfier BOGZ1LM263064105Q) and 117 Mutual Fund Shares (LM263064203, FRED identifier BOGZ1LM263064203Q). The market value of the equity component of US foreign direct investment in the ROW is given by Table L230 line 2 (LM263192101 FRED identifier BOGZ1LM263192141Q) and the market value of the equity component of ROW foreign direct investment in the US is given by Table L230 line 22 (LM263092101 FRED identifier BOGZ1LM263092141Q).

Because line 118 on Table S9 showing ROW direct investment in the US includes both the equity and net debt components of this investment, in measuring the equity component of the U.S. Net Foreign Asset position, we use only the equity portion of ROW direct investment in the US shown on Table L230 line 22 as described above.

Note from Table S5 lines 147 and 148 and Table S6 141 and 144 that corporate equities and foreign direct investment in the US nonfinancial corporate business and financial business sectors are recorded separately. Likewise, on Table L223, line 28 (LM263064105) showing ROW holdings of U.S. corporate equities corresponds to Table S9 line 116 (LM263064105) showing ROW holdings of corporate equities not including mutual fund shares (line 117 on Table S9 and line 12 on Table L224 *Mutual Fund Shares*) nor including foreign direct investment in the US (line 118 on Table S9). And likewise, on Table L223, line 9 (LM263164100) showing ROW issues of equity corresponds to Table S9 line 141 (LM263164100) showing US holdings of corporate equities in the ROW not including US foreign direct investment abroad (line 143 on Table S9).

Hence our measurement of gross and net equity positions by adding together the data series on portfolio investment in equities and the equity components of inward and outward direct investment is consistent with these accounting conventions.

The corresponding valuation changes of the market valuations of the equity component of portfolio investment and of foreign direct investment are as follows. The revaluation of US portfolio equity investment in the ROW is given on line 92 of Table S9 Corporate Equities (FR263164100 FRED identifier BOGZ1FR263164100Q). The revaluation of ROW portfolio equity investment in the US is given by the sum of lines 78 Corporate Equities (FR263064105 FRED identifier BOGZ1FR263064105Q) and 79 Mutual Fund Shares (FR263064203 RED identifier BOGZ1FR263064203Q). The revaluation of the equity component of US foreign direct investment abroad is not presented in Z1 but is available as series FR263192101. Note that the identifier for this series from the FRED database at the Federal Reserve Bank of St Louis is BOGZ1FR263192141Q. The revaluation of the equity component of ROW foreign direct investment in the US is not presented in Z1 but is available as series FR263092101. Note that that the identifier for this series from the FRED database at the Federal Reserve Bank of St Louis is BOGZ1FR263092141Q. These identifiers on FRED are current as of April 2021. They may be updated in the future.

Table L230 presents alternative valuations of the equity component of US foreign direct investment abroad and ROW foreign direct investment in the United States. We use a measure of the value of the equity component of foreign direct investment at current cost and the valuation changes associated with this measure in several plots. We use the following series for these alternative plots. A valuation of the equity component of US foreign direct investment abroad at current cost is given in line 37 of that table (LM263192161 FRED identifier BOGZ1LM263192101Q) and the current cost valuation of the equity component of ROW foreign direct investment in the US is given on line 42 (LM263092161 FRED identifier BOGZ1LM263092101Q). The revaluation of the equity component of US foreign direct investment abroad at current costs is given by series FR263192161 with FRED identifier BOGZ1FR263192101Q. The revaluation of the equity component of ROW direct investment in the US at current cost is given by series FR263092161 with FRED identifier BOGZ1FR263092101Q. These identifiers on FRED are current as of April 2021. They may be updated in the future.

C The Corporate Sector

We now detail exactly which series we use for each entry.

Gross Value Added The variables in the model are Y_t and $Y_{corp,t}$. The breakdown of Gross Value Added by sector in the Integrated Macroeconomic Accounts is given in Table S2. Gross Value Added for the non financial corporate business sector is given in line 4 of that table FA106902501 (FRED identifier NCBGAVQ027S) and that for the financial business sector on line 5 in series FA796902505 (FRED identifier FBUGAVQ027S). Gross Value Added for the economy as a whole is given on line 1 of that table in series FA896902505 (Fred identifier ALSGVAQ027S). We compute the fraction of Gross Value Added in the corporate sector as the sum of that in the non-financial corporate business sector and in the financial business sector all divided by Gross Value Added for the economy as a whole.

In Figure 17, we show the share of economy-wide gross value added that is produced in the U.S. corporate sector.

