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 since 2007 and is currently negative 65 percent of U.S. 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. equity liabilities to the rest of the world. We develop an international macro finance model of flows, stocks, and valuation of the U.S. corporate sector and the current account and net foreign asset position of the United States to interpret these trends. We find that the welfare impact of these trends on a representative U.S. household has been quite negative given the large share of U.S. equity owned by foreign investors.

JEL Classification Numbers: F30,F40

Key Words: Current account, Equity Markets, Global Imbalances

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1 Introduction

Figure 1 plots the net foreign asset position of the United States, as a fraction of U.S. GDP from 1990 into 2022. This position is measured as the market value of the assets U.S. residents hold abroad minus the market value of U.S. assets held by foreigners. For the period from 1990 to 2007, and in the decades before 1990, the United States maintained a relatively small negative net position despite running sustained and substantial current account deficits. As discussed by Gourinchas and Rey (2007) and Gourinchas, Rey, and Govillot (2017), up until 2007, it appeared that the residents of the United States enjoyed a privilege such that, at least ex-post, market revaluations of their cross border assets and liabilities allowed them to finance these current account deficits without incurring a substantial decline in its NFA position.

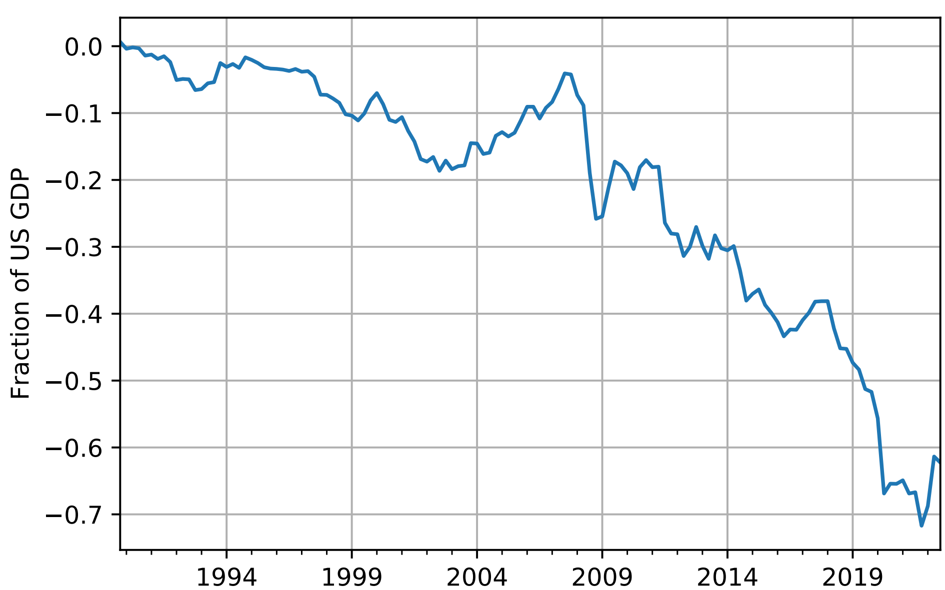

Figure 1: The U.S. Net Foreign Asset Position: 1990-2022

In sharp contrast to this prior experience, from 2007 into 2021, as shown in Figure 1, the U.S. net foreign asset (henceforth NFA) position has declined precipitously — by 60 percentage points of U.S. GDP — before bouncing back somewhat in the first three quarters of 2022.

At the same time, over the last decade, measures of the net financial wealth of U.S. residents have boomed, with much of this increase in net financial wealth driven, in an accounting sense, by an increase in the market valuation of the non-financial assets in U.S. Corporations.[1] Because foreigners' gross holdings of equity in U.S. corporations has grown to be quite large, this boom in the market valuation of U.S. corporations has mechanically increased the market value of U.S. liabilities to the Rest of World (henceforth ROW) leading directly to a deterioration of the U.S. NFA position through this revaluation of ROW equity in the United States.[2] There has not been a similar boom in the valuation of corporations in the ROW during this time period, so U.S. residents did not enjoy a similar revaluation of their gross equity position abroad. As a result, the net impact of asset revaluations accounts for a large portion of the deterioration in the U.S. NFA position over the past decade. In fact, as we show below, the negative impact of these revaluations of gross cross-border equity positions has been so large that it has erased any "privilege", again at least ex-post, that U.S. residents enjoyed from 1990 to the present. That is, the U.S. NFA position is now worse than it would have been if no asset revaluations had occurred at all over this time period.[3]

In this paper, we provide answers for two questions: What factors underlie this deterioration of the U.S. NFA position and the boom in the market valuation of U.S. corporations over the past decade? And what might these developments mean for the welfare of U.S. residents?

To answer these two questions, we develop a unified international macro-finance model of flows, stocks and valuations of the U.S. Corporate Sector and of the U.S. current account and NFA position. The model builds on Farhi and Gourio (2018) and Crouzet and Eberly (2021) but extends those frameworks to an international setting to include international positions and flows in the model.[4] Model households in two regions (the U.S. and ROW) trade domestic

[1]The *Financial Accounts of the United States* published by the Board of Governors of the Federal Reserve provides a measure of the Net Wealth of the United States in Table B1. This measure is the sum of market valuations of non-financial assets held by the Household, Non-Financial Non-Corporate, Non-Financial Corporate, Financial Sector, and the Federal and State and Local Government Sectors plus the Net Foreign Asset position of the United States. This measure is not a comprehensive measure of the wealth of U.S. residents because it does not include the value of human capital.

[2]This direct impact of changes in the valuation of U.S. corporations on the U.S. NFA position was partially reversed in the first half of 2022 as U.S. equities fell in value. In addition, this boom in the valuation of U.S. corporations has had an indirect impact on the U.S. current account and NFA position through its impact on the wealth-to-income ratio of U.S. residents, but we find below that this indirect effect is relatively small.

[3]Gourinchas and Rey (2014), Gourinchas, Rey, and Govillot (2017), Chen et al. (2022), Choi, Kirpalani, and Perez (2022), and Gourinchas (2023) and many others discuss the role of ex-ante return differentials on U.S. foreign assets and liabilities in shaping the U.S. external position. See Curcuru, Thomas, and Warnock (2013) for a critical review of the evidence for an ex-ante difference in expected returns on U.S. foreign assets and liabilities. In our analysis, we do not assume any ex-ante return differential on U.S. asset and liabilities. We focus our analysis on the impact of differences in ex-post realized returns. Other authors have also highlighted the large boom in the value of U.S. assets and its impact on the U.S. NFA position; see, for example, Jiang, Richmond, and Zhang (2020) and Milesi-Ferretti (2021).

[4]See also Caballero, Farhi, and Gourinchas (2017), Gutierrez and Philippon (2017), Eggertsson, Robbins, and Wold (2021), Greenwald, Lettau, and Ludvigson (2021), Corhay, Kung, and Schmid (2021) and others for macrofinance models of the boom in the valuation of U.S. Corporations.

and foreign equity and risk free bonds. Firms in both countries enjoy pricing power that translates to rents payable to their shareholders that Karabarbounis and Neiman (2019) refer to as *factorless income*. The size of this factorless income can vary across countries and over time, generating fluctuations in equity valuations relative to value-added. Additional sources of time variation in asset values include fluctuations in the equilibrium discount rate applied to future cash flows, fluctuations in expected future growth rates, fluctuations in the replacement cost of capital, and fluctuations in corporate tax rates. The model is fully tractable. We exploit its tractability to measure the factors driving observed flows, stocks and valuations of the U.S. Corporate Sector together with the evolution of the U.S. current account and NFA position in quarterly data over the period 1990 through 2022.[5] We then use the model to conduct counterfactual exercises relative to this model baseline to consider how these driving factors impacted the welfare of U.S. households.

We have two main findings from our analysis.

First, when we use our model for measurement, we find that much of the increase in the market valuation of the non-financial assets in U.S. corporations over the past decade has been due a dramatic increase in the free cash flow from operations available to pay to owners of firms. We define this free cash flow to owners of firms as the amount left over from corporate sector value added after deducting payments to labor, taxes (both indirect business taxes and taxes on corporate profits), and investment expenditures on new non-financial assets.[6] We find that changes in the valuation multiple of those cash flows to firm owners have played a smaller role in driving the increased market valuation of U.S. Corporations. In our accounting, some of this increase in corporate free cash flow is due to changes in taxes and the share of labor in costs, but the lion's share of the increase is due to an increase in the wedge between revenue and total cost resulting in a large increase in the share of factorless income. In what follows, we refer to this wedge as the *output wedge*.[7]

Second, when we use our model for counterfactuals, we find that the implications of

[5]Our measurement procedure is related to that developed in Chari, Kehoe, and McGrattan (2007) in that we saturate the model with interpretable parameters and then find parameter values such that the model matches the data period by period.

[6]We show in Figure A.3 that this increase in the free cash flow from U.S. corporations relative to corporate value added is unprecedented in post-WWII data and has reached levels attained previously in the available data only in the 1930's.

[7]We use the terminology *output wedge* as this wedge in our model plays the same role as the output distortion in Hsieh and Klenow (2009) and the "markups" in Farhi and Gourio (2018), Baqaee and Farhi (2020), Barkai (2020), and Crouzet and Eberly (2019). That is, it determines the share of revenue that corresponds to factorless income and distorts firms' incentives to accumulate physical capital. It is distinct from the measure of markups of price over marginal variable cost presented in De Loecker, Eeckhout, and Unger (2020). In their paper, they consider capital to be a fixed factor within the period and thus it is not part of marginal cost. As they discuss, changes in this measure of markups do not necessarily correspond to changes in the share of factorless income or the incentives of firms to invest in physical capital.

these developments driving the increase valuation of U.S. corporations for the welfare of U.S. residents are dramatically impacted by the observed large increase in gross cross-border equity positions. Specifically, in our counterfactual exercises, we find that had U.S. residents been the sole owners of U.S. corporations, the observed rise in the output wedge would have had only a small impact on the welfare of a representative U.S. household. This welfare impact would have been small because lower wage income would have been largely offset by higher free cash flow to U.S. households. That is, primary impacts of the increase in the output wedge are to reallocate income from labor to factorless income, and, while a larger output depresses output through its impact on capital accumulation, lower investment implies higher free cash flow to households that they can invest abroad.[8] In contrast, given the large cross-border equity positions observed in the data, we find that the observed rise in the output wedge has a large impact on the consumption of U.S. residents because much of the increase in free cash flow payable to owners of U.S. firms is paid to their foreign owners. In this way, the welfare impact for U.S. residents of a large increase in the wedge between revenue and cost for U.S. corporations is dramatically different depending on the degree of international diversification of equity portfolios.[9]

We make three principal contributions to the literature.

First, we build a simple model to provide an integrated accounting of flows, stocks and valuations of the U.S. corporate sector and of the U.S. current account and NFA position. It has long been recognized that the current account and net foreign asset position of a country are impacted not only by changes in capital accumulation but also through changes in asset valuations, both directly through revaluations of existing cross-border asset holdings and through wealth effects impacting the ratio of consumption to income.[10] While all of these effects are present qualitatively in standard international business cycle models, these standard models typically do not account quantitatively for the large changes in valuations of firms at home and abroad observed in the data. Here we address this shortcoming of standard international business cycle models by extending the recent macro-finance literature that has been developed to account for large observed changes in the valuation of U.S. corporations to integrate its implications for the U.S. current account and the U.S. net foreign asset position.

Second, in extending the macro-finance literature to include its implications for the current account and the net foreign asset position, we bring additional data to bear on the question of whether the observed increase in the market valuation of the U.S. corporate sector is driven

[8]See, for example Baqaee and Farhi (2020) Corollary 1 for a theoretical derivation of this result in a closed economy. This quantitative finding in our model is obtained given the large increase in the output wedge.

[9]Here we focus on the ex-post welfare impact of these developments on a representative U.S. household.

[10]See, for example, Lane and Milesi-Ferretti (2001), Lane and Milesi-Ferretti (2007) and subsequent updates of these data by these authors and the discussion of the literature on the current account and NFA position in Gourinchas and Rey (2014).

by an increase in cash flows to owners of firms or by a change in the valuation multiple of those cash flows. As discussed in Karabarbounis and Neiman (2019), to identify the share of factorless income in value added of the corporate sector, one must be able to identify the appropriate compensation of physical capital employed in that sector. This can be done either by direct estimation of that cost of capital as in Barkai (2020) or through measurement of the cost of capital based on expected dividend yields and estimates of expected future growth as in Farhi and Gourio (2018) and Crouzet and Eberly (2021). Both of these approaches, however, require assumptions about unobserved parameters — the equity premium in the first case and expected future growth rates in the second. By including data on the current account in our measurement, we are able, through the model, to identify both the cost of capital and future expected growth as these variables have an impact on the current account that is distinct from their impact on the valuation of domestic firms. Our model-based measurement comes down in favor of a stable ratio of expected free cash flow to the market value of non-financial assets in U.S. corporations over the past decade as the model requires relatively stable valuation ratios to account for the relative stability of the U.S. current account balance.

Third, and perhaps most important, as we discuss above, we find that conclusions regarding the welfare costs to U.S. residents of a large increase in the share of corporate value added attributed to factorless income are highly sensitive to the extent of cross-border diversification of equity positions.

We also perform a sensitivity analysis of our valuation results to alternative assumptions about determinants of equilibrium valuation ratios using a measurement procedure similar to that in Farhi and Gourio (2018) and Crouzet and Eberly (2021) and find that the conclusion that much of the increase in the market valuation of U.S. corporations is due to an increase in the output wedge is robust to this wide range of alternative assumptions about expected future growth even if the implication of the model for the U.S. current account is highly sensitive to these alternative assumptions. We describe how our measurement procedure relates to that used in prior macro-finance papers in greater detail in Appendix D.

The remainder of the paper is organized as follows. In Section 2 and Appendix A, we present the data we use on the U.S. NFA position and current account and the flows, stocks, and valuation of the U.S. Corporate Sector since 1990.[11] In Section 3, we present our model and develop its implications for the valuation of the U.S. corporate sector and the U.S. current account and NFA position.[12] In Section 4 and Appendix C, we describe how we

[11] In Appendix B, we discuss several concerns regarding the measurement of gross cross border equity positions and the valuation of cross border direct investment equity that have been raised in the prior literature. We do not make a contribution to resolving these concerns.

[12] In our baseline model, there are no equilibrium changes in the terms of trade. We present an extended

use our model for measurement of the factors driving the flows, stocks, and valuation of the U.S. Corporate sector as well as the U.S. current account and NFA position. We present our baseline findings in Section 5. In Section 6 we present our counterfactual exercises with the model to evaluate the impact of these changes on the welfare of U.S. residents. We present our sensitivity analysis of our measurement results in Section 7 and discuss the relationship between our measurement procedure and that taken in the prior literature in some detail in Appendix D. We then conclude.

2 The Evolution of the U.S. Current Account, NFA Position and the U.S. Corporate Sector: 1990-2022

In this section, we review the measurement concepts and data we analyze with our model.

The data on the U.S. NFA position shown in Figure 1 shows a large deterioration in this position over the course of the past decade. Figure 2 shows the evolution of the U.S. current account relative to U.S. corporate sector Gross Value Added (GVA). We see in this figure that the United States has consistently run current account deficits since 1990, but these deficits have not been particularly large during the past decade. We next discuss how these two observations regarding the current account and NFA position are reconciled.

model with such changes in the terms of trade in Appendix E.

Figure 2: The U.S. Current Account over U.S. Corporate Gross Value Added

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 net U.S. 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 compose the gross positions. The third term, (RES_t), is a residual, which reconciles the changes in the NFA position resulting from measured financial transactions and asset positions with the ones resulting from current account transactions.[13] Thus,

$$NFA_t - NFA_{t-1} = \underbrace{CA_t}_{\text{net lending abroad}} + \underbrace{VA_t}_{\text{valuation effects}} + \underbrace{RES_t}_{\text{residual term}} . \tag{1}$$

[13]In Table S.9, by construction, the change in the net foreign asset position (on line 104) is the sum of net lending (line 13) measured from the current account less capital transfers, nominal revaluations (line 103), and total other volume changes (line 70). We use the label "residual" as a shorthand for "total other volume changes". Total other volume changes in Table S.9 is equal to "other volume changes," (line 71), which captures discrepancies arising from the different measures of international portfolio positions and flows, less the "statistical discrepancy," (line 72), which captures the difference between net lending measured from the current account (line 13) and net lending measured from recorded financial transactions (line 69). See Curcuru, Dvorak, and Warnock (2008), section 3, for a discussion of these discrepancies arising from differences in the measurement of international financial flows and positions.

Summing (1) from period 1 to period t yields

$$NFA_t = NFA_0 + \underbrace{\sum_{j=1}^{t} CA_j}_{\text{cumulated CA}} + \underbrace{\sum_{j=1}^{t} VA_j}_{\text{cumulated valuations}} + \underbrace{\sum_{j=1}^{t} RES_j}_{\text{cumulated residuals}}, \tag{2}$$

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

Figure 3 shows the evolution of the three components in equation (2) divided by U.S. Corporate GVA in each quarter t, from 1990 Q1 until 2022 Q3. The figure shows three different phases in the evolution of the U.S. NFA position. During the first phase (1990–2002), the NFA position closely tracked cumulative current account dynamics. During the second phase (2002–2007), the cumulative current account continued to deteriorate, but the NFA position improved, owing 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. In the third and final phase (2007–2021) the U.S. NFA position declined substantially, despite a fairly stable (relative to corporate GVA) cumulated current account deficit. Note that by 2020, the U.S. NFA position was *more* negative than cumulated current accounts over the entire 1990 to 2020 period. As is evident in the figure, a large portion of the decline of the U.S. NFA position in this third phase was driven by negative valuation effects, meaning that during this period, U.S. residents experienced consistently lower capital gains on their foreign asset holdings than those enjoyed by foreigners on their U.S. assets.[14]

[14] In the Appendix, in Figure A.1, we present an alternative decomposition of the cumulated change in the U.S. NFA position, in which we show the change due to cumulated net lending measured from measured net financial transactions. Note that using measured net financial transactions to measure net lending reduces the decline in the NFA position due to U.S. borrowing from abroad but does not change the overall measure of the NFA. Thus, overall, it makes the end of the privilege appear even starker.

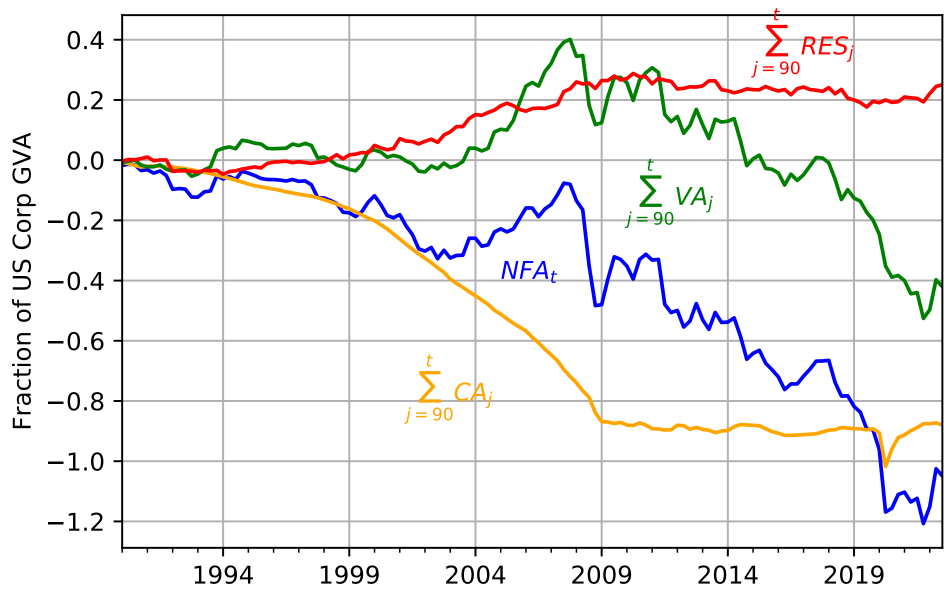

Figure 3: Decomposition of Changes in U.S. Net Foreign Assets over U.S. Corporate Value Added

Decomposing valuation effects 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 these valuation changes. As a matter of accounting, valuation effects are given by

$$VA_t = FA_{t-1} \times g_t^{P^*} - FL_{t-1} \times g_t^P,$$

where FA_{t-1} and FL_{t-1} are gross U.S. net foreign asset and liability positions at the end of $t-1$, and $g_t^{P^*}$ and g_t^P are the net growth rates in the dollar values of those positions between the end of $t-1$ and the end of period t. It is immediate from this expression that there are two necessary conditions for valuation effects to matter quantitatively: (1) gross positions must be large, and (2) the values of foreign assets and foreign liabilities cannot co-move too closely. We now document that both these conditions have been satisfied in the past decade.