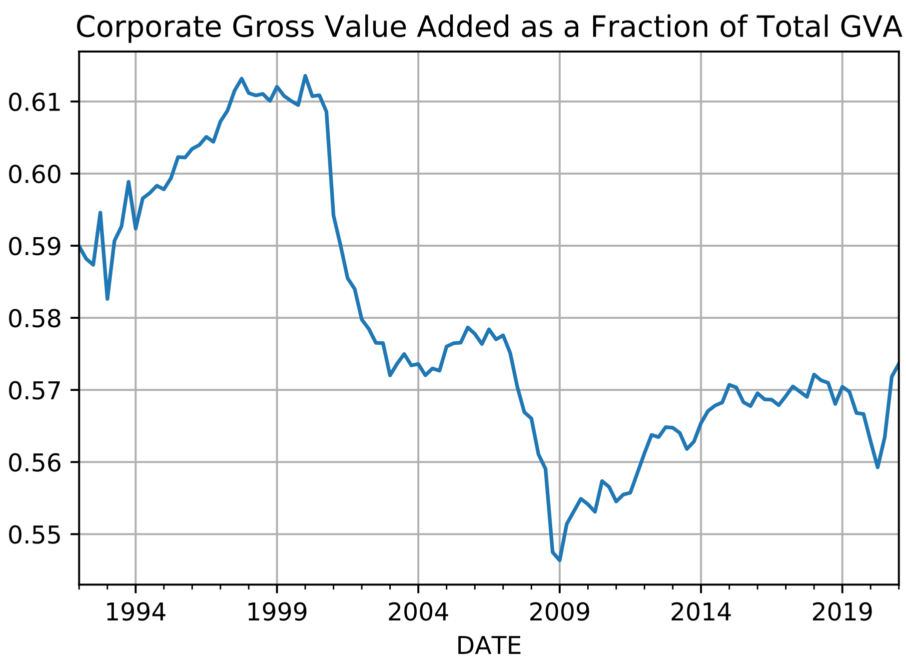

Figure 17: US Corporate Sector Share of Gross Value Added

Dividends The variable in the model is D_t which is a comprehensive measure of payouts to investors in the corporate sector from operations. We abstract from taxes in our model, so, to make measures of such payouts from the non-financial corporate sector and the financial business sector, we use the following data from Tables S5 and S6. For the non-financial corporate business sector, we measure payouts using the following lines from Table S5. We take operating surplus, net in line 8 (FA106402101, FRED identifier NCBOSNQ027S) less current taxes on income, wealth, line 21 (FA106220001, FRED identifier NCBTIWQ027S) less net capital formation in line 28 (FA105050985, FRED identifier NCBFNEQ027S). For the financial business sector, we measure payouts from the following lines in Table S6. We take operating surplus, net in line 8 (FA796402101 FRED identifier FBOSNTQ027S) less current taxes on income, wealth, line 23 (FA796220001 FRED identifier FBTIWEQ027S) less capital formation, net in line 30 (FA795015085 FRED identifier FBCFNTQ027S).

Earnings: The variable E_t in the model is a comprehensive measure of the operating earnings of the US corporate sector. In the model $E_t = D_t + I_t - \delta K_t$. We construct this measure using our constructed measure of dividends above adjusted using the following series from Tables S5 and S6. For the non-financial corporate business sector, we add to our measure of payouts capital formation, net in line 28 (FA105050985 FRED identifier NCBFNEQ027S). For the financial sector, we add to our measure of payouts capital formation, net in line 30 (FA795015085).

Replacement Value of Non-Financial Assets The variable K_{t+1} in the model is the replacement value of non-financial assets at the end of period t. This is the sum of such values across the non-financial business sector and the financial business sector. We construct this measure as the sum of line 103 (LM102010005 FRED identifier BOGZ1LM102010005Q) on Table S5 and line 103 (LM795013865 FRED identifier BOGZ1LM795013865Q) on Table S6.

Market or Enterprise Value of Corporate Non-Financial Assets The variable P_{t+1} in the model is the market or enterprise value of non-financial assets at the end of period t. This is the sum of such values across the non-financial business sector and the financial business sector. We construct this measure for the non-financial corporate business sector as the sum of Liabilities line 136 (FL104194005 FRED identifier NCBLEYQ027S) less Financial Assets line 108 (FL104090005 FRED identifier TFAABSNNCB) on Table S5 (note that this series is in billions of dollars). For the financial business sector, we construct this measure as the sum of corporate equity issues (LM793164105 FRED identifier BOGZ1LM793164105Q) and Foreign Direct Investment in the United States (LM793192005 FRED identifier BOGZ1LM793192005Q) less US Direct Investment Abroad (LM793092005 FRED identifier BOGZ1LM793092005Q). This measure of enterprise value for the financial business sector corresponds to value of equity in financial businesses resident in the U.S.

C.1 Comparison of measurement of enterprise value to that in Crouzet and Eberly 2021

Our measurement of the market value of the corporate sector is related to that in Crouzet and Eberly (2021). They use a valuation equation similar to ours, given in their equation (3), decomposing firm value into a replacement value of the capital stock and a valuation of the rents earned by the firm. Their aim is to compare this valuation to measures of "enterprise value" conceptually related to ours.

In Appendix 3 of that paper, they construct a measure of the "enterprise value" of non-financial corporations that differs from ours in two important respects. First, they follow a procedure developed in Hall (2001) to construct a market value of the bonds issued by the nonfinancial corporate sector. We have not followed this procedure.