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.[15] At the beginning of our sample, when

[15]According to the Bureau Of Economic Analysis (2014), "Direct investment is related to control or a

international equity markets were still relatively underdeveloped, direct investment was the main component of both inward and outward equity investment, accounting for 80 percent 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. Figure 4 plots the evolutions of these categories of U.S. foreign assets and liabilities as fractions of U.S. GDP.

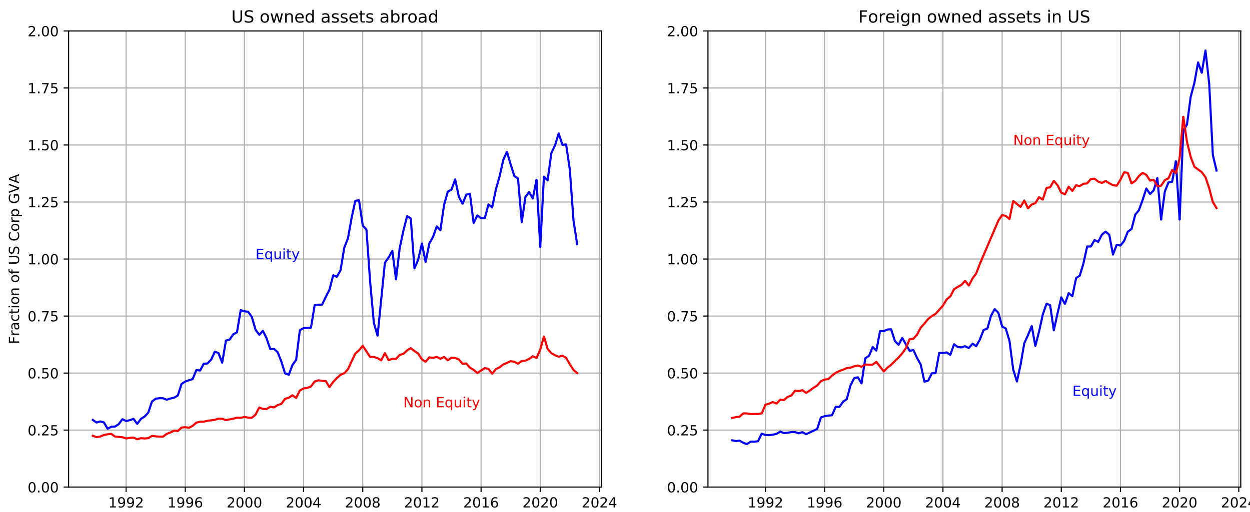

Figure 4: Gross Equity and Non-equity Positions over U.S. Corporate Value Added

The first key message from Figure 4 is that by 2007, all the gross positions are large and thus changes in the prices of the assets composing these positions can potentially generate significant valuation effects. The second key message is that over the past decade, U.S. equity liabilities have been large and now are larger in absolute terms than U.S. equity foreign assets.[16] Thus, changes in the price of U.S. equity that are not matched by identical changes in the price of ROW equity will have much larger effects on the U.S. NFA position than would have been the case in the past.

Figure 5 decomposes the cumulated valuation effects plotted in Figure 3 into valuation effects arising from equity and non-equity positions. The figure shows that net valuation changes arise almost exclusively from the equity positions. Although in principle both cate-

significant degree of influence and is U.S.ually 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."

[16]Note from these figures that it is still the case that non-equity claims are a larger share of total foreign claims on the U.S. than they are of total U.S. claims on the rest of the world.

gories are subject to relative valuation changes (due to both price changes and to exchange rate movements for assets denominated in different currencies), these effects are quantitatively much more important for the equity positions.[17] Note that prior to 2004 cumulated valuation effects were relatively small. The reason is that gross international equity positions were relatively small in the early part of our sample (Figure 4), so international differentials in equity price dynamics did not translate into large effects on the value of the NFA position.

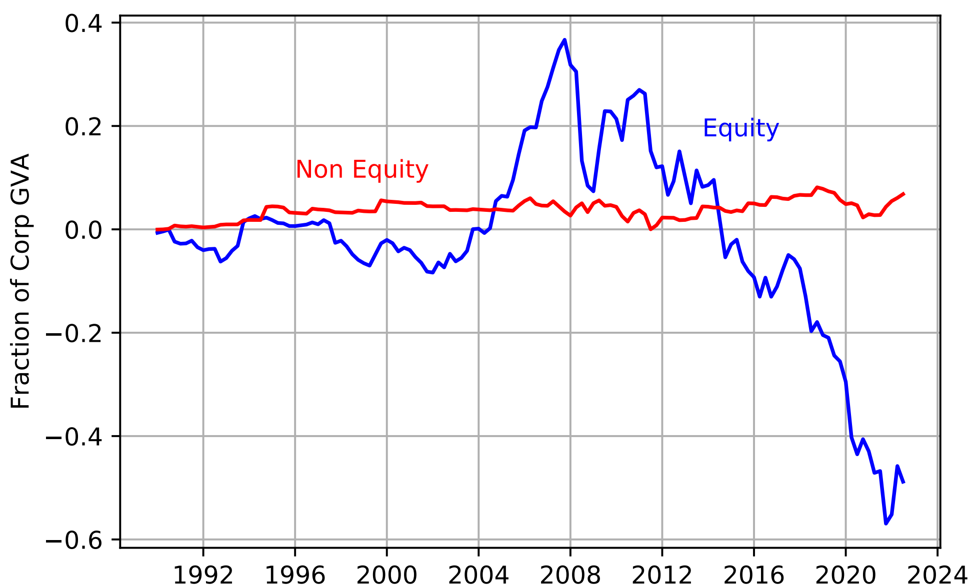

Figure 5: Cumulated Valuation Changes in Equity and Non-equity Positions over U.S. Corporate Value Added

Valuations, exchange rates and stock prices As discussed by the Bureau Of Economic Analysis (2014), changes in net valuations can arise from two sources: changes in the prices of the underlying assets, and changes in exchange rates, when assets and liabilities are denominated in different currencies. Note that the revaluation of ROW equity in the United States arises solely because of changes in the price of U.S. equity as these assets are valued in dollars. In contrast, the revaluation of U.S. equity in the ROW arises as a result of the

[17]One reason why valuation effects for non-equity assets are so small is that foreign bonds owned by Americans tend to be dollar-denominated, as are bond liabilities (see Maggiori, Neiman, and Schreger 2020). In the Appendix, we break down the cumulated valuation changes for equity into those coming from FDI equity versU.S. those from portfolio investment in equity; see Figure B.1. Cumulated valuation effects for equity are roughly equally split between the two components.

combination of changes in exchange rates and changes in local currency equity prices. In the period 2002–2007, changes in the U.S. exchange rate played an important role in the revaluation of U.S. equity in the ROW and, as a result, favorable net revaluation effects for the U.S. NFA position. In the past decade, the boom in U.S. equity prices has played a large role in accounting for the negative net revaluation effects for the U.S. NFA position.

To demonstrate this point, Figure 6 plots three stock prices indexes: the first is a price index for the United States; the second and third are price indexes for foreign stocks in local currency and in dollars, respectively.[18] These indexes help U.S. understand the contributions toward valuation effects of asset price movements in local currency versU.S. those of exchange rate changes.

Focus first on the top panel, which describes the earlier valuation episode from 2002 to 2007. This panel shows that U.S. equity and foreign equity performed similarly in local currency, but in dollar terms the foreign equity index substantially outperformed the U.S. index. This means that depreciation of the U.S. dollar against the basket of currencies that compose the foreign equity index was largely responsible for the positive valuation effect experienced by the U.S..

Moving now to the bottom panel, we can see that the later valuation episode from 2008 through 2022 Q2 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 in dollars indicates some appreciation of the U.S. dollar, but this appreciation accounts for only a small portion of the differential in dollar returns. Rather, the dominant factor was that the U.S. equity price index more than tripled over the period before falling back in 2022.

[18]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 ACWI ex U.S.A Index, which comprises stock market indexes for 22 developed economies and 27 emerging markets, weighted by market capitalization in dollars and in local currency. These indices are available from the MSCI website: see https://www.msci.com/end-of-day-data-search.

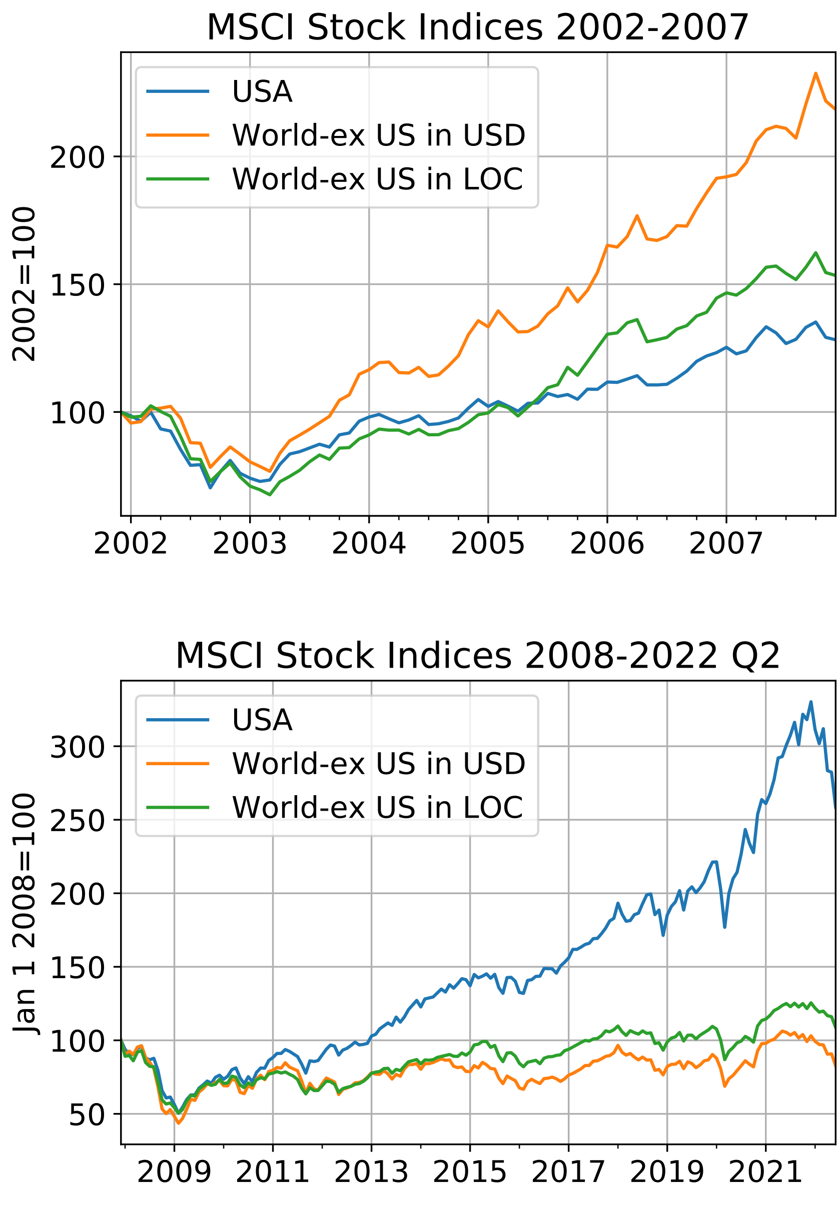

Figure 6: Two Valuation Episodes

Flows, Stocks, and Valuation of the U.S. Corporate Sector We now turn to a discussion of the data on the valuation of and free cash flow from the U.S. corporate sector. To present these data, we first discuss how we define our measurement concepts for this sector in a manner that is consistent across model and data for flows including value added, taxes, labor compensation, investment, dividends, and earnings, and stocks including the reproduction value of the stock of capital in that sector, and the value of these corporations.

We use Tables S.5 and S.6 of the Integrated Macroeconomic Accounts to measure the flows and balance sheets of the U.S. corporate sector. Table S.5 presents data for the non-financial corporate business sector, and Table S.6 presents data for the financial business sector. The overwhelming portion of foreign portfolio and direct investment into the United States is directed toward these two sectors. We combine these two accounts into an aggregated corporate sector. The national accounts follow the residence principle. Thus, the value added of U.S.-resident affiliates of foreign multi-nationals is counted as part of U.S. value-added, while the value added by U.S.-owned businesses abroad is not.[19]

The gross value added (GVA) of these sectors is divided into four categories of income in Tables S.5 and S.6: consumption of fixed capital (depreciation), compensation of employees, taxes on production and imports less subsidies, and net operating surplus. We measure the *earnings* of the corporate sector as net operating surplus less current taxes on income and wealth. We measure the free cash flow or *dividends* of the corporate sector as net operating surplus less current taxes on income and wealth less net capital formation. This measure of free cash flow corresponds to the after-tax cash flow from operations of corporations resident in the United States that is available to be paid out to investors in the debt and equity of those corporations. Note that in the data, only some of this cash flow is actually paid out to investors, while the rest of it is used to acquire, on net, financial assets (as accounted for in Tables S.5 and S.6). Thus, our empirical measures of earnings and dividends correspond to what those objects would be if firms were 100 percent equity financed and maintained no financial assets.

Our goal in measuring positions is to place a value on these flows of economic activity, which we refer to as earnings and dividends for corporations resident in the United States. Thus, we make several adjustments to the balance sheet data for the corporate sector presented in Tables S.5 and S.6. The following stylized balance sheet for the U.S. corporate sector is useful for organizing our discussion of these adjustments. Recall that this balance sheet is an aggregate of both U.S. firms with overseas subsidiaries (i.e., the parent firm is in the U.S.) and U.S. resident subsidiaries of foreign multinationals.

[19]The use of the residence principle has a substantial impact on the measurement of economic activity in the corporate sector relative to what one would get if one were to instead associate the economic activity of affiliates of multinational enterprises with the country in which the multinational is headquartered. For example, the BEA reports that in 2018, majority-owned U.S. affiliates of foreign multinational enterprises contributed $1.1 trillion, or 7.1 percent of U.S. business sector value added and accounted for 6.0 percent of total private industry employment in the United States. Likewise, in 2018, U.S. multinationals 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. using the residence principle, the Integrated Macroeconomic Accounts include that $1.1 trillion of value added by U.S. affiliates of foreign multinationals as a flow attributed to the U.S. corporate sector and do not include the $1.5 trillion produced by foreign affiliates of U.S. multinational enterprises in this category.

Corporate Sector Balance Sheet

Assets	Liabilities
Non-financial assets	Equity
(replacement or enterprise value)	(measured at market value)
Financial assets	Financial liabilities
(includes U.S. FDI in ROW)	(debt, bank loans, etc., including ROW FDI in U.S.)

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 is reported directly in the Integrated Macroeconomic Accounts.

The second is a measure of what we term the *enterprise value* of these non-financial assets.[20] This measure corresponds to the valuation that financial markets attach to the non-financial assets of U.S. corporations. We measure the value that financial markets attach to corporate non-financial assets located in the United States, both measured and unmeasured, as the sum of the market value of resident corporations' equities plus the value of their 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.[21]

The financial assets of these firms, listed as the second entry on the left side of this balance sheet, include the U.S.ual financial instruments as well as the debt and equity components of U.S. 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 U.S.ual financial instruments plus the debt and equity components of the direct investment of foreign parent firms into their U.S. subsidiaries. Note that excluding U.S. FDI in the rest of the world from enterprise value but including rest of world FDI into the United States aligns our measure of U.S. enterprise value with the residence principle.

Valuation and Capital in the U.S. and European Corporate Sectors In Figure 7, we show the ratio of enterprise value to value added for the U.S. corporate sector in blue (solid line) and the ratio of the replacement value of the stock of capital in those corporations

[20]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 and is closely related to that used in Hall (2001). We describe the specific series we use in measuring the enterprise value of the U.S. corporate sector in Appendix 2.

[21]Note that it would not be appropriate to equate the value of U.S.-located firms to the value of equity alone, because some fraction of firms' future cash flow is pledged to debt holders and bank lenders, and thus some fraction of firm value is reflected in the value of those liabilities.

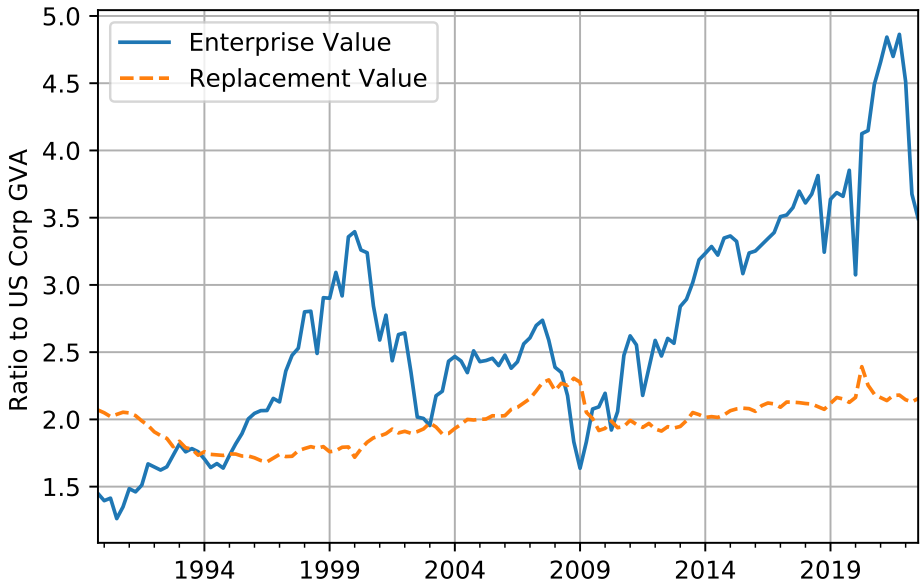

Figure 7: Enterprise and Replacement Values, Ratios to GDP, U.S. Corporate Sector

to values added in orange (dotted line).[22] The figure indicates that the capital-output ratio has been quite stable over time, while the enterprise value of U.S. corporations has risen dramatically. A direct implication of the divergence between these two lines is that Tobin's Q for the U.S. corporate sector has risen substantially over the past decade.

In Figure 8, we examine the ratio of our measure of payouts to owners of firms to U.S. corporate sector GVA. We see that compared with the period before 2007, this ratio has indeed risen substantially over the past 14 years. Figure A.3 shows this ratio in annual data 1929-2021. It is clear from these two figures that the recent increase in payouts to firm owners is unprecedented in post WW-II data. This increase in payouts arises from a combination of reductions in taxes, the labor compensation, and investment as ratios to corporate gross value added. Note that this measure of payouts to owners of firms does not require any imputations of compensation to physical capital or depreciation of that capital. Instead, it is a direct measure of free cash flows from operations for the U.S. Corporate sector.

In Figure 9, we construct a measure of the dividend or payout yield for the U.S. corporate sector based on the ratio of the after-tax cash available to pay to investors to our measure of the enterprise value of this sector. What is striking about this figure is that compared with

[22]We reproduce this figure for the financial business sector and non-financial corporate business sector separately in the Appendix in Figures A.5 and A.4 respectively.

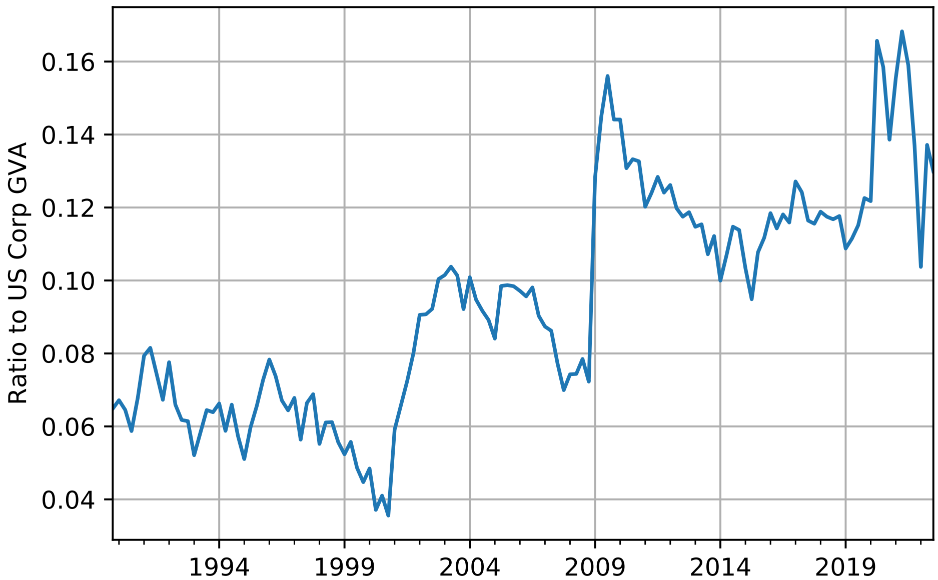

Figure 8: U.S. Corporate Sector Payouts, Ratio to U.S. Corp Value Added

the period before 2007, the ratio of payouts to value has not changed much in recent years. Thus, it appears that a substantial portion of the increase in the ratio of the value of U.S. corporations to GVA can be accounted for by an increase in the ratio of payouts to GVA.