Second, they subtract only liquid financial assets from the sum of the market values of the equity and liabilities of the firms in this sector. This list of liquid assets corresponds to the sum of lines 2 through 11 of Table L103. We treat the remaining financial assets on this table (rows 12 through 19) as negative debt and subtract these as well. This difference in procedures implies that the measure of enterprise value used in Crouzet and Eberly (2021) includes both foreign direct investment into the U.S. and U.S. direct investment abroad.

C.2 Comparison of measurement of earnings to that in Greenwald, Lettau, and Ludvigson 2021

Greenwald, Lettau, and Ludvigson (2021) conduct a valuation exercise that is related to ours, but they organize the measurement differently. Specifically, they look to value the equity issued by the US non-financial corporate sector. This implies that they are interested in the cash flows available to be paid specifically to equity inclusive of the earnings of US corporations on their foreign operations.

D Foreign Ownership of US Equity

Our baseline measure is a ratio with the numerator equal to a comprehensive measure of ROW ownership of US equity assets and the denominator equal to our measure of the Market or Enterprise Value of Corporate Non-Financial Assets as defined above. Here the numerator is computed as the gross ROW equity claims on the US described above as the by the sum of Table S9 lines 116 Corporate Equities (LM263064105, FRED identfier BOGZ1LM263064105Q) and 117 Mutual Fund Shares (LM263064203, FRED identifier BOGZ1LM263064203Q) and the market value of the equity component of ROW foreign direct investment in the US given by Table L230 line 22 (LM263092101 FRED identifier BOGZ1LM263092141Q).

E Hedge Fund Data

Starting in 2013, the Securities and Exchange Commission began releasing quarterly data on privately managed funds (such as hedge funds and private equity funds) collected through SEC form PF in *Private Fund Statistics*. These data for U.S. domiciled hedge funds is now presented in Table B.101.f of the *Financial Accounts of the United States*, with a breakdown of gross positions into debt and equity. The Federal Reserve makes available in the *Enhanced Financial Accounts* a companion table showing a breakdown of the gross positions all hedge funds that file Form PF, both domestic and foreign. By comparing these two tables, we can see the magnitude of investments by foreign resident private funds that file form PF. At the end of 2018, the total holdings of corporate equities by private funds both foreign and domestic listed in the *Enhanced Financial Accounts* was \$1.97 trillion and these funds had a net asset value of \$3.75 trillion. From Table B.101.f, we see that the portion of these totals held by U.S. domiciled private funds was \$0.77 trillion in corporate equities and \$1.55 trillion in net asset value. These data indicate that nearly \$2 trillion of ROW portfolio investment in U.S. equities is by hedge funds located abroad. Since it is possible that the investors in these hedge funds are primarily U.S. residents, this leads to a potential overstatement of the claims by foreign residents on the U.S., as what is recorded here as holdings of U.S. equity of private funds domiciled abroad may in fact simply represent indirect holdings by U.S residents of U.S, corporate equities. In particular, the roughly \$2.2 trillion in net asset value reported by these overseas private funds could represent primarily an unmeasured asset of U.S. residents.

F Income Yields on U.S. External Assets and Liabilities

Our empirical decomposition focuses on decomposing changes in the U.S. Net Foreign Asset position into contributions of current account deficits versus valuation effects. We have documented that realized valuation effects used to favor the US and the US was therefore able to borrow heavily without accumulating much debt. That is one notion of privilege, and we have shown that form of privilege has ended.

But, more broadly, one could think about a country being privileged in international financial markets if the residents of that country persistently earn higher expected excess returns on their gross foreign assets than they pay on their gross liabilities. These differences in expected excess returns on different types of assets can show up in relatively high income yields on foreign assets (relative to liabilities) or relatively high expected valuation effects. Our previous analysis focused on measured realized valuation effects, but we now briefly discuss data on income yields. See also Setser (2017) and Setser (2018).

Here it is useful to decompose income yields on U.S. gross foreign assets and liabilities into those on Non-Equity Assets and Liabilities, Portfolio Investment Equity Assets and Liabilities, and Direct Investment Equity Assets and Liabilities.[25]

[25]The income and positions on these various gross assets and liabilities are listed in the BEA's International Transactions Table 4.1. *U.S. International Transactions in Primary Income* and International Investment

Non-Equity Assets and Liabilities are comprised of debt associated with Direct Investment, Portfolio Investment Debt Securities, Other Investment, and, for Reserve Assets. These Non-Equity Liabilities include U.S. currency, deposits in U.S. banks, and U.S. Treasury debt, all of which likely have lower income yields than other forms of debt assets and liabilities. Thus, one might expect that the observed income yield on U.S. Non-Equity Assets might be higher than the income yield on U.S. Non-Equity Liabilities. We find, however, that when these Non-Equity Assets and Liabilities are taken together, this is not the case. Specifically, we calculate implicit income yields on the aggregate of these Non-Equity Assets and Liabilities on an annual basis by dividing the total income received (or paid) by the total stock of these assets (or liabilities) and show these implicit income yields in Figure 18. We see in this figure that, when averaged across categories of non-equity assets and liabilities, the income yields on U.S. non-equity assets and liabilities have been very similar since 1999.

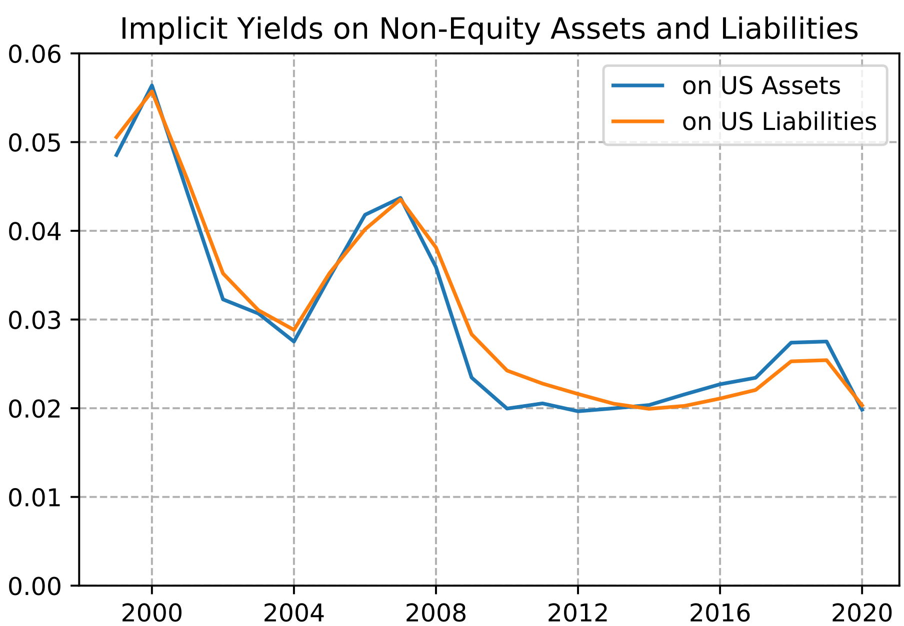

Figure 18: Implicit Income Yields on U.S. Non Equity Assets and Liabilities

In Figure 19 we show the income yields on U.S. Portfolio Equity Assets and Liabilities from 1999 through 2020. We see in this figure that, over the past ten years, the income yield on U.S. Portfolio Equity Assets as been roughly one percentage point higher than the income yield on U.S. Portfolio Equity Liabilities. Note that these Portfolio Equity income

Position Table 1.2 *U.S. Net International Investment Position at the End of the Period, Expanded Detail* yields correspond to the dividend yields on these equity assets and liabilities. These may differ for assets and liabilities even if expected excess returns do not if these differences are due to differences in U.S. and foreign firms payout policies or differences in expected growth rates of dividends across countries.

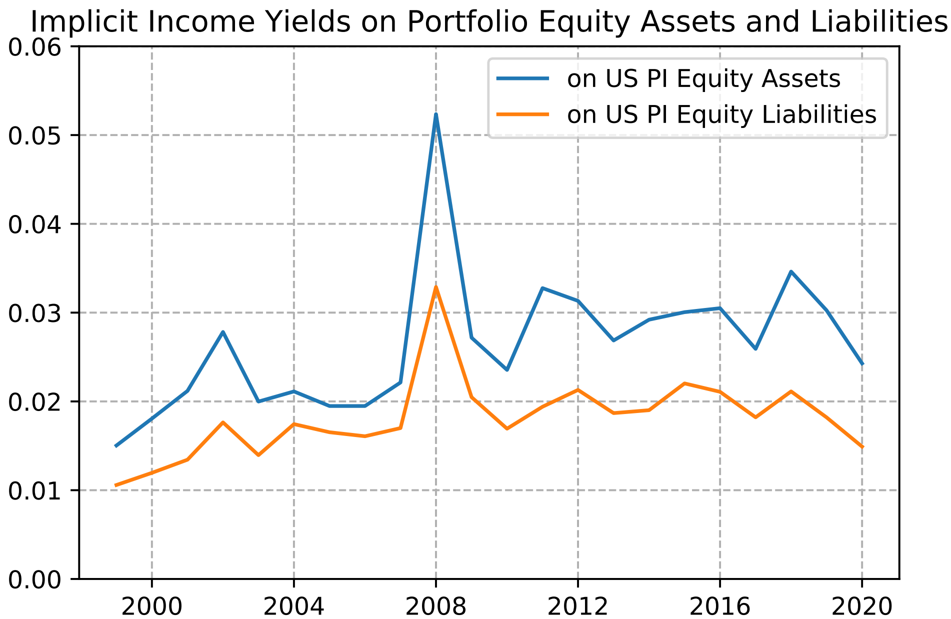

Figure 19: Implicit Income Yields on U.S. Portfolio Equity Assets and Liabilities

In Figure 20 we show the income yields on U.S.Direct Investment Equity Assets and Liabilities from 1999 through 2020. We see in this figure that, over the past ten years, the income yield on U.S. Direct Investment Equity Assets as been roughly five percentage points higher than the income yield on U.S. Direct Investment Equity Liabilities. This gap between the income yields on U.S. Direct Investment Equity Assets and Liabilities, together with growing gross direct investment equity positions, accounts, mechanically, for most of the gap between U.S. Net Factor Income from Abroad and the net factor income that one might predict from the U.S. Net Foreign Asset position.