We now document that the sharp increases in corporate enterprise value and payouts just described are U.S.-specific phenomena and that similar increases have not occurred in the European Union. In Figure 10 we plot, for the period 2002–2020, the ratio of the enterprise value of the corporate sector to GDP in the United States and in the European Union. The figure highlights the divergence between the U.S. and European ratios since the Great Recession, with the U.S. value rising by over 100 percent of GDP relative to its pre Great Recession level, while the European value was essentially constant over the same time span. As documented above in Figures 8 and 9, our main hypothesis is that the large increase in the U.S. corporate enterprise value reflects an increase in the payout rate of the U.S. corporate sector. Figure 11 provides supporting evidence for this hypothesis, showing that the diverging patterns in enterprise value between the United States and the European Union are indeed mirrored by diverging paths in their respective payout ratios, with payouts over the 2007-2020 period increasing in the U.S. but not in the EU. The figure suggests that differential dynamics of payouts are key to explaining the differential behavior of U.S. and

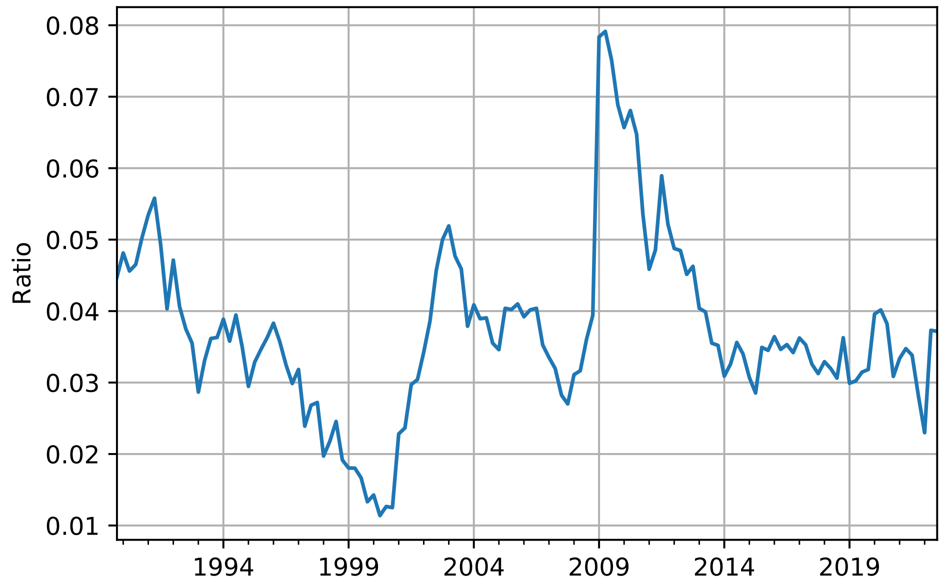

Figure 9: Payouts to Enterprise Value Ratio, U.S. Corporate Sector

European equity markets.[23]

This evidence that outside the United States, firm profits payable to investors have not risen, relative to GDP, is consistent with other studies. See, for example, Lequiller and Blades (2014, Chapter 3), Philippon (2019, Chapter 5), and Gutierrez and Philippon (2020). Gutierrez and Piton (2020) find evidence of labor's share declining much more in the United States than in other advanced economies.[24]

3 Model

We now develop a simple international macro finance model of flows, stocks and valuations of the U.S. corporate sector and of the U.S. current account and net foreign asset position. The objective is to construct a framework that can be used to measure the factors driving observed flows, stocks and valuations of the U.S. Corporate Sector and U.S. current account and net

[23]Details on how we constructed data in Figures 10 and 11 are in Appendix A.5. The appendix also illustrates Buffett ratios and payout ratios constructed for a larger aggregate of U.S. financial partners, including the United Kingdom, Canada and Japan. Results for this aggregate are very similar to those for the European Union alone.

[24]In contrast to these papers, De Loecker and Eeckhout (2021), using the Worldscope dataset of firm financial statements, argue that markups and profits have risen in Europe as well as in the United States.

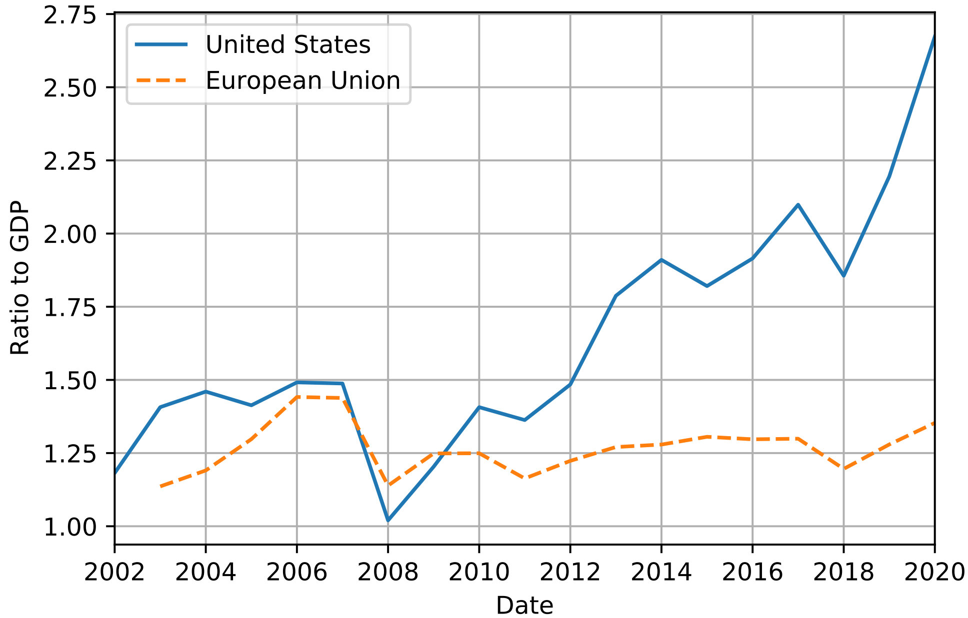

Figure 10: Corporate Enterprise Value in the United States and the European Union

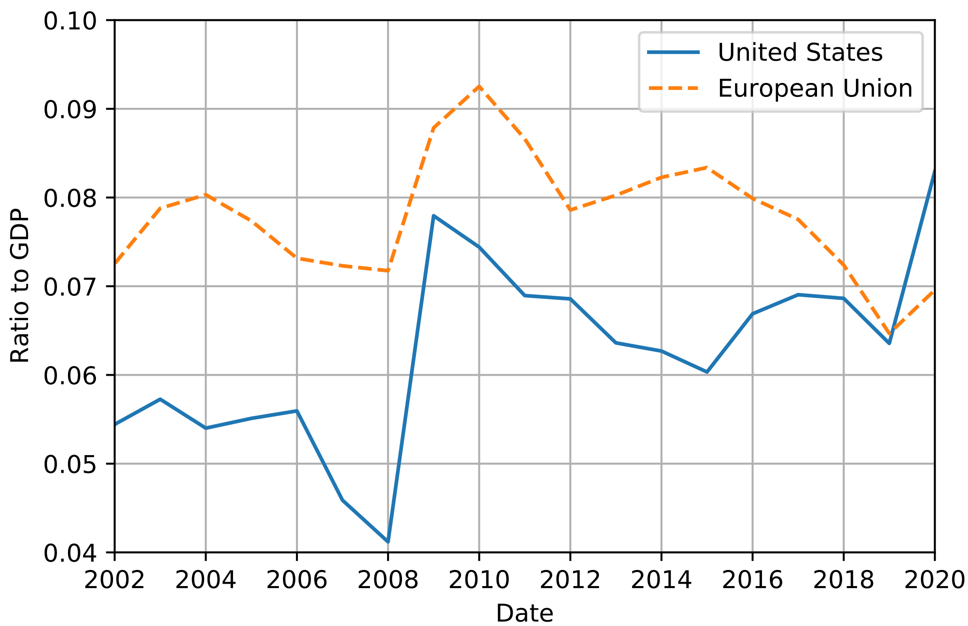

Figure 11: Corporate Payouts in the United States and the European Union

foreign asset position over the period 1990 through 2022 and then conduct counterfactual exercises relative to this model baseline to consider how these driving factors impacted the welfare of U.S. households.

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. 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 monopoly profits. Households receive labor income, dividends from holdings of corporate equity both in their region of residence and abroad, and interest income from a risk free bond that is traded internationally.

In our baseline model specification, we assume that foreign households are risk-neutral and that their rate of time preference determines the cost of capital for firms worldwide. That assumption allows U.S. to characterize equilibrium allocations in closed form and to illustrate the economic mechanisms at work as transparently as possible. We also assume that both countries produce and consume the same final good, so the terms of trade and the real exchange rate in the model will always be equal to one. Recall that exchange rate movements account for only a small portion of the valuation effects in the NFA position between 2010 and 2022. In Appendix E, we discuss a generalization of the model in which domestically and foreign produced goods are imperfect substitutes, in which case shocks to monopoly power and/or productivity have the potential to affect the terms of trade.

3.1 Intermediate-Goods Firms

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.

Output can be consumed domestically, exported, or transformed into investment goods. Thus,

$$C_t + G_t + Q_t X_t + N X_t = Y_t,$$

where C_t is private consumption, G_t is public consumption, $Q_t X_t$ is investment expenditure in units of final output, and NX_t is net exports. Investment goods augment the capital stock in the standard way:

$$K_{t+1} = (1 - \delta_t)K_t + X_t,$$

where δ_t is a time-varying depreciation rate. The replacement value of the capital stock at the end of period t in units of final consumption is denoted by $Q_t K_{t+1}$ where this replacement value evolves over time according to

$$Q_t K_{t+1} = Q_{t-1}K_t + (Q_t - Q_{t-1})K_t - \delta_t Q_t K_t + Q_t X_t \tag{4}$$

where the term $Q_{t-1}K_t$ is the replacement value of the capital stock at the end of period $t-1$, $(Q_t - Q_{t-1})K_t$ is revaluation of installed capital between $t-1$ and t, and the term $\delta_t Q_t K_t$ corresponds to consumption of fixed capital in units of the final consumption good at t.

Both countries produce the same final good. Thus, using asterisks to denote foreign variables, the world resource constraint is

$$C_t + C_t^* + G_t + G_t^* + Q_t X_t + Q_t^* X_t^* = Y_t + Y_t^*.$$

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_t that rents capital k_t and labor l_t produces output y_t given by

$$y_t = z_t k_t^{\alpha_t} \left(Z_t l_t\right)^{1-\alpha_t},$$

where Z_t is aggregate labor productivity, and where α_t is a time-varying parameter determining the relative importance of capital versU.S. labor in production costs. The production technologies for leader and follower firms are common across all varieties in the United States. We denote the corresponding productivities in the ROW by z_{Ht}^*, z_{Lt}^*.

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 in the U.S.. These factor prices, together with firm productivity z_t, determine firms' marginal and average cost. Intermediate firms pay a proportional tax at rate τ_t on sales. Because these firms have no intermediate inputs, this can be interpreted as a value-added tax. 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, with markup of after-tax price over marginal (and average) cost of $\epsilon/(\epsilon-1)$. However, the leader firm also recognizes that if it sets its price above the marginal cost of the firm with productivity z_{Lt}, 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. Given these constraints on pricing, the equilibrium output wedge μ_t between after-tax revenues relative to total costs is given by

$$\mu_t = \frac{(1-\tau_t)p_{it}}{cost_t(z_{Ht})} = \min\left\{\frac{\varepsilon}{\varepsilon-1}, \quad \frac{cost_t(z_{Lt})}{cost_t(z_{Ht})} = \frac{z_{Ht}}{z_{Lt}}\right\}. \tag{5}$$

where $cost_t(z_{Ht})$ is the unit cost of production at t for a leader firm. We assume that $\frac{z_{Ht}}{z_{Lt}} < \frac{\varepsilon}{\varepsilon-1}$ for all t, so that the output wedge is always driven by the threat of potential competition, $\mu_t = \frac{z_{Ht}}{z_{Lt}}$.

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

$$y_{it} = Y_{it} = Y_t = z_{Ht}K_t^{\alpha_t}\left(Z_tL_t\right)^{1-\alpha_t}. \tag{6}$$

Without loss of generality, we normalize $P_t = 1$ for all t. In our baseline model we also assume exogenous and fixed labor supply, and normalize $L_t = 1$.

Tax payments by intermediate goods firms fund government purchases:

$$G_t = \tau_t Y_t.$$

Since the production function for final output in equation 3 has constant returns to scale, in equilibrium, final output is equal to the pre-tax revenue of intermediate goods firms. After-tax revenue from intermediate firms is divided between rental payments to labor and capital and pure profits which we denote by Π_t. The share of pre-tax output accruing as profit income to owners of intermediate goods firms is

$$\frac{\Pi_t}{Y_t} = \left(\frac{\mu_t - 1}{\mu_t}\right)(1-\tau_t), \tag{7}$$

while the shares going to labor and capital are

$$\frac{W_tL_t}{Y_t} = \frac{(1-\alpha_t)}{\mu_t}(1-\tau_t), \tag{8}$$

$$\frac{R_tK_t}{Y_t} = \frac{\alpha_t}{\mu_t}(1-\tau_t), \tag{9}$$

and the remaining share τ_t goes to taxes.

3.2 Investment Firms

In addition to intermediates-producing firms, a second set of competitive firms holds and rents out capital and makes investment choices. These competitive investment firms choose investment to maximize the expected present value of their dividends. Dividends from these firms are given by

$$D_{Xt} = R_t K_t - Q_t X_t = R_t K_t - Q_t K_{t+1} + Q_t(1 - \delta_t)K_t. \tag{10}$$

Investment firms discount cash flow one period ahead at rate r_t^*. At each date t, given K_t, they choose K_{t+1} to solve

$$\max_{K_{t+1}} \left\{ -Q_t K_{t+1} + \frac{1}{1 + r_{t+1}^*} \mathbb{E}_t \left[R_{t+1} K_{t+1} + (1 - \delta_{t+1}) Q_{t+1} K_{t+1} \right] \right\}$$

where the interpretation is that purchasing one more unit of new capital at t reduces current dividends by the price of capital Q_t, but generates additional rental income R_{t+1} and a resale value of undepreciated capital $(1 - \delta_{t+1})Q_{t+1}$ in the next period.

The first-order condition to this problem is

$$Q_t = \frac{1}{1 + r_{t+1}^*} \mathbb{E}_t \left[R_{t+1} + (1 - \delta_{t+1}) Q_{t+1} \right] \tag{11}$$

In our model, we assume that all firms are financed entirely by equity and have no financial assets. Thus, the measure of aggregate dividends paid by U.S. firms in the model corresponds to a measure of free cash flow from operations available to be paid to all investors in the firm:

$$D_t = \Pi_t + D_{Xt}, \tag{12}$$

and likewise for foreign dividends. The measure of firm value V_t in the model corresponds to the market valuation of these free cash flows from operations.[25]

We refer to the after-tax Net Operating Surplus of firms in our model as the *earnings* of these firms. These earnings are given by

$$E_t = (1 - \tau_t)Y_t - W_t K_t - \delta_t Q_t K_t \tag{13}$$

[25] Note that firms in our model are 100 percent equity financed, in contrast to the data. But the enterprise value of model firms would be unaffected if we were to introduce corporate debt alongside equity, because the Modigliani-Miller Theorem would apply.

Note, as is standard, our measure of aggregate dividends D_t is equal to our measure of earnings E_t less net investment $Q_tX_t - \delta_tQ_tK_t$.

The profit maximization problems for foreign firms mirror those for domestic ones. Foreign technology parameters are all identical to domestic ones, with the exceptions of the intermediate firm productivity values, z_{Ht}^* and z_{Lt}^* (and thus the output wedge $\mu^{ast} = z_{Ht}^*/z_{Lt}^*$), and the replacement cost of capital, Q_t^*.

3.3 Households

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

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \left(\frac{1}{1+\rho}\right)^t \log(C_t), \tag{14}$$

where ρ is the constant rate of time preference.

The assets in this economy are shares in domestic and foreign firms and a one period nominal bond. Domestic households enter period t owning a fraction λ_{t-1} of shares in domestic firms (foreign households own fraction $1 - \lambda_t$) and a fraction λ_{t-1}^* of foreign firms. They also enter period t with B_t units of bonds, which pay interest at rate r_t^*. Each period households buy new domestic and foreign shares at prices V_t and V_t^*, and bonds B_{t+1} at a price normalized to one. The interest rate between t and $t+1$, r_{t+1}^*, is known at date t (bonds are risk-free) and is the same rate used by firms to discount future cash flows. The flow budget constraint for the domestic representative household is

$$C_t + (\lambda_t - \lambda_{t-1})V_t + (\lambda_t^* - \lambda_{t-1}^*)V_t^* + B_{t+1} = W_tL_t + \lambda_{t-1}D_t + \lambda_{t-1}^*D_t^* + (1+r_t^*)B_t. \tag{15}$$

Foreign households are symmetric to domestic ones, except that we assume they have linear utility ($u^*(C_t^*) = C_t^*$) and a time-varying discount factor ρ_t^*. The foreign discount factor between t and $t+1$, ρ_{t+1}^*, is known at t.

Note that because Foreign households have linear utility, the world interest rate is pinned down at

$$r_{t+1}^* = \rho_{t+1}^* \tag{16}$$

for all dates t.

3.4 Expectations

Equilibrium investment in capital and the valuation of the future streams of dividends for U.S. and foreign firms depend on expectations of future realizations of the parameters of the model. We assume that households and firms make decisions taking as given forecasts for the evolution of all model parameter values very similar to those assumed in the transition experiment in Farhi and Gourio (2018). We assume households perceive no uncertainty around these forecasts.

We now describe these forecasts. At each date t, model agents:

1. Observe the one period ahead risk-free rate, $r^*_{t+1} = \rho^*_{t+1}$. They expect $r^*_{t+j} = r^*_{t+1}$ for all $j \geq 1$.

2. Perfectly forecast one-period ahead growth in global labor productivity, g_{t+1}. Thus, $E_t\left[Z_{t+1}/Z_t\right] = Z_{t+1}/Z_t = 1 + g_{t+1}$.

3. Expect global productivity to grow at a constant rate from period $t+1$ onward. We denote the future expected trend growth rate at t by $\bar{g}_{t+1}$. Thus, $E_t\left[Z_{t+j+1}/Z_{t+j}\right] = 1 + \bar{g}_{t+1}$ for all $j \geq 1$. Note that we do not impose $\bar{g}_{t+1} = g_{t+1}$.

4. Perfectly forecast next period values for leader and follower productivities in the two economies, $z_{H,t+1}$ and $z_{L,t+1}$ and $z^*_{H,t+1}$ and $z^*_{L,t+1}$. In addition, we assume that they expect these values to persist $E_t[z_{H,t+j}] = z_{H,t+1}$, $E_t[z_{L,t+j}] = z_{L,t+1}$, $E_t[z^*_{H,t+j}] = z^*_{H,t+1}$ and $E_t[z^*_{L,t+j}] = z^*_{L,t+1}$ for all $j \geq 2$. Thus, agents expect constant output wedges, μ_{t+1} and μ^*_{t+1}, from period $t+1$ on.

5. Perfectly forecast next period values for the technological parameters α_{t+1} and δ_{t+1} and the tax rate τ_{t+1}. In addition, they expect these parameter values to persist: $E_t[\alpha_{t+j}] = \alpha_{t+1}$, $E_t[\delta_{t+j}] = \delta_{t+1}$ and $E_t[\tau_{t+j}] = \tau_{t+1}$ for all $j \geq 2$.

6. Expect no changes in the relative prices of investment goods: $E_t[Q_{t+j}] = Q_t$ and $E_t[Q^*_{t+j}] = Q^*_t$ for all $j \geq 1$.

To summarize, each period t agents receive news about the cost of capital r^*_{t+1} at t and values of other model parameters that will be realized at $t+1$. They treat these parameters as if they follow a random walk. That is, their expectations for the values of these parameters at dates $t+j$ are equal to the value that they expect at $t+1$. In solving the model, we ignore the second moments that arise from the joint distribution of innovations to these parameters.

3.5 Asset Pricing

Firm value V_t in the model can be decomposed into the ex dividend value of claims to investment producing firms, plus the value of claims to profits from intermediate goods firms. As is standard in a model with constant returns to scale and no investment adjustment costs, equation (11) implies that the present value at t of dividends from investment firms from $t+1$ on is equal to the expected replacement value of capital in the next period. That is, $V_{Kt} = Q_t K_{t+1}$.