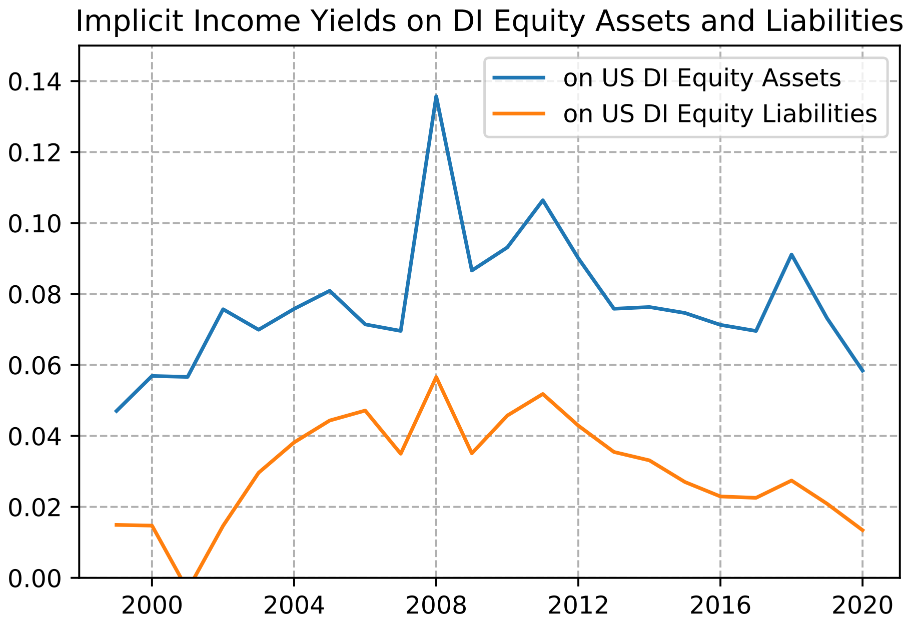

Figure 20: Implicit Income Yields on U.S. Direct Investment Equity Assets and Liabilities

There has been considerable discussion in the literature of this gap between the income yields on U.S. Direct Investment Assets and Liabilities.

One hypothesis is that the valuation of U.S. Direct Investment Equity Assets recorded in the BEA's International Investment Position tables is too low, thus resulting in a high income yield as a matter of mismeasurement of the denominator of that ratio. This is often referred to as the "Dark Matter" hypothesis. See Hausmann and Sturzenegger (2007). See also Kozlow (2006) and this discussion from the BEA at `https://www.bea.gov/help/faq/202`. Note from these discussions that the measured income yield on Direct Investment Equity is a ratio of corporate income net of taxes to the value of the corporation, not a measure of dividend yields as is the case for portfolio equity.

Another hypothesis regarding this gap in income yields for Direct Investment Equity Assets and Liabilities is that, for fiscal reasons multinational firms tend to over-report income from foreign affiliates and under-report income generated in the United States. See, for example, Curcuru, Thomas, and Warnock (2013), Setser (2017), Setser (2019), Torslov, Weir, and Zucman (2020), Guvenen et al. (2021), and Garcia-Bernardo, Jansky, and Zucman (2021). According to this hypothesis, the numerator of the ratio that is the income yield is mismeasured. The upshot of some of these papers is that that these concerns affect the division of the current account between net exports and net foreign income but do not distort the measurement of the U.S. NFA position not the current account.

G Market Valuation of FDI Equity

Milesi-Ferretti (2021) raises concerns with the market valuation of ROW direct investment in U.S. resident corporations and the market valuation of U.S. residents' direct investment in corporations resident in the ROW estimated in Table S9 and Table L230 providing a breakdown of that direct investment. In these tables, the market value of ROW direct investment in U.S. resident corporations is estimated using U.S. stock market indices and the market value of U.S. residents' direct investment in corporations resident in the ROW is estimated using foreign stock market indices. One might argue that it is more appropriate to use foreign stock market indices to value foreign direct investment equity in the U.S. and U.S. stock market indices to value U.S. direct investment equity in the ROW. In Figure 22, we show the evolution of U.S. net foreign assets with Foreign Direct Investment into and out of the U.S. valued at current cost as it was in the *Financial Accounts of the United States* until 2019. This could be viewed as an intermediate case between the current method for valuing FDI and the alternative suggested above. The figure shows that valuating FDI at current cost has an impact on the measured evolution of U.S. NFA. In particular negative valuations no longer apply to FDI which accounts for about 50% of the gross equity positions. So not surprisingly the size of the decline of the US NFA is smaller (25% of GDP instead 40%). Nevertheless the main fact we highlight remains: over the past 10 years US NFA has declined because of negative valuation effects.

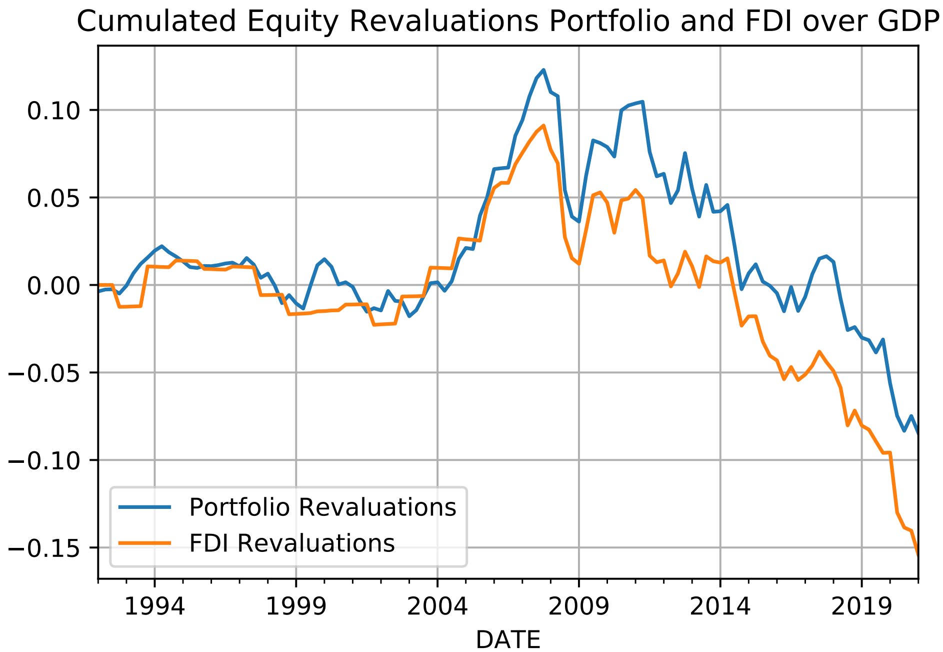

Figure 21: Cumulated Valuation Effects for Portfolio Equity and FDI Equity over GDP

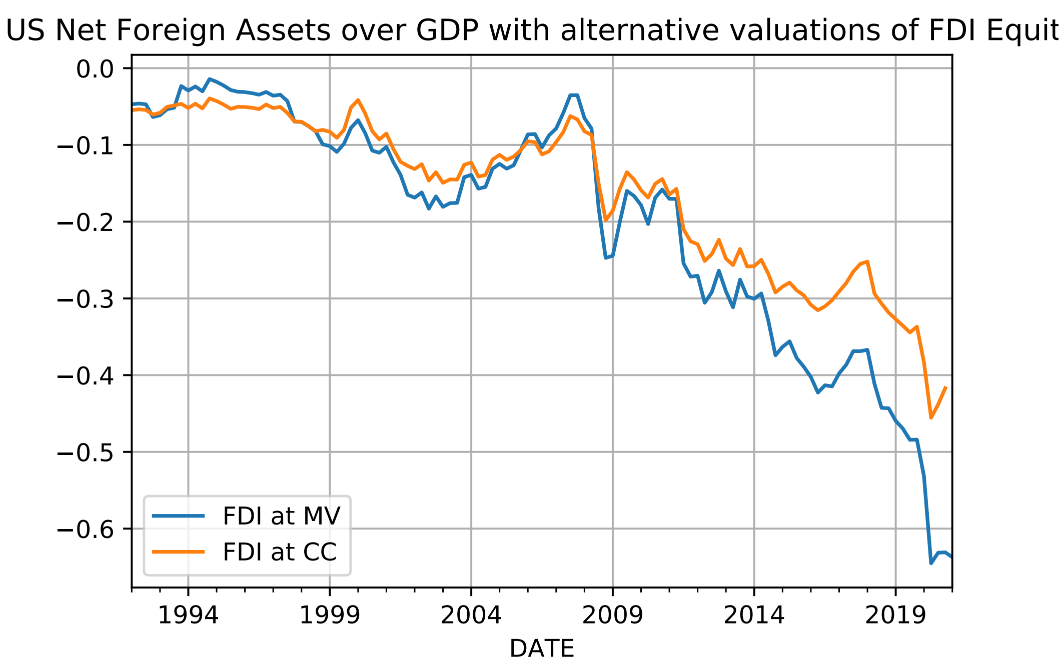

Figure 22: US NFA over GDP with FDI equity valued at market value and at current cost