The ex dividend price of a share of all domestic intermediate-good-producing firms is the expected present value of the future stream of monopoly profits these firms will earn. Given our assumptions that agent know at t the parameters determining profits Π_{t+1} and agents expect the discount rate r^*_{t+1}, the growth rate of the economy from $t+1$ on $\bar{g}_{t+1}$, and the share of the economy corresponding to after-tax profits of intermediate goods firms all to remain constant from $t+1$, then

$$V_{\Pi t} = \mathbb{E}_t \left[\sum_{j=1}^{\infty} \frac{\Pi_{t+j}}{(1+r^*_{t+1})^j} \right] = \frac{\Pi_{t+1}}{r^*_{t+1} - \bar{g}_{t+1}}$$

Thus, the market price of all domestic firms is given by

$$V_t = V_{Kt} + V_{\Pi t} = Q_t K_{t+1} + \frac{\Pi_{t+1}}{r^*_{t+1} - \bar{g}_{t+1}} \tag{17}$$

3.6 Balance of Payments Accounting

We now consider our model's implications for the current account and the net foreign asset position of the United States. The current account is defined as national savings minus investment, where national savings is comprised of household saving plus government saving plus corporate saving. In our model, the government runs a balanced budget period by period, and corporate saving is identical to corporate investment. Thus, the model current account is identical to household saving. The change in the net foreign asset position of the United States. in the model is the sum of the current account and the revaluations of cross border asset holdings of households in the United States and in the Rest of the World.

We now solve for the savings of U.S. households. The representative U.S. household at each date t chooses a sequence for consumption to maximize utility (14), subject to a lifetime budget constraint. Given that this household has logarithmic utility, it consumes a constant fraction of its lifetime wealth inclusive of current income. That is, at each date t

$$C_t = \frac{\rho}{1+\rho} Wealth_t. \tag{18}$$

where household wealth at t inclusive of current income is given by

$$\begin{aligned} Wealth_t &= W_t L_t + H_t + \lambda_{t-1} D_t + \lambda^*_{t-1} D^*_t + \\ &\quad + \lambda_{t-1} V_t + \lambda^*_{t-1} V^*_t + (1 + r^*_t) B_t \end{aligned} \tag{19}$$

where H_t denotes human wealth excluding current labor earnings and is given by

$$H_t \equiv \frac{W_{t+1} L_{t+1}}{r^*_{t+1} - \bar{g}_{t+1}}. \tag{20}$$

U.S. household saving is the difference between their current income and consumption. using the result in equation (18) that with log utility, consumption is a constant fraction of wealth, we obtain a formula for the current account in the model

$$CA_t = \frac{1}{1+\rho} \left[\left(\frac{D_t}{V_t} - \rho \right) \lambda_{t-1} V_t + \left(\frac{D^*_t}{V^*_t} - \rho \right) \lambda^*_{t-1} V^*_t + (r^*_t - \rho) B_t + \left(\frac{W_t L_t}{H_t} - \rho \right) H_t \right] \tag{21}$$

This expression is intuitive. It compares the current income yield on each type of asset (both financial and human) owned by the household to the household's rate of time preference and then takes a weighted aggregate of these quantities where the weights are given by the beginning of period values of each type of asset held by the household. Domestic households will save out of dividend income on domestic and foreign equity if the current income yield on those assets exceeds their rate of time preference ρ. They will save out of bond income if the real interest rate exceeds ρ. And they will save out of labor income if the income yield on human wealth (current earnings relative to the future value of human wealth) exceeds ρ.

This formula (21) reduces to a simple expression on a balanced growth path. Specifically, suppose the economy is on a balanced growth path, with a constant interest rate r^* and constant growth rate g. On that balanced growth path, the ratios D_t/V_t, D^*_t/V^*_t, and $W_t L_t/H_t$ would all be constant and equal to $(r^* - g)/(1 + g)$. It follows that if ρ satisfies $1 = \frac{1}{1+\rho}\frac{1+r^*}{1+g}$, then the balanced growth path current account will be $CA_t = \frac{1}{1+\rho}(r^* - \rho)B_t = gB_t$.

Off a balanced growth path, this formula (21) captures the effects of business cycle shocks that lead to fluctuations in investment and corresponding fluctuations in D_t and D^*_t. This formula also captures the effects of changes in the discount rate r^*_{t+1} and expected future growth rate $\bar{g}_{t+1}$ that would also impact equilibrium current income yields on assets. When using our model for measurement, we match observed income yields on financial assets D_t/V_t and D^*_t/V^*_t from the data as described below.

In our model, the change in the end of period net foreign asset position between $t-1$ and

t is given by the sum of the current account and asset revaluations

$$NFA_t - NFA_{t-1} = CA_t + \lambda^*_{t-1}\left(V^*_t - V^*_{t-1}\right) - (1-\lambda_{t-1})\left(V_t - V_{t-1}\right) \tag{22}$$

where the final terms capture revaluations of foreign equity assets and liabilities. We refer to the term $\lambda^*_{t-1}\left(V^*_t - V^*_{t-1}\right)$ as the revaluation of U.S. equity assets in the ROW and the term $(1-\lambda_{t-1})\left(V_t - V_{t-1}\right)$ and the revaluation of U.S. equity liabilities to the ROW.

The flow of capital must finance the current account, so we finally have

$$CA_t = B_{t+1} - B_t + (\lambda^*_t - \lambda^*_{t-1})V^*_t - ((1-\lambda_t) - (1-\lambda_{t-1}))V_t \tag{23}$$

3.7 Equilibrium

An equilibrium is a set of sequences for the world interest rate $\left\{r^*_{t+1}\right\}_{t=0}^{\infty}$, for stock prices $\{V_t, V_t^*\}_{t=0}^{\infty}$, for investment prices $\{Q_t, Q_t^*\}_{t=0}^{\infty}$, and 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 with the expectations described above, all markets clear. Because bonds are in zero net supply, bond market clearing requires $B_{t+1} + B^*_{t+1} = 0$.

4 Using the Model for Measurement

We use our model to measure the factors driving flows, stocks, and valuation of the U.S. Corporate Sector and the U.S. Current Account and Net Foreign Asset position in two steps.

In the first step, we use data from the Integrated Macroeconomic Accounts (IMA) to construct data for flows, stocks, and valuation of the U.S. Corporate Sector and the U.S. Current Account and Net Foreign Asset position consistent with those concepts in the model. Specifically, we construct from the data in IMA Tables S5, S6, and S9 quarter by quarter from 1990 through 2022 Q3 measures of

- Corporate sector value added Y_t, taxes $\tau_t Y_t$, compensation of labor $W_t L_t$, consumption of fixed capital $\delta_t Q_t K_t$, investment expenditure $Q_t X_t$, end of period reproduction cost of the capital stock $Q_t K_{t+1}$, and end of period market valuation V_t of U.S. resident corporations,

- U.S. current account CA_t, the U.S. NFA position NFA_t, measures of U.S. gross equity holdings in the ROW $\lambda^*_t V^*_t$ and ROW gross holdings of equity in U.S. Corporations $(1-\lambda_t)V_t$ as well as the gross flows and revaluations of these equity positions. We obtain data on monetary dividends paid on U.S. equity in the ROW $\lambda^*_{t-1}D^*_t$ from the NIPA.

We provide detailed information on the data sources and construction of these variables in Appendix A.

Note that these data imply measures of Gross and Net Operating Surplus and dividends from operations paid by U.S. resident corporations as in equations (10), (12), and (13). Thus, these data summarize standard valuation metrics including the ratio of the value of U.S. resident corporations to GDP (the Buffett ratio) V_t/Y_t, the end of period reproduction value of capital to output ratio Q_tK_{t+1}/Y_t, Tobin's Q measured as the ratio of the market valuation of the firm to the reproduction value of its capital stock V_t/Q_tK_{t+1}, the current dividend yield of U.S. and ROW equity D_t/V_t, D^*_t/V^*_t, and ratios of pre- and post-tax Net Operating Surplus to market valuation of U.S. corporations corresponding to a current earnings yield E_t/V_t as well as the ratio of these earnings to the reproduction value of the capital stock E_t/Q_tK_{t+1}. Thus, when we choose the parameters of our model to match the data listed above, our model will also match all of these standard valuation metrics.

In the second step, we choose sequences of model parameters such that our model exactly reproduces all these data as an equilibrium outcome. Specifically, we fix the rate of time preference ρ and reverse engineer sequences of parameters so that the model replicates the data items listed in the first step exactly for every quarter from 1990 Q1 through 2022 Q3. The time-varying parameters are:

1. The discount rate for valuing the corporate sector r^*_{t+1} and for the growth rate of aggregate productivity $\bar{g}_{t+1}$ from $t+1$ on that is expected in period t.

2. The division of value added into taxes τ_t, consumption of fixed capital δ_t, domestic and foreign output wedges μ_t and μ^*_t, and compensation of labor as a fraction of costs $(1-\alpha_t)$.

3. The domestic and foreign replacement costs for capital Q_t and Q^*_t.

4. The growth rate g_{t+1} of productivity between t and $t+1$.

5. The evolution of gross cross-border equity positions as indexed by λ^*_t and $(1-\lambda_t)$.

We summarize the procedure for choosing these parameters here and provide a comprehensive explanation in Appendix C. [26]

[26] In particular, for simplicity, here in the body of the paper we have described the model in real terms. The data are in fact presented in nominal terms. We discuss the impact of inflation on our procedure for choosing parameters in Appendix C.

We can divide our procedure for setting these parameters into three steps.

First, the evolution of the capital price Q_t, the depreciation rate δ_t, the tax rate τ_t, the growth rate of productivity from t to $t+1$ denoted by g_t, gross cross border equity positions as indexed by λ_t^* and $(1-\lambda_t)$. Note that the parameters Q_t and δ_t are chosen to ensure that equation (4) holds in the model when the model matches observed stocks of end of period reproduction value of capital Q_tK_{t+1}, measured consumption of fixed capital $\delta_tQ_tK_t$, and measured investment expenditures Q_tX_t. The series for μ_t^* and Q_t^* are set to replicate the time series for rest of world free cash flow D_t^* and enterprise value V_t^*.[27] We set the constant rate of time preference for U.S. households ρ to be consistent, on a balanced growth path, with the sample average of the current dividend yield on U.S. Corporations D_t/V_t.

Second, given a measure of the cost of capital r_t^*, we impute a rental rate of capital R_{t+1}/Q_t from equation (11) where we impose our assumption on expectations that $\mathbb{E}_tQ_{t+1} = Q_t$ and that the depreciation rate δ_{t+1} is known at t. Note that in doing so, we ensure that in equilibrium, firms in the model find it optimal to choose the observed end of period t reproduction value of the capital stock Q_tK_{t+1}. Once this is done, we use equations (8) and (9) to infer the parameters α_{t+1} and μ_{t+1}. With these parameters, we also have the quantity of factorless income Π_{t+1} from equation (7). Given the parameters α_{t+1} and μ_{t+1}, we use the production function and the capital stock to set the realized growth rate of productivity Z_t between t and $t+1$ (denoted by g_{t+1}) to match observed growth in value added for the U.S. Corporate Sector over that time period.[28]

Given these prior two steps, we have two parameters left to determine each period in our third step. These are the cost of capital r_{t+1}^* expected to persist from period t on and the growth rate of productivity $\bar{g}_{t+1}$ expected to persist from period $t+1$ on. We choose these parameters so that our model matches both the observed valuation of the U.S. Corporate Sector relative to the reproduction value of its capital stock $V_t - Q_tK_{t+1}$ and the observed current account for the U.S. We use these data to determine these parameters as follows.

We develop one equation in the two unknowns r_{t+1}^* and $\bar{g}_{t+1}$ by combining equation (11) multiplied through by K_{t+1} to solve for $r_{t+1}^*Q_tK_{t+1}$, equation (13) defining earnings E_{t+1},

[27] Note that domestic households only care about what happens in the rest of the world to the extent that it impacts foreign asset values and cash flow, and these are also the only starred variables (besides r_{t+1}^* and λ_t^{ast}) that enter the current account expression 21.

[28] Note that, in our model, μ_{t+1} is determined by the ratio of the firm-specific productivity of the leader firm to the follower firm z_{Ht+1}/z_{Lt+1} for each intermediate good. We set the firm-specific productivity z_{Ht+1} each period so that output in the model at $t+1$ is equal to Z_t. With this procedure, we allocate changes in μ_{t+1} into a component due to changes in the productivity of the leader firm and changes in the productivity of the follower firm so as to ensure that the path for output in the U.S. and the ROW in the model are the same.

and equation (17) for the value of U.S. Corporations. This equation is given by

$$r^*_{t+1} - \bar{g}_{t+1} = \frac{\mathbb{E}_t[E_{t+1}]}{V_t} - \bar{g}_{t+1}\frac{Q_t K_{t+1}}{V_t} \tag{24}$$

Note that the term $Q_t K_{t+1}/V_t$ (the inverse of Tobin's Q) can be taken directly from the data and, given our assumptions that the parameters $\tau_{t+1}, \alpha_{t+1}, \mu_{t+1}$, and δ_{t+1} are known at time t and that $\mathbb{E}_t Q_{t+1} = Q_t$, we can also construct the expected earnings yield $\mathbb{E}_t E_{t+1}$ from data known at time t.

Note as well that this equation (24) is equivalent to the standard equation from the Gordon growth formula

$$r^*_{t+1} - \bar{g}_{t+1} = \frac{\mathbb{E}_t[D_{t+1}]}{V_t} \tag{25}$$

because, as discussed after equation (13) above, expected dividends in period $t+1$ are equal to expected earnings less net investment in that period and given our assumptions about agents' expectations, net investment expected in period $t+1$ is given by $\bar{g}_{t+1} Q_t K_{t+1}$. We make use of equation (24) instead of this classic formula involving the expected dividend yield because it highlights how measures of the cost of capital r^*_{t+1} depend on measures of expected growth from $t+1$ on $\bar{g}_{t+1}$.

Specifically, if Tobin's Q is equal to one, then the expected growth rate $\bar{g}_{t+1}$ cancels out on both side of equation (24) and this equation becomes a single equation in the single unknown r^*_{t+1}. In this case, one can then directly use the procedure in our second step above to pin down the model parameters α_{t+1} and μ_{t+1} independently of assumptions about the value of the expected growth rate $\bar{g}_{t+1}$. In contrast, if Tobin's Q is infinite (as would be the case in an endowment economy), then the expected earnings yield in equation (24) does not pin down r^*_{t+1} but only $r^*_{t+1} - \bar{g}_{t+1}$. In an analysis presented below of the sensitivity of our measurement of the parameters of our model to our use of the data on the current account to help identify r^*_{t+1} and $\bar{g}_{t+1}$, we find that our measurement of the cost of capital r^*_{t+1} and the associated values of the parameters α_{t+1} and μ_{t+1} is not very sensitive to alternative assumptions about the growth rate $\bar{g}_{t+1}$ outside of the time period around the peak of the Tech Boom in 2000. In particular, the findings regarding the evolution of the cost of capital r^*_{t+1} over the past decade are quite robust to alternative assumptions about future growth rates.

Our second equation in the two unknown parameters r^*_{t+1} and $\bar{g}_{t+1}$ is our equation (21) for the current account. Note that, given our procedure in step one to set the rate of time preference ρ for U.S. Households, all of the terms in equation (21) are directly observed in data except for the value H_t of human wealth from $t+1$ on, which is given in equation

(20).[29] As is evident from this equation, this value of human wealth is a simple function of observed labor compensation in period $t+1$ and $r^*_{t+1} - \bar{g}_{t+1}$. Hence equation (21) together with equation (24) determine the combination of r^*_{t+1} and $\bar{g}_{t+1}$ needed to have our model match the data on U.S. corporate valuations and the current account.[30]

Note that in our model and measurement exercise, we abstract from value added created in the government sector (primarily through government employees) and in the non-corporate private sector. We also abstract from consideration of investment expenditures for residential housing and consumer durable goods, both of which are done primarily outside the corporate sector. We have also abstracted from demographic factors relevant to the current account in an overlapping generations framework as discused in Auclert et al. (2021). To the extent that these omitted factors impact the U.S. current account, in our model, they are accounted for in our measure of $r^*_{t+1} - \bar{g}_{t+1}$ as it is this inverse of the valuation multiple of human wealth that is the only unknown in our equation (21) for the current account.

We describe how our measurement procedure relates to that used in prior macro-finance papers in detail in Appendix D.

5 Baseline Results

We now present the baseline results from our measurement procedure.

Figure 12 plots some of the key parameter sequences derived from our measurement procedure.[31] The top left panel plots (in blue) the model-implied sequence for r^*_{t+1} (annualized), while the top right panel shows the sequence for trend growth $\bar{g}_t$ alongside actual quarterly growth g_t. The estimated sequence for trend growth is much less volatile than the actual quarterly growth rate series, but some correlation between the two is apparent.

The bottom left panel shows the model-implied time series for the ratio between revenue and cost for the U.S. corporate sector, μ_t; the path for share of income that is factorless, $(1-\tau_t)(\mu_t - 1)/\mu_t$, looks similar. This gap spikes during the 2001 dot-com boom, and then rises steadily from the Great Recession onward, before dropping in the most recent couple of quarters. The share of capital in costs, α_t, exhibits some fluctuations, but no long run trend.

Figure 13 illustrates the model's ability to replicate key macroeconomic time series for the U.S. corporate sector: value added, gross investment, labor earnings, and cash flow payable

[29]This equation does involved the lagged value of the cost of capital r^*_t and the stock of bonds carried into the period B_t. We construct these series iteratively using equations (21) and (23) to determine the stock of bonds carried into the next period B_{t+1}. See Appendix C for further details.

[30]This logic of how we use the current account in our measurement of the cost of capital and expected growth is related to that in Lustig and Van Nieuwerburgh (2008).

[31]Figure F.1 plots time series for all parameter values.

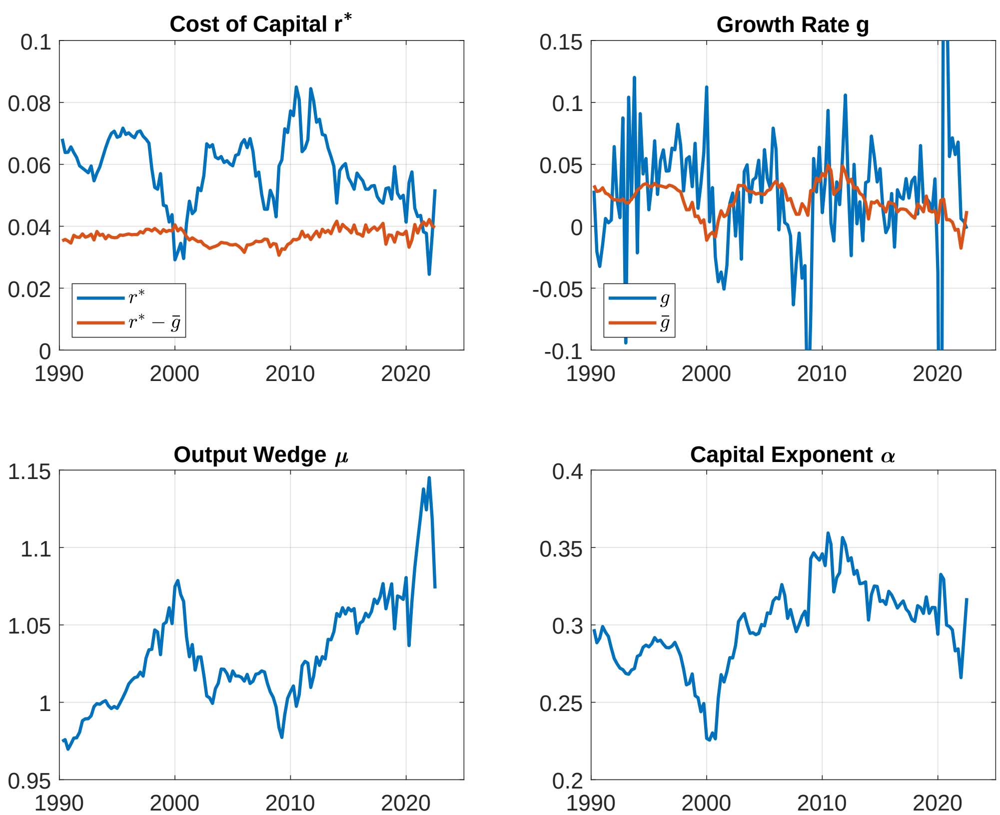

Figure 12: Estimated Times Series for Key Parameters

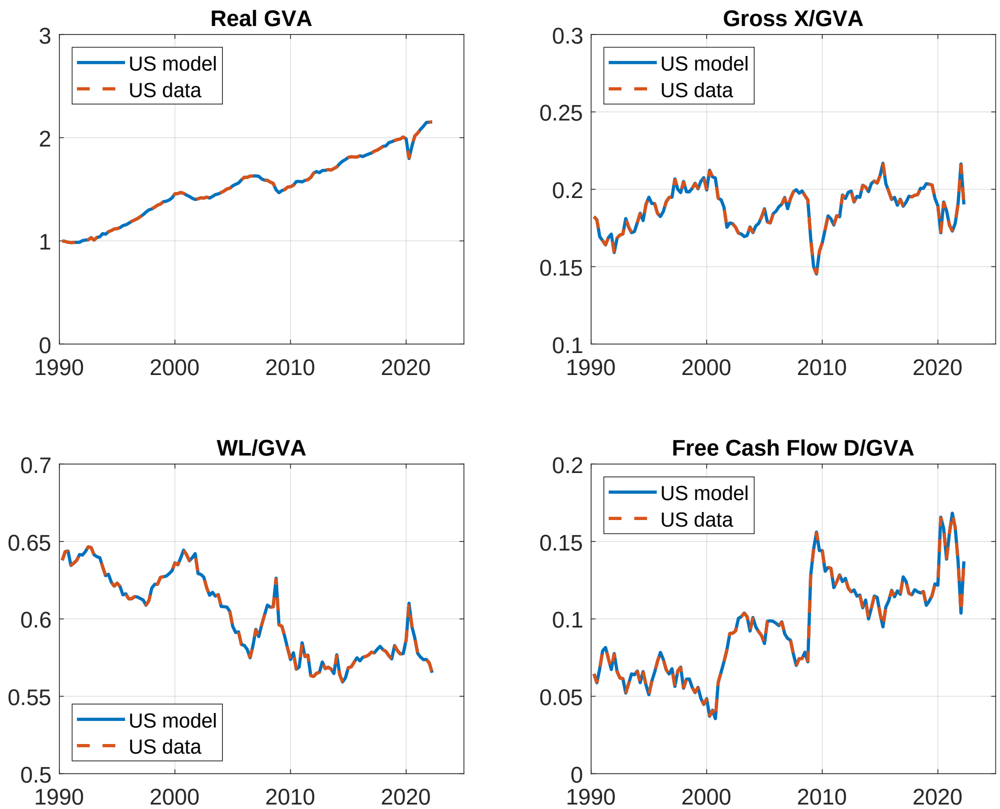

Figure 13: National Income Accounts for the Corporate Sector

to firm owners (defined as in eq. 12). By construction, this fit is exact. The model replicates the decline in the 2000's in labor's share of value-added, $(1-\tau_t)(1-\alpha_t)/\mu_t$, via a mix of changes in the share of labor in costs determined by $1-\alpha_t$ and changes in the ratio of revenue to costs determined by μ_t. The rise is cashflow payable to investors in part reflects lower payments to labor, and in part lower taxes; investment is a fairly stable share of value added.