H Offshore Financial Centers

Here we discuss the measurement of investment by hedge funds, which are often located overseas in places such as the Cayman Islands. See, for example, Coppola et al. (2021). Since it is possible that the investors in these hedge funds are primarily U.S. residents, this leads to a potential overstatement of the claims by foreign residents on the U.S., as what is recorded as holdings of U.S. equity of private funds domiciled abroad may in fact simply represent indirect holdings by U.S residents of U.S. corporate equities. We address this concern in two ways. First we use data from the Securities and Exchange Commission to estimate the share of U.S. corporate foreign equity holdings held by foreign hedge funds. These data are described in the data appendix section E and the share is reported in figure 23 in the appendix. The figure shows that the share is quite large (close to 20%) so, if some of these holdings are not truly foreign, the standard data overestimates of the size of the gross equity position of foreigners. However the figure also shows that over the period 2013-2020 the share of these holdings over the total foreign equity position in the United States has not increased. Another way we can estimate foreign holdings of U.S. equity that are not truly foreign is to use the share of holdings of U.S. corporate equity by the Cayman Islands, from Table 1.d in Aggregate Holdings of Long-term Securities by U.S. and Foreign Residents (as reported by the Federal Reserve). This share is also reported in figure 23 from 2012 until 2020 and the story is similar: the share is large but it has not increased recently. These findings lead to conclude that the deterioration of the U.S. net equity position over the past 10 years is not simply reflecting a reclassification from domestic holding into foreign equity holdings.

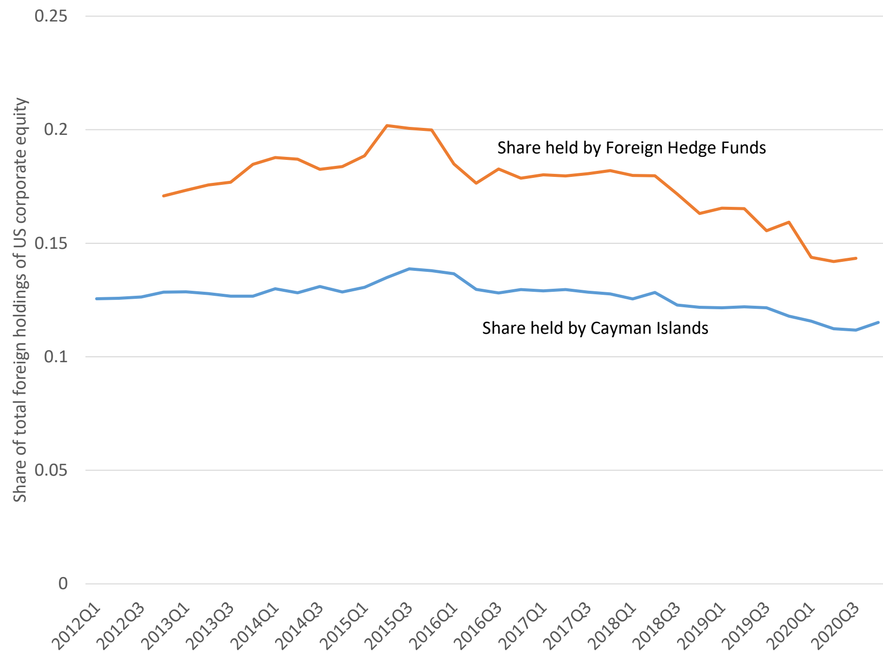

Figure 23: Estimates of share of not truly foreign holding of US corporate equity

I Additional Figures

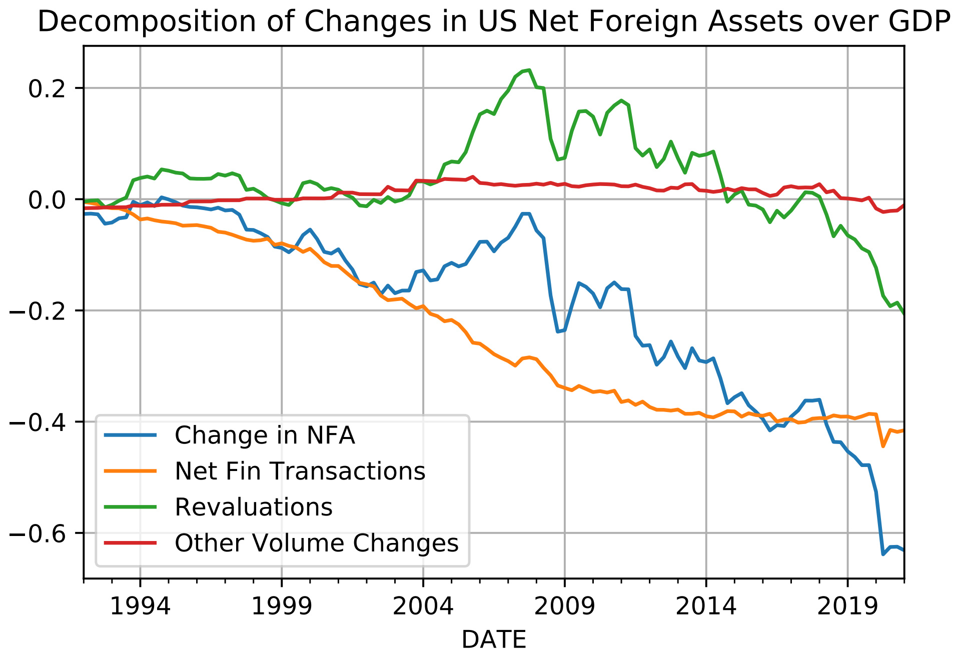

Figure 24: Alternative Decomposition of Changes in US Net Foreign Assets over GDP