Figure 14 illustrates the model's replication of key valuation metrics: the Buffett ratio, the replacement cost of capital, and the dividend and earnings yields. Again, by construction, this fit is exact.

The sequence for the discount rate r^*_{t+1} declines substantially over the past decade, but this decline in the discount rate does not account for much of the change in the valuation of U.S. corporations relative to output over this time period. To understand this finding, consider equation 17 which decomposes the value of U.S. corporations into a component due

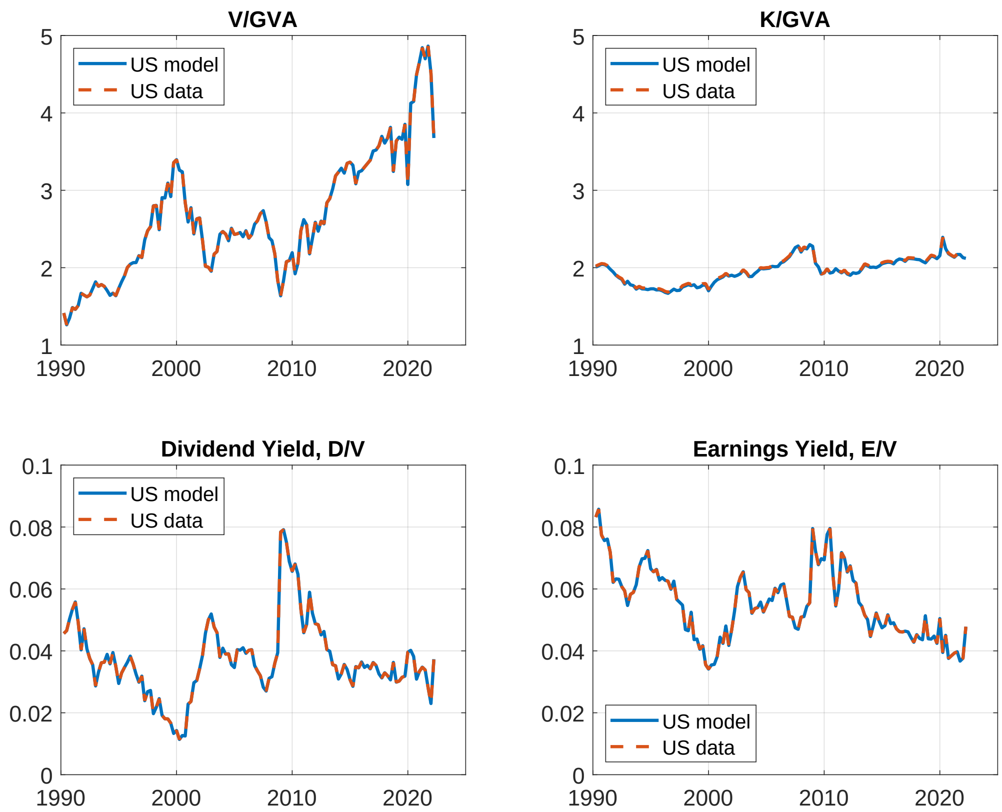

Figure 14: Key Asset Pricing Metrics

to the reproduction value of their installed capital and a component due to the discounted present value of their future factorless income. Now consider the model's implications for each of these two components of firm value.

As shown in the upper right panel of Figure 14, the model, by construction, reproduces the observation in the data that the ratio of the reproduction value of installed capital in U.S. resident corporations has not risen much relative to corporate value added over the past decade. As shown in the bottom two panels of Figure 12, it does so through a combination of an increase in the wedge μ_t between revenue and costs and a decline in the share α_t of physical capital in costs. These two forces in the model counteract firms' incentives to otherwise increase the capital-output ratio in the face of a falling cost of capital r^*_{t+1}. In this sense, investment has been weaker over the past decade than would have been the case had we seen a decline in the discount rate r^*_{t+1} alone.

Now consider the model's implications for the drivers of changes in the discounted present value of their future factorless income. Our measurement procedure implies that the sequence for the discount rate r^*_{t+1} tracks the trend growth rate series series closely, so that the difference between the two (the red line in the top left panel of Figure 12) fluctuates very little. Thus, we find that the majority of the increase in this component of firms' valuation is due to an increase in the quantity of factorless income Π_t rather than to changes in the valuation multiple $1/(r^*_{t+1} - \bar{g}_{t+1})$ applied to that income.

The reason that we find a stable valuation multiple $1/(r^*_{t+1} - \bar{g}_{t+1})$ for factorless income is rooted in our requirement that the model also match the observed current account sequence for the United States. The current account is highly sensitive to changes in the ratio of current labor income to human wealth given that value of human wealth, H_t, is large. Moreover, this value H_t is inversely proportional to $r^*_{t+1} - \bar{g}_{t+1}$ (see eq. 20). Thus, large changes in $r^*_{t+1} - \bar{g}_{t+1}$ would imply large changes in desired U.S. consumption and counterfactually large swings in the current account. Put differently, the observed current account is a data moment that provides sharp identification for expected trend growth.[32]

One interesting observation from Figure 14 is that while the U.S. corporate dividend yield exhibits no long term trend, there is a downward trend in the earnings yield. What explains this difference between these two standard valuation metrics? In our model, the expected forward dividend yield is given by eq. (25). The absence of a long run trend in the dividend yield thus suggests no trend in $r^*_{t+1} - \bar{g}_{t+1}$. Earnings are defined similarly to dividends, except that depreciation is subtracted from gross operating surplus instead of investment. Thus,

[32]This logic is also present in Aguiar and Gopinath (2007) and Lustig and Van Nieuwerburgh (2008). Aguiar and Gopinath (2007) argue that the current account swings in emerging markets can be used to identify changes in expected growth. Lustig and Van Nieuwerburgh (2008) discuss a similar argument regarding the (lack of) sensitivity of consumption to shocks to asset returns.

the expected forward earnings to price ratio is also $(r^*_{t+1} - \bar{g}_{t+1})$ for monopolists, for whom there is no distinction between earnings and dividends. But for capital-producing firms the expected earnings yield is just r^*_{t+1}. The expected earnings yield for the entire economy is a weighted average of the ratios for the two firm types, with weights given by their shares in total enterprise value:

$$\frac{\mathbb{E}_t\left[E_{t+1}\right]}{V_t} = (r^*_{t+1} - \bar{g}_{t+1})\frac{V^{\Pi}_t}{V_t} + r^*_{t+1}\frac{Q_t K_{t+1}}{V_t}$$

Note that when trend growth is positive, the forward earnings yield will exceed the forward dividend yield (as is evident in Figure 14). The intuition is that in a growing economy, investment exceeds depreciation, so cash flow payable to investors is less than earnings. This equation also explains why the expected earnings yield in model and data declines over time: as the share of monopolist firms in total enterprise value rises over time, the expected earnings yield will fall even absent trends in r^*_{t+1} or $\bar{g}_{t+1}$.

Figure 15 plots one of the main results in our paper. The top left panel is the U.S. current account relative to corporate sector value added, which the model is calibrated to perfectly replicate. The U.S. current account deficit widened steadily through the 1990s and early 2000s, before moderating during the Great Recession. The other panels of the figure decompose the model current account series following eq. (21). The decline in the U.S. current account during the 1990s is primarily attributed to declining dividend yields on U.S. equity, which led U.S. households to borrow from the rest of the world. However, when U.S. asset values fall during the dot-com bust, that dividend yield rises, which all else equal would have pU.S.hed the current account back toward balance. The model rationalizes the continuing observed decline in the current account via rising expected growth (see Figure 12) which depresses $r^*_{t+1} - \bar{g}_{t+1}$, blowing up the perceived value of human wealth, and stimulating ongoing borrowing.

A high dividend yield on U.S. equity during the Great Recession helps explain why the current account narrowed around this time. Thereafter, slowing expected growth reduces the value of human capital, which is why current account deficits remain modest even as the dividend yield on U.S. equity declines.

The top left panel of Figure 16 plots the net foreign asset position predicted by the model against the actual position. The top right panel plots the net equity position, which matches the data by construction. The NFA position in the model reflects cumulative current accounts (bottom left panel) plus cumulative equity revaluations (bottom right panel).

There are three reasons why the model does not perfectly replicate the path for actual NFA position. The first reason is that the equity liability revaluations in the model are not identical to those reported in Table S9 in the Integrated Macroeconomic Accounts. Recall

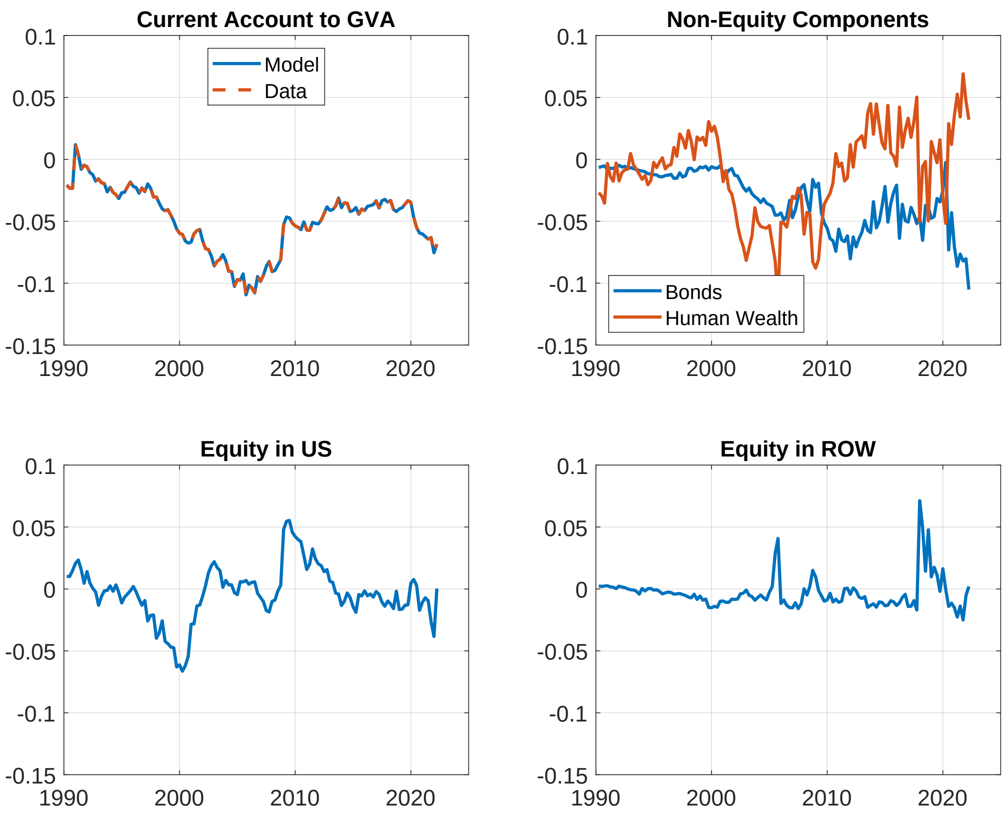

Figure 15: Current Account Decomposition

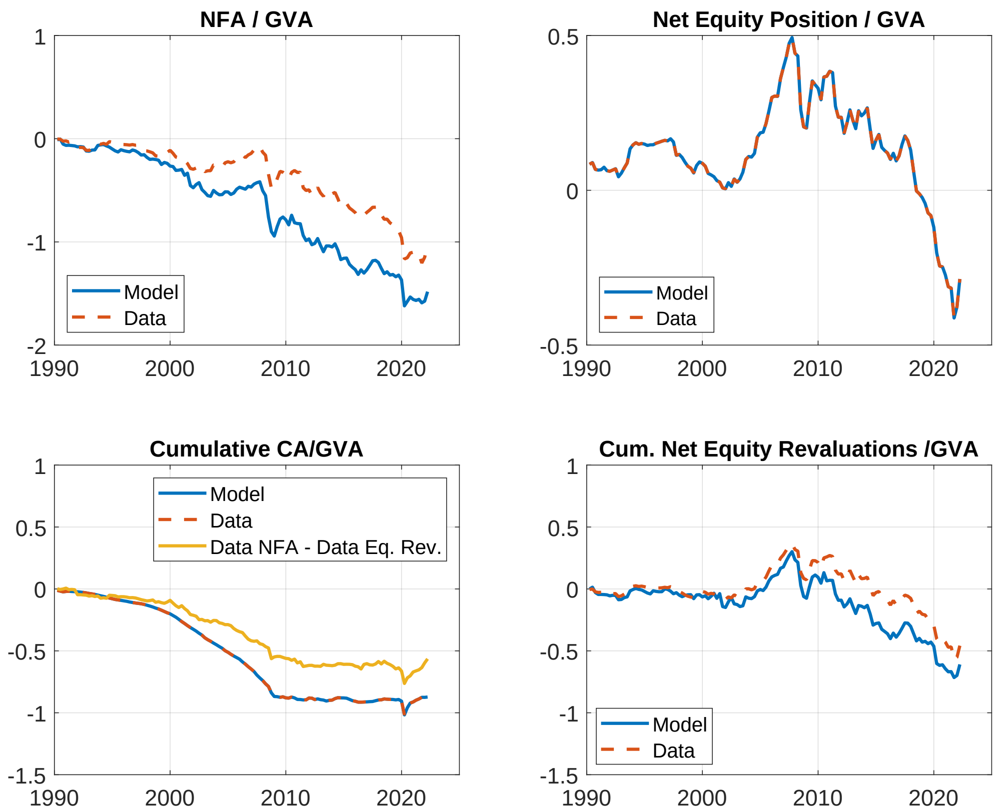

Figure 16: NFA Dynamics

that we infer our own series for the revaluation of ROW holdings of U.S. equity based on our estimated series for the value of the U.S. corporate sector. Note, however, that the difference between the two revaluation series is small (bottom right panel).

The second reason is that the model does not feature any nonequity valuation effects, while there are such effects in the data, mostly reflecting exchange rate movements (see Figure 5). The third and most important reason is that in the data accounting identity (eq. 1) there is a residual term. This residual term, which incorporates the statistical discrepancy between the current account and net foreign asset purchases, contributed to a significant improvement in the U.S. NFA position in the 2000's that our model cannot replicate (see Figure 3).[33]

Our focus is on the impact of changes in asset values and returns on the current account and the change in the NFA position. Some portion of the changes in asset valuations seen in the data are due simply to anticipated factors — as an economy grows and as it invests in more physical capital, the value of its corporations would be expected to grow as well. The remainder of changes in asset valuations are due to the arrival of news that makes realized returns differ from expected returns. We next decompose the change in the U.S. NFA position into components due to predictable or anticipated factors and components due to unanticipated news that made realized asset returns differ from those that were expected.

To that end, recall that the change in the model NFA position is the sum of the current account surplus plus the increase in the value of foreign equity assets minus the increase in the value of the U.S. equity liabilities.[34]

$$NFA_t - NFA_{t-1} = CA_{t-1} + \lambda^*_{t-1}\left(V^*_t - V^*_{t-1}\right) - \left(1 - \lambda_{t-1}\right)\left(V_t - V_{t-1}\right) \tag{26}$$

Given the information available to households in period $t-1$ about model parameters, they expect returns on all assets between $t-1$ and t to be equal to r^*_t. Then, at each date t, these households receive further news about future output wedges, growth, and other parameters, and this news generates dynamics in both the current account and in asset values. Specifically, let e_t and e^*_t denote excess real returns (realized minus expected return)

[33] The combined impact of nonequity revaluations and the residual term can be seen by comparing the cumulative actual current account in the data (which the model perfectly replicates) to the hypothetical current account series that would obtain in the data absent a residual term and absent nonequity revaluations. That hypothetical series is plotted in yellow in the bottom left panel of Figure 16.

[34] The NFA decompositions below are all in real terms. As described above, in the data inflation affects the decomposition of changes in the NFA into the current account and valuation changes. But the NFA to value-added ratio itself, and changes thereof, are not affected by changes in the price level in our economy

to domestic and foreign equity realized in period t:

$$e_t = \frac{D_t + V_t}{V_{t-1}} - (1 + r^*_{t+1}), \qquad e^*_t = \frac{D^*_t + V^*_t}{V^*_{t-1}} - (1 + r^*_{t+1})$$

In the model, these realized excess returns are due to news about parameters from $t + 1$ onward that leads agents to expect a different present value of dividend income relative to what they expected at $t - 1$.

In Appendix G we show that the evolution of the U.S. net foreign asset position in our model can be decomposed into portions due to expected and excess returns on U.S. and ROW equity as well portions due to the interest due on net non-equity assets and the comparison of the value of current labor compensation to the value of human wealth as follows.

$$\begin{aligned} NFA_t - NFA_{t-1} \;=\; & \underbrace{\frac{r^*_{t+1} - \rho}{1 + \rho} NFA_{t-1}}_{(1)} + \underbrace{\left(\frac{r^*_t - \rho}{1 + \rho} - \bar{g}_t\right) V_{t-1}}_{(2)} + \underbrace{\left(\frac{\frac{W_t L_t}{H_t} - \rho}{1 + \rho}\right) H_t} _{(3)} \quad (27) \\ & - \underbrace{(Q_t X_t - \mathbb{E}_{t-1}[Q_t X_t])}_{(4)} \\ & - \underbrace{\frac{\rho}{1 + \rho} \lambda_{t-1} e_t V_{t-1}}_{(5)} - \underbrace{\frac{\rho}{1 + \rho} \lambda^*_{t-1} e^*_t V^*_{t-1}}_{(6)} \\ & - \underbrace{e_t (1 - \lambda_{t-1}) V_{t-1}}_{(7)} + \underbrace{e^*_t \lambda^*_{t-1} V^*_{t-1}}_{(8)} \quad (28) \end{aligned}$$

Terms (1) and (2) capture savings motives that are predictable at $y - 1$. Term (1) indicates that the NFA position will tend to grow at rate $(r^*_{t+1} - \rho)/(1 + \rho)$. Note that on a balanced growth path this term is equal to the growth rate $\bar{g}$, implying a stable NFA to GDP ratio.[35] The second term is the contribution to the NFA from expected returns to domestic equity. Term (3) is the current account contribution to national saving from a yield on human capital exceeding ρ.

The remaining terms capture the impact of shocks at t to asset values and returns. Term (4) captures deviations of investment at date t from investment expected at $t - 1$: if information revealed at t spurs unexpected domestic investment, the U.S. will fund that extra investment by borrowing from abroad. Term (5) captures the impact of excess equity returns at t on desired consumption and the current account. Term (6) captures the direct effect of excess returns on the NFA position: here excess returns to domestic equity reduce

[35] In particular, if $1 = \frac{1}{1+\rho} \frac{1+r^*}{1+\bar{g}}$, then $\frac{r^* - \rho}{1+\rho} = \bar{g}$.

the NFA position, by inflating U.S. liabilities, while excess returns to foreign equity improve the position. On a balanced growth path, terms (2) through (8) are all zero.

Figure 17 uses eq. (27) to decompose the change in the NFA position relative to the start of our sample period (1990) into the cumulative values of each of the eight labeled terms. The cumulative value for each term is plotted relative to value-added at date t. The message from the plot is that, over the entire sample period, there are three key drivers of the decline in the U.S. NFA position.

The most important, quantitatively, is that, starting around the end of the Great Recession, positive excess returns on U.S. equities have inflated U.S. equity liabilities (shown in the purple line in the right panel of Figure 17). These excess returns account for a decline in the NFA position of over 100 percent of corporate value-added, though some of this effect was unwound in the last few quarters of our sample as the U.S. asset values declined. Note that, at high frequency, excess returns to domestic and foreign equity tend to work in opposite directions, reflecting high frequency co-movement across global equity markets. (Consider the high frequency fluctuations in the green and purple lines in the right panel of Figure 17).For example, at the end of our sample, poor U.S. equity market performance reduced U.S. equity liabilities but poor foreign market performance simultaneously reduced the value of U.S. foreign equity assets. The second important driver of the U.S. NFA position is that, during the 2000's a low income yield on human capital fueled current account deficits (shown in the yellow line in the left panel of Figure 17). The third key driver is that as the NFA position has widened, the fact that the interest rate exceeds the rate of time preference has fueled further borrowing (shown in the blue line in the left panel of Figure 17).

6 Counterfactuals

In Section 4, we used our model to measure the factors driving observed flows, stocks and valuations of the U.S. corporate sector together with the evolution of the U.S. current account and NFA position in quarterly data over the period 1990 through 2022. This measurement exercise establishes a baseline path for model parameters that accounts for the evolution of this broad collection of data over this three-decade time period. We now use the model to conduct counterfactual exercises relative to this model baseline to consider how these changes in parameters impacted the welfare of U.S. households. Our particular focus is on the question of how the large increase in gross cross-border equity positions observed in recent decades impacts the welfare implications of the large increase in the gap μ_t between firm revenue and firm cost measured in our baseline over the course of the last decade.

To address this question, we simulate the model for three specific counterfactual paths

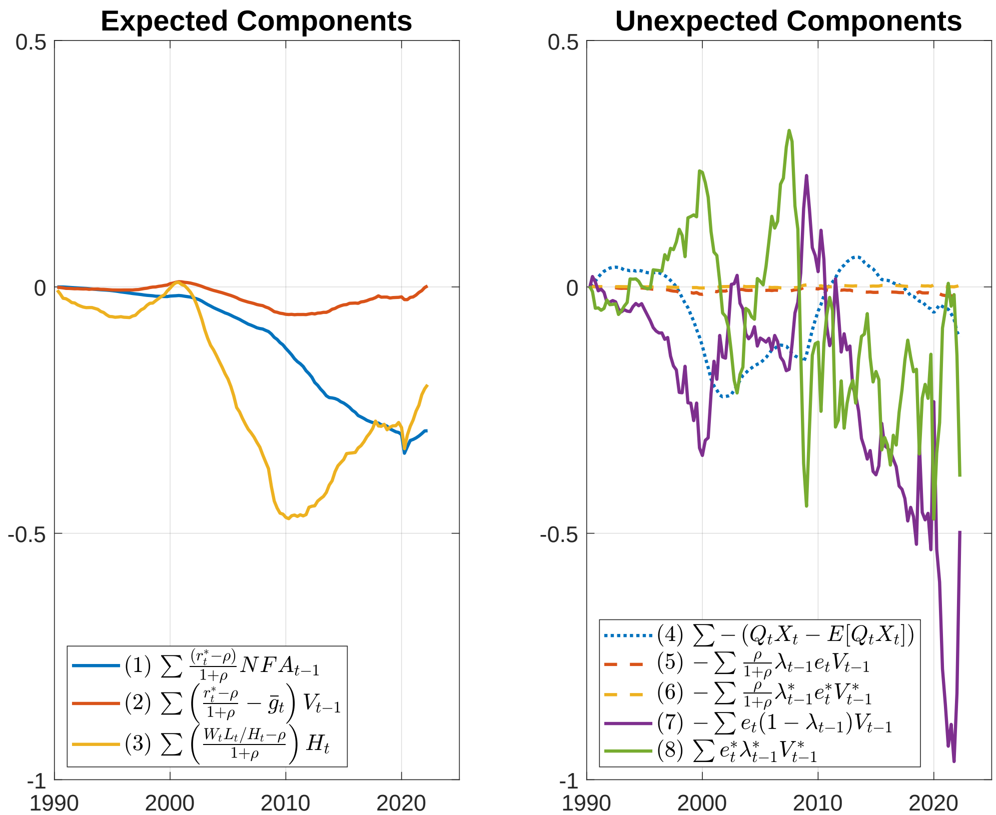

Figure 17: NFA Decomposition

for parameters.

In the first, we solve for the counterfactual equilibrium of the model when we set the share of U.S. firms owned by U.S. residents to $\lambda_t = 1$ and the share of ROW firms owned by U.S. residents to $\lambda_t^* = 0$, leaving all other parameter values unchanged. In this counterfactual exercise, the paths of output, labor compensation, capital, investment, and the market valuation of the U.S. corporate sector are all the same as in the baseline calibration. That is because, in our model, the distribution of the ownership of firms across U.S. and ROW households does not impact the equilibrium discount rate r_{t+1}^* or equilibrium production and investment decisions. In this counterfactual exercise, the paths for U.S. consumption and for the current account are different than in the baseline because now U.S. households enjoy more of the unexpected capital gains on their now larger holdings of equity in U.S. corporations. Our baseline model together with this counterfactual exercise give U.S. two paths for the consumption of U.S. households: with a large increase in μ_t: one with and one without observed gross cross-border equity positions.

In the second counterfactual exercise, we solve for the equilibrium of the model setting $z_{Lt} = z_{Ht}$ for all t, leaving all other parameters the same. In this counterfactual exercise, with this alternative path for the productivity of follower firms, we have $\mu_t = 1$ for all t. With these alternative parameters, U.S. firms accumulate substantially more capital than in the baseline, raising the path of output and labor compensation (both in absolute terms and relative to output). This counterfactual exercise gives U.S. an alternative path for consumption if U.S. firms had experienced the same path for productivity but leader firms had not enjoyed a large increase in their power to price above cost, all under the assumption that cross-border equity share holdings $(1 - \lambda_t)$ and λ_t^* had remained as in the baseline.

In the third counterfactual exercise, we solve for the equilibrium path for consumption of U.S. households when we set the share of U.S. firms owned by U.S. residents $\lambda_t = 1$ and the share of ROW firms owned by U.S. residents $\lambda_t^* = 0$ and set $z_{Lt} = z_{Ht}$ for all t so that $\mu_t = 1$ for all t.

With these counterfactuals, we can compare the paths of output and consumption given the baseline path for the output wedge μ_t against the paths of output and consumption with $\mu_t = 1$. And we can perform this comparison twice: once under the baseline data-consistent path for gross equity positions $(1 - \lambda_t)$ and λ_t^*, and once for a counterfactual world in which cross-border equity positions are always zero. We use these alternatives to study the impact of international equity diversification for the welfare implications of a rise in the ratio between revenue and cost μ_t that is a key driver of rising U.S. asset valuations in our analysis.

We show these results in Figure 18. In the top left panel of this figure, we show the ratio of the path of U.S. output in our baseline to that in our counterfactuals with $z_{Lt} = z_{Ht}$ for all t so that $\mu_t = 1$ for all t. As noted above, the path for output implied by our model is not impacted by assumptions about the extent of international diversification of equity holdings $(1 - \lambda_t)$ and λ_t^*. Hence, there is only one line in this top panel. We see in this figure that the increase in μ_t over the past decade has had a large negative impact on the path of output relative to the counterfactual with $\mu_t = 1$ at all dates. In our model, since labor is supplied inelastically and the path for leader firm productivity is the same in the baseline and the counterfactual simulation, this decline in output is entirely due to the impact of increases in μ_t on the accumulation of physical capital; the negative impact on the model capital to output ratio is plotted in the top right panel of the figure. In this regard, we confirm the findings of Gutierrez and Philippon (2017) that the big increase in the valuation of U.S. firms in our baseline is associated with comparatively weak investment due to a large increase in the gap between revenue and costs for leader firms.

In the bottom panels of Figure 18 we show how the impact of a rising output wedge on the consumption (and thus welfare) of US households is mediated by the dynamics of international equity diversification.

First, consider the impact of the large estimated increase in μ_t in a world with no cross-border equity holdings (bottom right panel). Here we plot the ratio of the path of U.S. household consumption in our baseline (in which μ_t is generally rising) to consumption in the counterfactual with $z_{Lt} = z_{Ht}$ for all t (so that $\mu_t = 1$ for all t) under the assumption that cross-border equity holdings $(1 - \lambda_t)$ and λ_t^* are always zero. It is clear that a large increase in μ_t in the U.S. has only a modest impact on U.S. consumption, notwithstanding the large impact on U.S. output shown in the top panel. The intuition for this result is straightforward. First, the income that U.S. households lose from lower labor compensation when μ_t goes up is mostly offset by a rise in the factorless income that they receive in dividend payments from firms. Second, the decline in investment that drives down equilibrium output also implies a period of elevated cash flow to shareholders, and that extra income can be invested abroad, and used to replace lower future domestic income. The finding that a rise in μ_t has only a small negative impact on consumption is analogous to the result that an increase in output wedges starting from an efficient equilibrium has no first-order impact on welfare in a closed economy. In Appendix H we prove that, starting from a zero output wedge, the impact on consumption from a marginal shock to μ_t is nill when there is zero foreign ownership of U.S. equity.

Now consider the impact of the large increase in μ_t in our baseline on U.S. household consumption in a world with cross-border equity holdings equal to those in the data. Specifically, we plot the path of U.S. household consumption in our baseline to that in our counterfactual with $z_{Lt} = z_{Ht}$ for all t (so that $\mu_t = 1$) under the assumption that cross-border equity

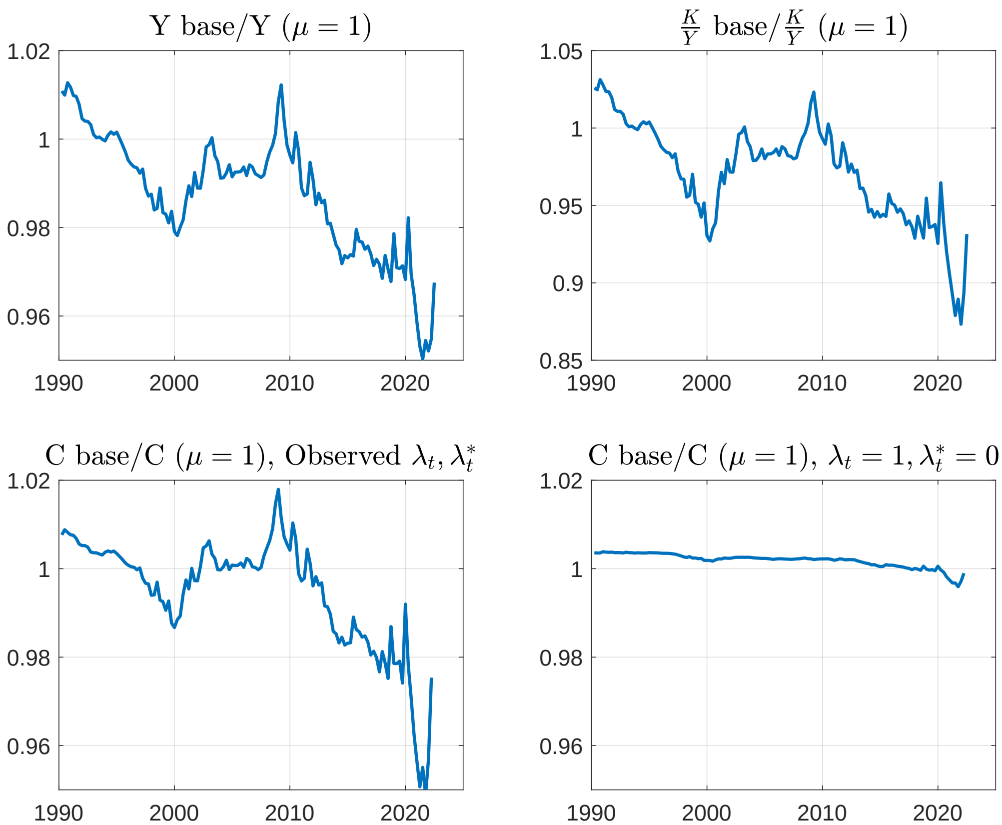

Figure 18: Effect of Output Wedges on Y, K/Y, and C. Effect on C Shown with Actual Path for Diversification, and Zero Diversification Counterfactual.

holdings $(1 - \lambda_t)$ and λ_t^* evolve as in our baseline calibration. Now, we see a large negative impact of the increase in μ_t on equilibrium consumption. In fact, the additional decline in consumption relative to a world with a zero output wedge is quantitatively similar to the associated decline in output. The reason is that now the income that U.S. households lose from a decline in the share of labor compensation in output is not largely offset by an increase in dividends that they receive as owners of firms, because foreign households receive a large share of those increased dividends. As a result, U.S. households have less wealth (both in absolute terms and relative to output) than they would have in the absence of cross-border equity holdings and they reduce their consumption as a result.

Thus, we find that the negative welfare implications of an increase in market power for U.S. firms for U.S. households are massively magnified in the presence of large foreign ownership of U.S. equity.

7 Sensitivity Analysis

We now consider the extent to which our measurement of the discount rate r_{t+1}^* and the parameters μ_{t+1} and α_{t+1} derived from that estimate are sensitive to our use of equation 21 and data on the current account in our measurement procedure.

We do so for two reasons. First, prior papers such as Farhi and Gourio (2018) and Crouzet and Eberly (2021), which do not consider the implications of their models for the current account, use data on historical growth rates to estimate $\bar{g}_{t+1}$. We consider alternative versions of this procedure in our sensitivity analysis.

Second, one might consider an alternative model structure that does not have a representative U.S. household. For example, Greenwald, Lettau, and Ludvigson (2021) consider a model in which there are two types of U.S. households, one which earns labor income and consumes that income every period (living hand-to-mouth), and another that owns all financial assets. If we were to make a similar assumption, our model's implication for the current account would be similar to that in equation 21 except that the final term involving current labor compensation $W_t L_t$ and the level of human wealth H_t would not be included since the households earning labor income would contribute nothing to the overall household saving rate and thus the valuation of human wealth would not influence the current account. In this case, we would not be able to use this equation in our measurement of r_{t+1}^* and $\bar{g}_{t+1}$.

To conduct our sensitivity analysis, we consider four alternative measurement procedures in which we replace our use of equation 21 for the current account and use only equation 24 involving the valuation metrics of the earnings yield and Tobin's Q with alternative auxiliary assumptions about either expected growth $\bar{g}_{t+1}$ or the expected dividend yield $r_{t+1}^* - \bar{g}_{t+1}$

as in equation 25. Specifically, we calculate the model implied paths for r^*_{t+1}, μ_{t+1}, and α_{t+1} under the auxiliary assumptions that

1. $r^*_{t+1} - \bar{g}_{t+1}$ is constant at the average of D_{t+1}/V_t over the 1990-2022 time period

2. $\bar{g}_{t+1}$ is equal each quarter to the median expected ten year growth forecast in the Survey of Professional Forecasters[36]

3. $\bar{g}_{t+1}$ set equal to the trend from an HP filtered series of quarterly growth rates of U.S. corporate value added, and

4. the expected dividend yield $r^*_{t+1} - \bar{g}_{t+1}$ is equal to the realized dividend yield D_{t+1}/V_t each period

We show the results for $r^*_{t+1}, \bar{g}_{t+1}, \mu_{t+1}$, and α_{t+1} in Figure 19. We include in this plot (in green) the values of these parameters that we obtain in our baseline measurement exercise in which our model with a representative U.S. household replicates the path for the current account. Note that the series for $r^*_{t+1}, \bar{g}_{t+1}, \mu_{t+1}$, and α_{t+1} that we obtain in our baseline are sufficiently close to those obtained under the assumption that $r^*_{t+1} - \bar{g}_{t+1}$ is constant at the average of D_{t+1}/V_t over the 1990-2022 time period (in blue) that it is difficult to distinguish the two alternative measurements in the figure.

We draw two conclusions from this sensitivity analysis.

First, as is evident in the top left panel of this figure, these alternative measurement procedures produce widely divergent estimates of expected growth $\bar{g}_{t+1}$. Despite this wide array of estimates of expected growth rates $\bar{g}_{t+1}$, these alternative measurement procedures produce very similar estimates of the discount rate r^*_{t+1} over our time period outside of the years around the peak of the dot-com boom in 2000 and the stock market boom during COVID in 2020 and 2021. As we discussed above, this finding arises mechanically from the observation that the estimate of the discount rate r^*_{t+1} that one obtains from equation 24 is not sensitive to one's estimate of the growth rate $\bar{g}_{t+1}$ when Tobin's Q is equal to one. We interpret this agreement in estimates of r^*_{t+1} across our five alternative measurement procedures as indicating that, in the data, outside of the period around the year 2000, Tobin's Q is close enough to one such that the divergence in estimates of future growth $\bar{g}_{t+1}$ do not have a substantial influence on the model-implied discount rate r^*_{t+1}.

Second, as is evident in the bottom right panel of this figure, these alternative measurement procedures all imply that the ratio between revenue and costs in the U.S. corporate sector μ_t has increased substantially in the past decade. That is, each of these measurement

[36] We interpolate these data to develop a quarterly series for $\bar{g}_{t+1}$

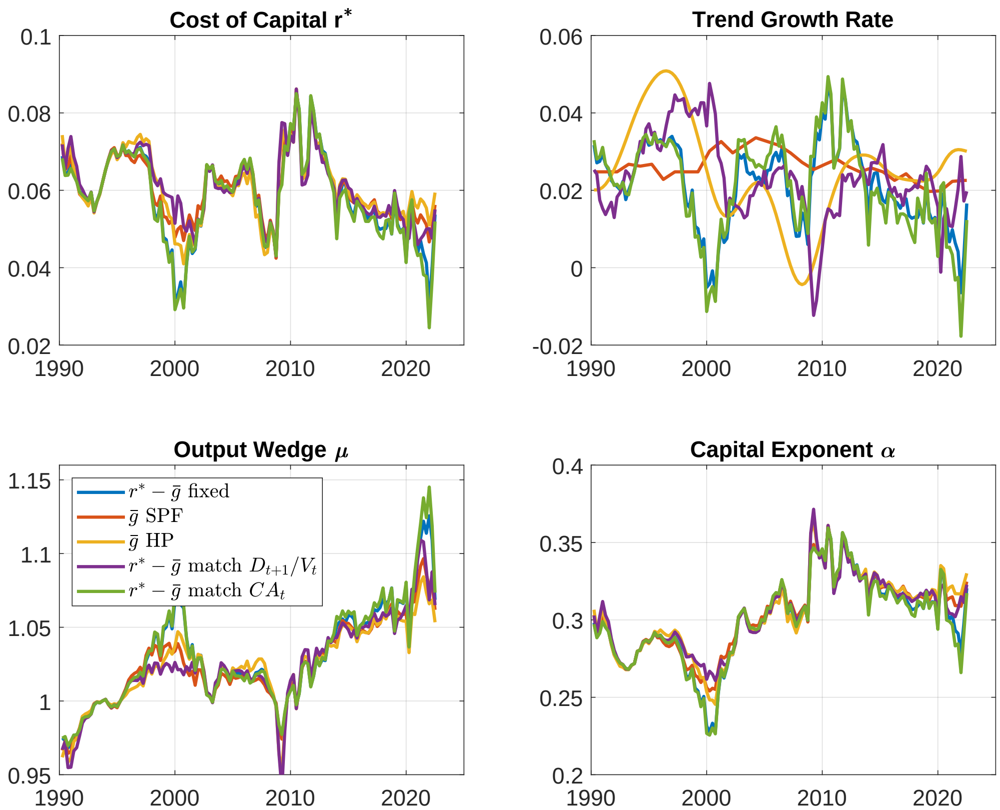

Figure 19: Sensitivity to Trend Growth Model

procedures account for the large increase in free cash flow from the U.S. corporate sector seen directly in the data in Figure 8 as arising primarily from an increase in the ratio between revenue and costs. This finding follows from the observation that, given the nearly recursive structure through which the parameters of our model are identified, once these alternative measurement procedures agree on the appropriate discount rate r^*_{t+1}, it is immediate that they will agree on estimates of μ_{t+1} and α_{t+1}.