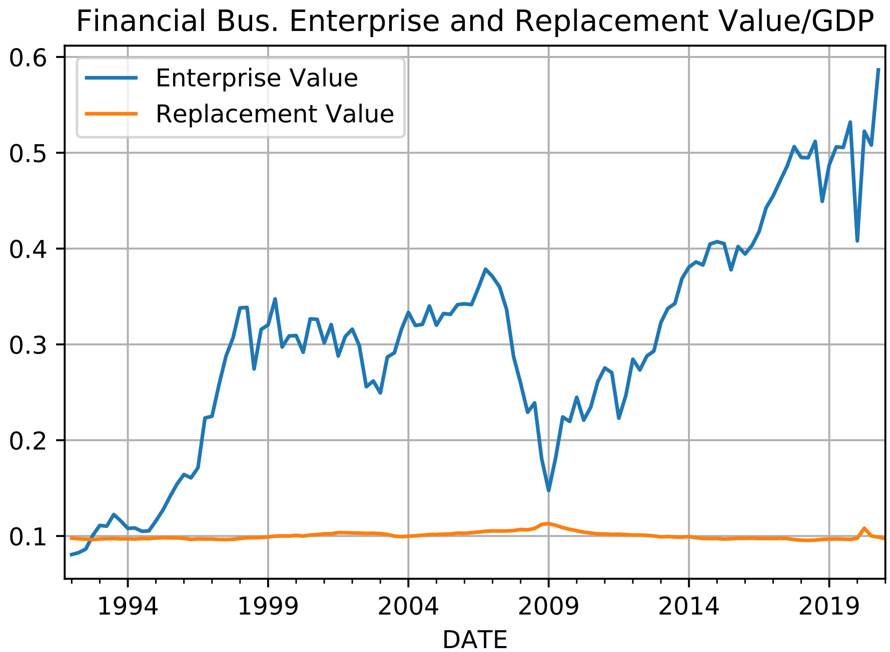

Figure 25: Ratio of Enterprise and Replacement Values of US Financial Business Sector Nonfinancial Assets to GDP

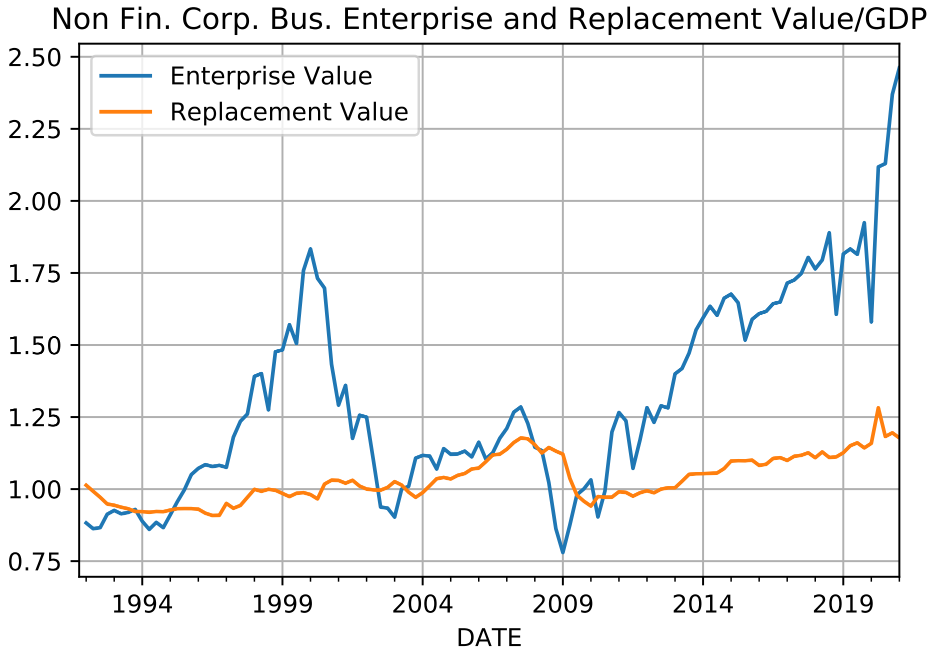

Figure 26: Ratio of Enterprise and Replacement Values of US Non-Financial Corporate Sector Nonfinancial Assets to GDP

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