If we use our model with a representative U.S. household to examine the implications of these alternative scenarios about expected future growth $\bar{g}_{t+1}$ and hence the valuation multiple $1/(r^*_{t+1} - \bar{g}_{t+1})$ for the model implied current account, we would find that these alternative scenarios would miss the data on the current account quite badly. This is because the value of human wealth H_t that enters into the calculation of the current account in equation 21 is both very large and very sensitive to this valuation multiple. In contrast, if we followed the model assumption in Greenwald, Lettau, and Ludvigson (2021) in which labor income is earned by a set of households that consume that income every period, then each of these alternative scenarios would produce similar implied series for the current account, but none of these would match the data.

8 Conclusion

The U.S. net foreign asset position has deteriorated sharply over the past decade or more as the value of corporate equity that foreigners own in the U.S. has boomed. At the same time, the share of U.S. corporate gross value added available as free cash flow to owners of these corporations has also boomed, with this shift representing a dramatic change in the allocation of U.S. corporate gross value added to taxes, payments to labor, acquisition of new capital, and payouts to owners of firms not previously seen in post WWII U.S. data.

We have presented a simple international macro-finance model that we have used to measure and interpret the factors driving these changes in the flows, stocks, and value of the U.S. corporate sector and the U.S. current account and net foreign asset position over the period 1990-2022. The factors considered include changes in tax and capital depreciation rates, changes in the share of labor compensation in total costs, changes in the ratio of revenue to total costs, and changes in the discount factor that firms use to guide investment decisions and that households use, together with expectations of future growth, to value both payouts from corporations and their human wealth.

Our model extends previous macro-finance models used for similar measurement exercises in integrating the evolution of the current account and net foreign asset position into the model. In doing so, we confirm and reinforce previous findings that increases in the cash flows to firm owners rather than changes in the valuation multiple of those cash flows accounts for much of the increase in the value of the U.S. corporate sector over the past decade. In particular, we confirm the finding that there has been a large increase in the ratio of revenue to total costs for the U.S. corporate sector over the past decade.

Our model extends previous work in international macroeconomics in developing a unified accounting of observed fluctuations in the valuation of U.S. corporations and the U.S. current account and net foreign asset position over the past 30 years. We find that the direct impact of changes in the valuation of the U.S. corporate sector on the U.S. NFA position through its mechanical impact on the valuation of ROW equity holdings in the U.S. has been quite large over the past decade while the indirect impact of these developments on the current account through induced changes in the wealth to income ratio for U.S. households have been quite small. One important reason that these indirect wealth effects on the current account have been small is that much of the increase in the valuation of U.S. corporations is offset by a decrease in the valuation of the human wealth U.S. households derive from that sector.

We then use our model to conduct counterfactual exercises to evaluate the impact on the welfare of U.S. households of our measured expansion in the wedge between total revenue and costs for U.S. corporations. We find a large negative welfare impact on U.S. households of this increase in the wedge between revenue and cost for U.S. corporations given observed gross cross-border equity positions — the ROW enjoys a large portion of the increased free cash flow from U.S. corporations. This finding stands in sharp contrast to what one would find if U.S. households owned all the equity in U.S. corporations. In this case, the increase in the wedge between revenue and costs for U.S. corporations is, to a first order, simply a reallocation of sources of income for a representative U.S. household.

The size of cross-border asset holdings has grown very large in recent decades. Those large gross positions open the door to new channels for shocks to propagate internationally, especially shocks that affect asset values. Gourinchas and Rey (2007) and showed that changes in asset values play a quantitatively important role, in an accounting sense, in driving the dynamics of the net foreign asset position. We have shown that that finding extends with even more force in recent data.[37] But we also go further in building an explicit economic model that can generate realistic valuation movements, and that we can use to trace out their implications for the current account, and for consumption and welfare. Through the lens of our model, a rising share of factorless income in the US is a key driver of rising US asset valuations. This rise would not have mattered much for US households absent foreign ownership of US equity. But given high observed foreign ownership of US firms, the rise in US equity values during the 2010's was associated with a large consumption loss for Americans.

[37] See also Gourinchas (2023) on this point.

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Appendix

In this appendix , we discuss the sources and construction of our data in section A. In section B we discuss concerns about the international data that have been raised in the literature. In section C we describe how we use our model for measurement in full detail. In section D we compare our measurement procedure to those used by prior papers in the literature.

A Data Sources

We use data from the following quarterly version of tables in the Federal Reserve Board of Governors Z1 release *The Financial Accounts of the United States*. We draw most of the data from that website directly as the versions of the data presented on the FRED website maintained by the St. Louis Federal Reserve do not have the correct series for the market value of FDI equity as of the time of the writing of this paper.

We draw most of our data from these tables in Z1 drawing from the *Integrated Macroeconomic Accounts*

- Table S.1 *Selected Aggregates for Total Economy and Sectors* of the Integrated Macroeconomic Accounts
- Table S.5 *Non Financial Corporate Business* sector of the Integrated Macroeconomic Accounts
- Table S.6 *Financial Business* sector of the Integrated Macroeconomic Accounts
- Table S.9 *Rest of World* sector of the Integrated Macroeconomic Accounts

We download data from the Board of Governors Data Download Program. Series identifiers can be found in the "Federal Reserve Statistical Release Z.1. Financial Accounts of the United States." The line numbers reported below refer to the version of that publication dated December 9, 2021, available at https://www.federalreserve.gov/releases/z1/20211209/z1.pdf

The Python code for downloading and constructing our figures is available upon request. We download quarterly nominal GDP and the change in the GDP deflator from one quarter to the next from the FRED database at the Federal Reserve Bank of St. Louis (identifiers "GDP" and "A191RI1Q225SBEA").

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 U.S. subsidiaries.

A.1 Gross and Net Foreign Assets, Flows, and Valuations

Gross and net foreign assets: Data on gross and net foreign assets are taken from Table S.9. The total market value of financial claims of the U.S. on the ROW is given in line 134 of Table S.9 in series FL264194005. The total market value of financial claims of the ROW on the United States (U.S.) is given on line 105 of Table S.9 in series FL264090005. These two series constitute the gross foreign asset positions used in our study, with the NFA position of the U.S. shown in Figure 1 being the difference between the market value of U.S. claims on the ROW and ROW claims on the U.S., which corresponds to (the negative of) line 158, series FL262090095, in Table S.9.

We take ratios of these and subsequent series relative to nominal GDP (FRED identifier "GDP") and to nominal Gross Value Added of the Corporate Sector which we construct in quarterly data from Tables S.5 and S.6 as described below. Note that this series for GDP is in billions of dollars, whereas many of the other series are in millions of dollars, so we multiply this series by 1000. Note as well that a data series for gross value added of the U.S. Corporate Sector and its components is available from BEA NIPA Table 1.14.

The current account, the capital account, and valuation changes: using data from Table S.9 we decompose nominal changes in the U.S. net foreign asset position according to the following accounting identity

$$NFA_t - NFA_{t-1} = \underbrace{CA_t}_{\text{net lending abroad}} + \underbrace{VA_t}_{\text{valuation changes}} + \underbrace{RES_t}_{\text{residual term}}.$$

Table S.9 is presented from the perspective of the rest of the world. We consider flows and net foreign assets from the perspective of the United States. Thus, we typically take the negative of the 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 positions of the U.S. computed as Table S.9 line 134 (FL264194005) minus line 105 (FL264090005). The change $NFA_t - NFA_{t-1}$ is reported (with the opposite sign) on line 104 (FC262090095). 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). Note that this series is annualized, so we divide the quarterly data by 4. "Valuation changes" VA_t is the negative of line 103 (FR265000005). What we term the "residual term" RES_t is given by the negative of line 70 (FV268090185). Note that line 70 in Table S.9 is called "total other volume changes" and consists of "other volume changes" in line 71 minus the official "statistical discrepancy" in line 72 between net lending abroad measured from the goods and services flow side and from observed net financial flows.

Note that in Table S.9 the following accounting identity holds

$$\underbrace{NFT_t}_{\text{net financial transactions}} = \underbrace{CA_t}_{\text{net lending abroad}} - \underbrace{SD_t}_{\text{statistical discrepancy}}$$

where the left-hand side is "net lending on the financial account" reported in line 69 (FA265000005) and the right-hand side is the sum of line 13 (FA265000905) minus line 72 (FU267005005). Note that line 69 is annualized in quarterly data, just like line 13, so we divide it by 4.

Thus, an alternative decomposition of the cumulated change in the U.S. NFA position is

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

where "other volume changes" (OV_t) is line 71 (FV268090085) in Table S.9. As discussed in Bertaut and Judson (2022), this series for "other volume changes" represents primarily discrepancies arising for separate data sources on gross cross border asset positions and flows. Note that these decompositions of cumulated changes in the U.S. net foreign asset position are invariant to measurement issues in the current account relating to the measurement of U.S. exports and factor income as discussed in Guvenen et al. (2021).

We compare cumulated net financial flows to the cumulated current account here.

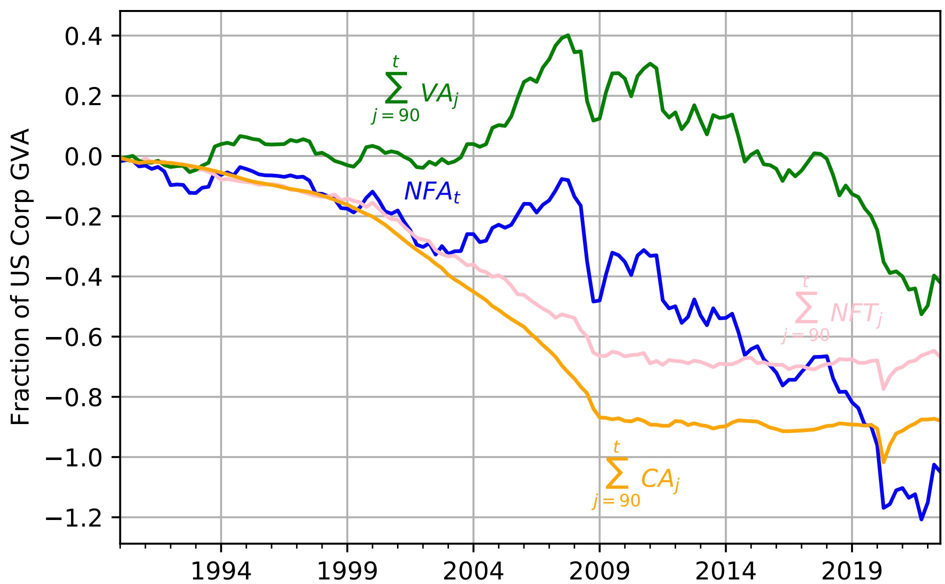

Figure A.1: Decomposition of Changes in U.S. Net Foreign Assets over U.S. Corporate Value Added

The equity component of gross and net foreign assets: We measure the equity component of gross and net foreign assets of the U.S. using the sum of portfolio investments in equity and the equity component of foreign direct investment. The market value of U.S. portfolio equity investment in the ROW is given on line 152 of Table S.9, "corporate equities including foreign investment fund shares" (LM263164100). The market value of ROW portfolio equity investment in the U.S. is given by the sum of lines 125, "corporate equities" (LM263064105), and 126, "mutual fund shares" (LM263064203).

The market value of the equity component of U.S. foreign direct investment in the ROW is given by Table S.9, line 154 (LM263192101), and the market value of the equity component of ROW foreign direct investment in the U.S. is given by Table S.9, line 127 (LM263092101).

We compute market values of non-equity gross and net foreign assets and liabilities as the difference between the the measures of the total positions and the equity component of those positions as described above.

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 U.S. portfolio equity investment in the ROW is given on line 99 of Table S.9, "corporate equities," (FR263164100). The revaluation of ROW portfolio equity investment in the U.S. is given by the sum of lines 83, "corporate equities," (FR263064105) and 84, "mutual fund shares," (FR263064203). The revaluation of the equity component of U.S. foreign direct investment abroad is line 100, (FR263192101). The revaluation of the equity component of ROW foreign direct investment in the U.S. is line 85, (FR263092101).

We measure the valuation changes for non-equity assets and liabilities as the difference between the total valuation changes and the valuation changes for the equity assets and liabilities discussed above.

We use a measure of the value of the equity component of foreign direct investment at current cost in Figure B.2 below. We use the following series for these alternative plots. A valuation of the equity component of U.S. foreign direct investment abroad at current cost is given in series FL263192161 and the current cost valuation of the equity component of ROW foreign direct investment in the U.S. is given in series FL263092161.

A.2 Measurement of the U.S. Corporate Sector

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

Gross value added The breakdown of gross value added by sector in the Integrated Macroeconomic Accounts is given in Table S.2. Gross value added for the non-financial corporate business sector is given in line 4 of that table (FA106902501) and that for the financial business sector on line 5 (FA796902505). Gross value added for the economy as a whole is given on line 1 of that table in series FA896902505. 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 A.2, we show the share of economy-wide gross value added that is produced in the U.S. corporate sector.

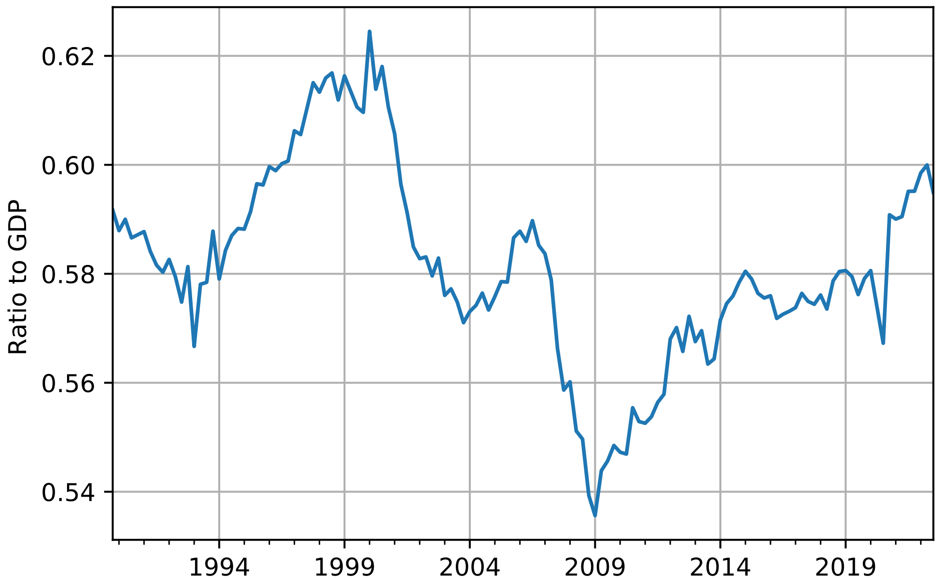

Figure A.2: U.S. Corporate Sector Gross Value Added Share of GDP

Dividends The variable in the model is D_t, which is a comprehensive measure of payouts to investors in the corporate sector from operations. For the non-financial corporate business sector, we measure payouts using the following lines from Table S.5: we take operating surplus, net in line 8 (FA106402101) less current taxes on income, wealth, line 21 (FA106220001) less net capital formation in line 28 (FA105050985). For the financial business sector, we measure payouts from the following lines in Table S.6. We take operating surplus, net in line 8 (FA796402101) less current taxes on income, wealth, line 23 (FA796220001) less capital formation, net in line 30 (FA795015085).

We have also computed an annual series for Dividends from the U.S. Corporate Sector using data Corporate GVA, consumption of fixed capital, net operating surplus, and taxes on corporate income from Table 1.14 of the BEA NIPA accounts and data on gross investment by the corporate sector from Fixed Assets Table 6.7. We show this series for the ratio of Corporate Dividends relative to Corporate GVA in Figure A.3. As is evident in this figure, the recent elevated level of dividends relative to Corporate GVA is quite unusual in the post WW-II history. Dividends had only previoulsy reached current levels relative to GVA in the Great Depression.

Earnings: The variable E_t in the model is a comprehensive measure of the operating earnings of the U.S. 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 S.5 and S.6. For the non-financial corporate business sector, we add net capital formation, as recorded in line 28 (FA105050985), to our measure of dividends. For the financial sector, we add net capital formation, as recorded in line 30 (FA795015085), to our measure of dividends.

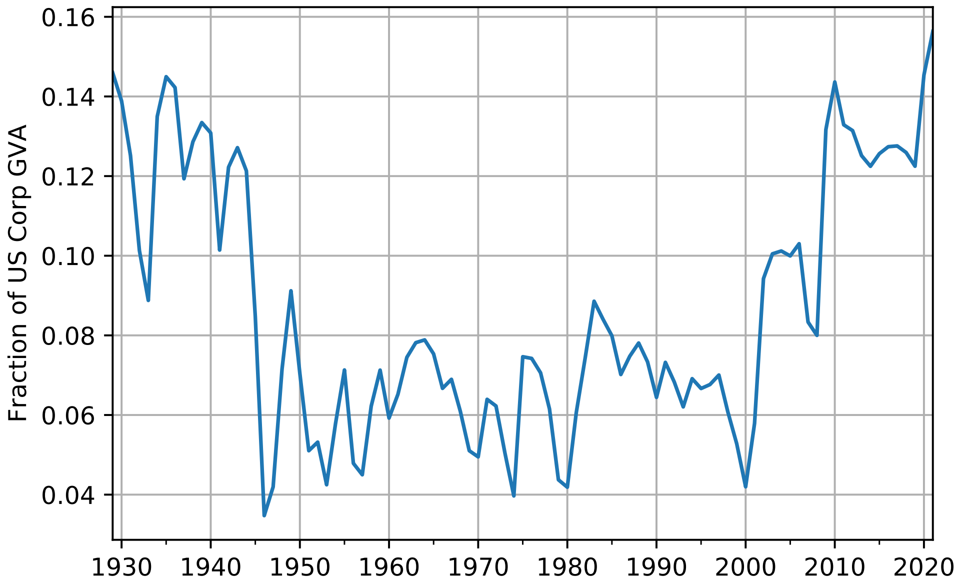

Figure A.3: U.S. Corporate Sector Free Cash Flow 1929-2021, Ratio to U.S. Corp Value Added

Replacement value of non-financial assets The variable $Q_t K_{t+1}$ 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 109 (LM102010005) on Table S.5 and line 105 (LM795013865) on Table S.6.

Market or enterprise value of corporate non-financial assets The variable V_t 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 corporate sector and the financial business sector. We construct this measure for the non-financial corporate business sector as the sum of "Liabilities," line 144 (FL104194005), less "Financial Assets," line 114 (FL104090005) on Table S.5 (note that this series is in billions of dollars). Note as well that line 144 includes both the market value of corporate equities and ROW FDI investment in the U.S. non-financial corporate sector. Line 114 includes the value of U.S. FDI investment by the non-financial corporate sector in the ROW.[38] Finally, note that this measure of the market value of the non-

[38] Given this use of market values to measure the equity entries in the balance sheet of the U.S. corporate sector, the entries on the two sides of this balance sheet do 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 166 on Table S.5 and line 153 on Table S.6). This entry does not correspond to the standard accounting notion of net worth or to 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 the U.S. NIPA. See https://www.bea.gov/national/sna-and-nipas for more information.

financial assets in the non-financial corporate sector corresponds to the measure presented for that sector in Z1 Table B.1 *Derivation of U.S. Net Wealth* line 14 (LM102010405).

For the financial business sector, we take a different approach than that taken on line 15 in Table B.1. Our aim is to measure the enterprise value of banks, insurance companies, and other financial services firms resident in the United States, but to exclude the value of pure financial intermediaries such as mutual funds, closed end funds, and exchange traded funds (ETFs), as we assume that these pure financial intermediaries by definition have no enterprise value. To construct this measure, we compute the sum of corporate equity issues (LM793164105 from line 143 of Table S.6) and "Foreign Direct Investment in the United States: Equity" (LM793192105 from line 146 on Table S.6) less "U.S. Direct Investment Abroad: Equity" (LM793092105 from Line 126 on Table S.6). We then subtract from this measure the value of corporate equities in closed end funds (LM554090005 line 7 of Table L.123) and exchange traded funds (LM564090005 line 8 of Table L.124). Note that the value of mutual fund shares is already excluded from this measure and reported separately on line 144 of Table S.6.

We construct our measure of V_t as the sum of these measures across these two sectors.

We report on our measures of Enterprise and Replacement values of assets in the non-financial corporate sector and the financial business sector in figures A.4 and A.5.

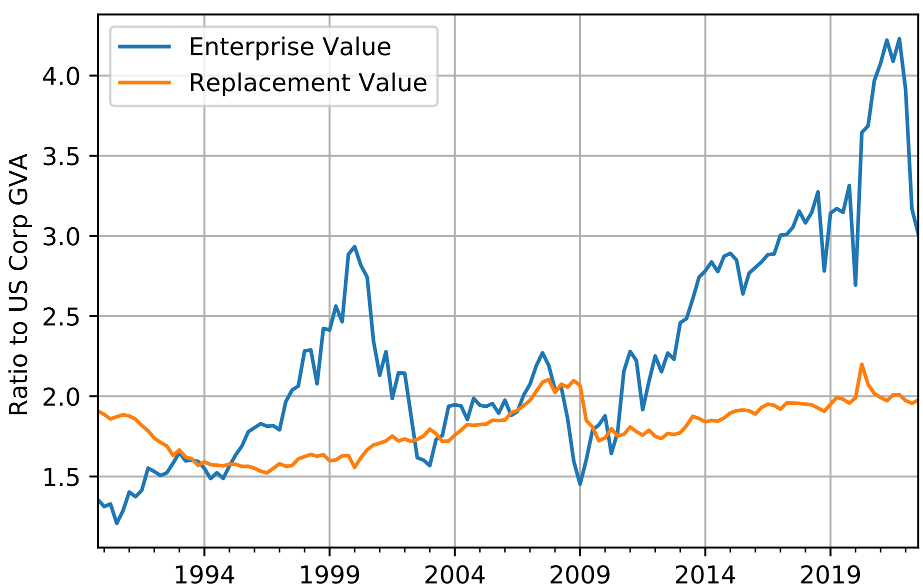

Figure A.4: Enterprise and Replacement Values of U.S. Non-financial Corporate Sector Non-financial Assets

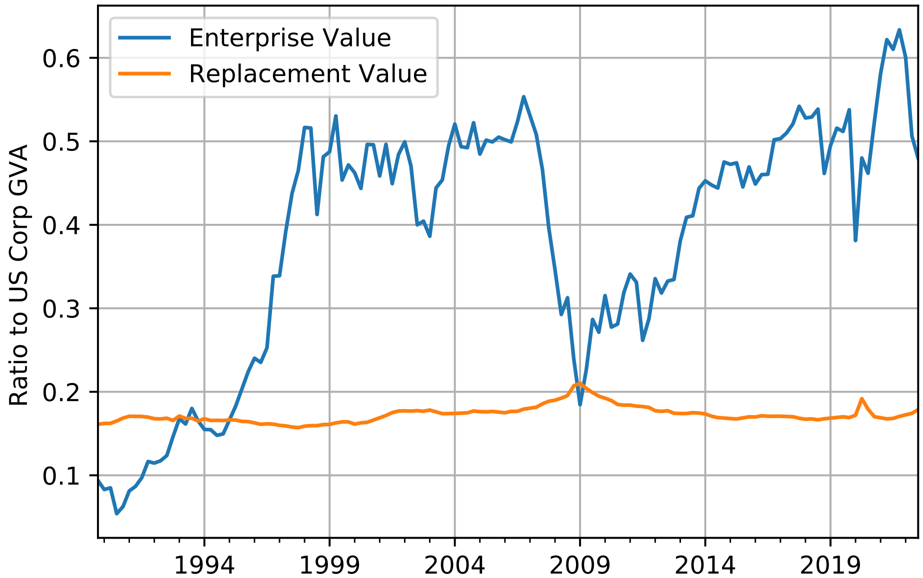

Figure A.5: Enterprise and Replacement Values of U.S. Financial Business Sector Non-financial Assets

A.3 Foreign Ownership of U.S. Equity

Our measure of the share of U.S. equity owned by the ROW at the end of period t $(1 - \lambda_t)$ is a ratio with the numerator equal to a comprehensive measure of ROW ownership of U.S. 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 U.S. described above as the sum of Table S.9 lines 125 "Corporate Equities" (LM263064105), and 126 "Mutual Fund Shares" (LM263064203), and the market value of the equity component of ROW foreign direct investment in the U.S. is given by Table S.9 line 127 (LM263092101).

We show that ratio in Figure A.6

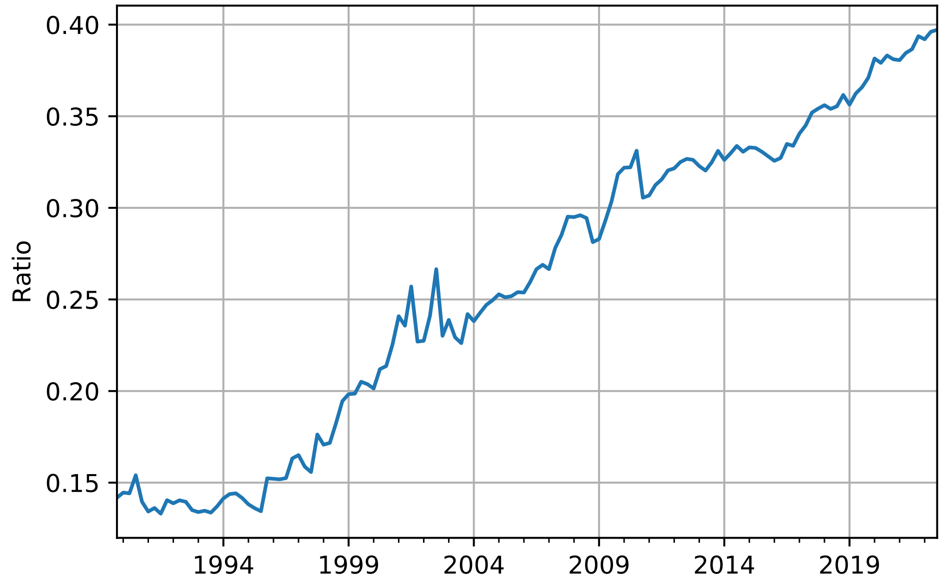

Figure A.6: ROW ownership share of U.S. Corporations

A.4 U.S. Ownership of Foreign Equity

We do not construct a direct measure of the enterprise value of ROW corporations V_t^*. Instead, we measure the U.S. ownership at the end of period t directly as the sum of U.S. portfolio investments in ROW equity and the equity component of U.S. foreign direct investment in ROW. The market value of U.S. portfolio equity investment in the ROW is given on line 152 of Table S.9, "corporate equities including foreign investment fund shares" (LM263164100). The market value of the equity component of U.S. foreign direct investment in the ROW is given by Table S.9, line 154 (LM263192101).

We measure the dividends that U.S. residents receive in period t on their ownership of equity in the ROW (denoted by $\lambda_{t-1}^* D_t^*$ in the model) as monetary dividends paid as reported in BEA NIPA Table 4.1 "Current receipts from the rest of the world: Income receipts on assets: Dividends" which we retrieve from FRED series identifier B3375C1Q027SBEA. Note, as we discuss below, this series includes only the monetary dividends actually paid on U.S. FDI in the ROW as opposed to the full accounting income reported as part of the current account.

We note that, in contrast to the well-known "income puzzle" on U.S. FDI in the ROW (discussed below), these dividends on U.S. equity in the ROW actually paid are not high relative to the market valuation of U.S. residents holdings of equity in the ROW. We compute that dividend yield as follows. To compute $\lambda_{t-1}^* V_t^*$, we add together the market value of U.S. equity in the ROW at the end of period $t-1$ ($\lambda_{t-1}^* V_{t-1}^*$) as measured above and add to it the revaluation of U.S. equity in the ROW in period t ($\lambda_{t-1}^*(V_t^* - V_{t-1}^*)$). We measure this revaluation as the sum of revaluations of U.S. portfolio and FDI equity in ROW. The revaluation of U.S. portfolio equity investment in the ROW is given on line 99 of Table S.9, "corporate equities," (FR263164100). The revaluation of the equity component of U.S. foreign direct investment abroad is line 100, (FR263192101).

With these data, we compute the current dividend yield on U.S. equity in ROW as the ratio of $\lambda_{t-1}^* D_t^*$ to $\lambda_{t-1}^* V_t^*$ constructed as above giving D_t^*/V_t^* as in Figure A.7. While it is the case that this ratio shows big spikes around changes in U.S. tax law that encourage the repatriation of earnings on U.S. FDI, the long term average for this series is in line with the current dividend yield on U.S. corporations reported in figure 9.

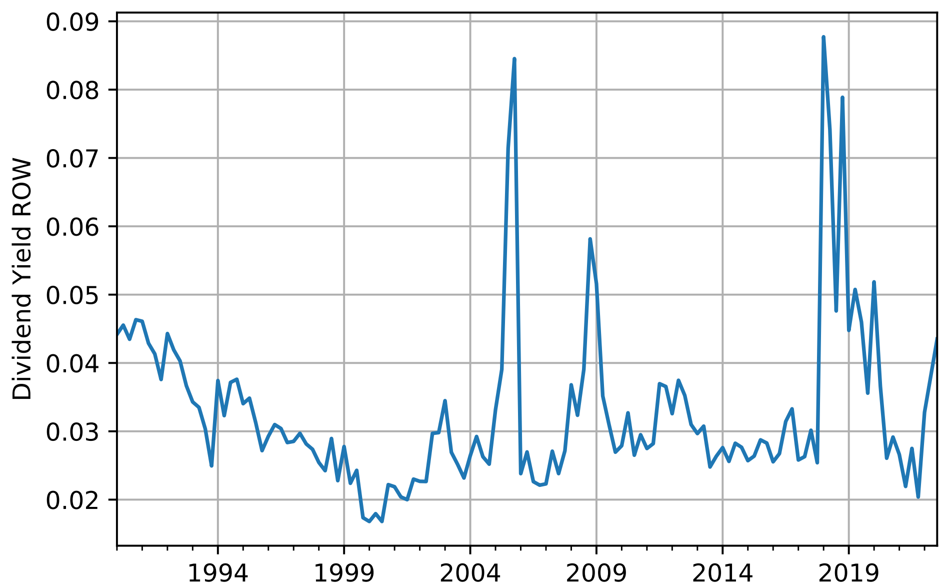

Figure A.7: Current Dividend Yield on U.S. Equity in ROW

A.5 Measurement of the Foreign Corporate Sector

In Figure 10 the series for the enterprise value of the corporate sector in the United States and in the European Union are computed as the sum of enterprise value of non-financial corporations (for the U.S., from Table S.5.a of the Financial Accounts of the United States, for the European Union from OECD Dataset 720, Non-consolidated Financial Accounts) plus the sum of the market value of the equity of monetary financial institutions and of insurance corporations (both from OECD Dataset 720). Note that for the United States, we do not use the OECD Dataset 720 to compute the net worth of non-financial corporations, as figures in that dataset include the net worth of non-financial non-corporate businesses, so the OECD's U.S. figures are not consistent with their analogues for other OECD countries. In Figure 11, we compute payouts using data from OECD Dataset 13: Simplified Non-financial Accounts. Payouts are measured as net operating surplus minus taxes on income and wealth minus net capital formation for the whole business sector. The U.S. series for enterprise value and payouts in Figures 10 and 11 are the same as the ones plotted in Figures 7 and 8, with the only difference being that the former are annual, whereas the latter are quarterly. Figure A.8 adds to Figures 10 and 11 a line that reports enterprise values and payouts computed for an aggregate of the European Union, Canada, Japan and the United Kingdom. Data for the three additional countries are from the same OECD source as the European Union data and are aggregated using nominal exchange rates. The figure shows how enterprise value and payouts for the European union and for the larger aggregate behave in a very similar fashion (and quite differently from the corresponding U.S. series).

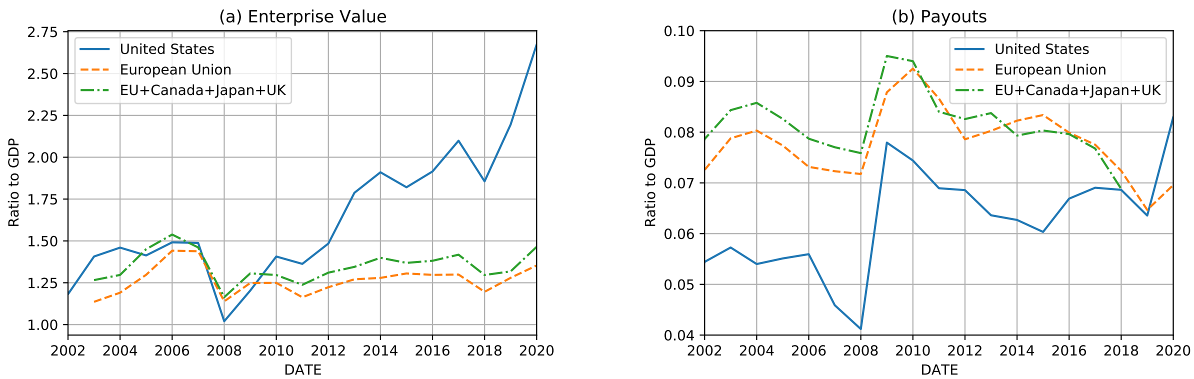

Figure A.8: Enterprise Value and Payouts in a Larger Aggregate of Foreign Economies

Finally, Figure A.9 shows two additional measures of the performance of the U.S. economy over the past 12 years relative to the European Union. Panel (a) shows the ratio of GDP per capita (measured in constant PPP dollars, from the OECD Annual National Accounts) between the U.S. and the EU, while panel (b) plots the same ratio for the employment-population ratio (from the OECD Annual Labor Force Statistics). The main message from the figure is that relative GDP has been quite stable over the last decade, while employment in the United States has declined relative to employment in Europe.

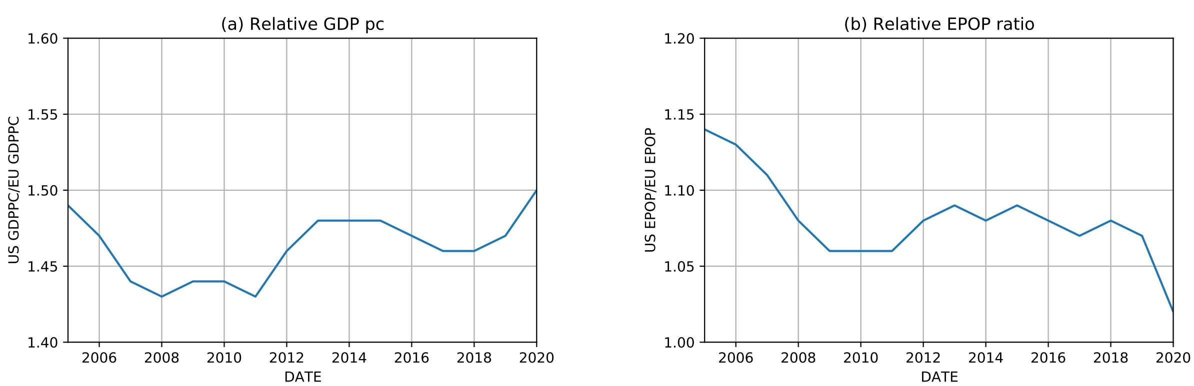

Figure A.9: GDP and Employment Per Capita: United States / European Union

B Issues with the International Data

In this paper, we rely on data from the Integrated Macroeconomic Accounts. Several aspects of the the international component of these data as reported in Table S9 have been discussed in detail in the literature. We review several of these important concerns here.

B.1 Measurement of Ownership of U.S. Resident Corporations and Cross Border Portfolio Equity

Several factors complicate the measurement of cross border holdings of claims on U.S. resident corporations.

First, as noted in Bertaut, Bressler, and Curcuru (2019), U.S. multinationals have increasingly chosen to incorporate in offshore tax havens in what are called "corporate inversions." As a result, a growing share of what are reported as cross-border equity holdings are, in fact, primarily claims on what are economically U.S. firms held by U.S. equity investors through their claims on the parent firm located in the offshore tax haven.

Second, again as noted in Bertaut, Bressler, and Curcuru (2019), cross border holdings of assets through mutual funds are classified as equity even if the mutual fund is a bond fund.

These concerns may lead to an overestimate of ROW claims on U.S. resident corporations.

Third, as noted in Bertaut, Bressler, and Curcuru (2019), firms are issuing a growing volume of bonds through offshore subsidiaries. Since some U.S. firms follow this practice, a portion of what is recorded as U.S. investors' holdings of foreign corporate bonds is, in fact, a claim on what is economically a U.S. firm. In this regard, we may overestimate U.S. household non-equity claims on ROW corporations.

Fourth, as noted in Bertaut, Bressler, and Curcuru (2020), U.S. households hold portfolio equity in U.S. firms with international operations. In this regard, we underestimate the extend of U.S. residents' holdings of equity claims on corporations resident in the ROW.

Bertaut, Bressler, and Curcuru 2019 estimate that roughly $2 trillion of the total $12 trillion U.S. outward investment abroad in 2017, or 16 percent, was actually exposure to the U.S.. It is unclear what the total adjustment of the estimated gross claims by foreigners on the U.S. would be if similar methods were applied to these data.

B.2 The Income Puzzle

A long-standing puzzle in the international data is 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. There is a large literature on this topic. Curcuru, Thomas, and Warnock (2013) is an important paper in this literature that points out that a large portion of this discrepancy is due to a gap between the accounting income yields on U.S. direct investment assets and liabilities.

One hypothesis regarding the puzzlingly high accounting income on U.S. FDI equity in the ROW 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 the following discussion from the BEA: `https://www.bea.gov/help/faq/202`.

Another hypothesis regarding this gap in income yields for Direct Investment Equity Assets and Liabilities is that for fiscal reasons, multinational firms tend to overreport income from foreign affiliates and underreport income generated in the United States. See, for example, Bosworth, Collins, and Chodorow-Reich (2007), Curcuru, Thomas, and Warnock (2013), Curcuru and Thomas (2015), 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 distort neither the measurement of the U.S. NFA position nor the current account.

One important point to note is that the accounting income yield on U.S. direct investment equity in the ROW is a ratio of corporate income as reported by the ROW subsidiaries of U.S. multinationals to the value of the corporation, not a measure of monetary dividends actually paid. The gap between accounting income on direct investment equity and the monetary dividends actually paid is accounted for as a capital flow titled “Reinvestment of Direct Investment Income”. In our measurement, we use only the measure of monetary dividends paid as discussed in subsection A.4 above. We do not use data on accounting income on direct investment equity in our measurement procedure.

B.3 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 S.9 and Table L.230. 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 United States and U.S. stock market indices to value U.S. direct investment equity in the rest of the world. In Figure B.2, we show the evolution of U.S. net foreign assets with foreign direct investment into and out of the United States 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 the U.S. NFA position. In particular, negative valuations no longer apply to FDI, which accounts for about 50 percent of the gross equity positions. So, not surprisingly, the size of the decline of the U.S. NFA position is smaller (40 percent of GDP instead of 60 percent). Nevertheless the main fact we highlight remains: since 2007, the U.S. NFA position has declined primarily because of negative valuation effects.

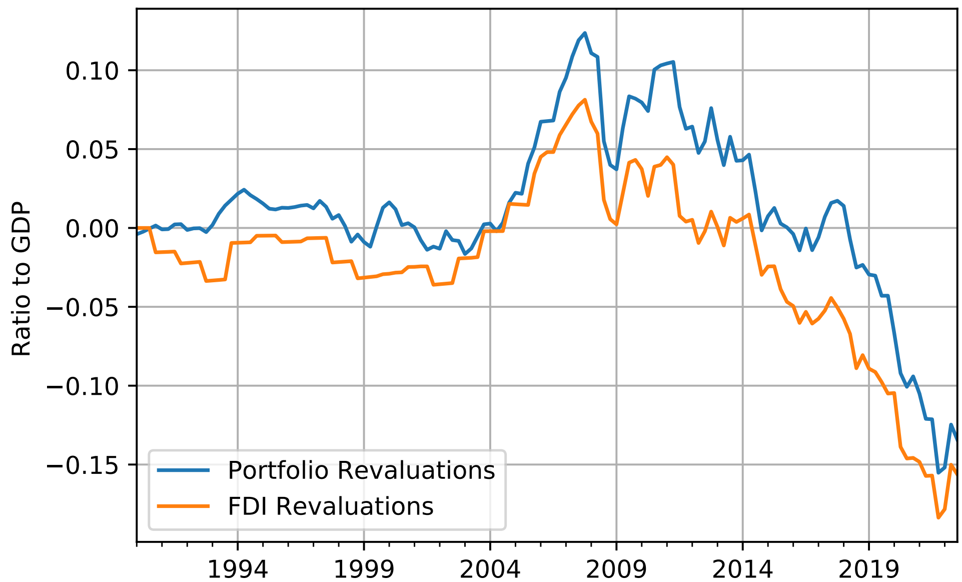

Figure B.1: Cumulated Valuation Effects for Portfolio Equity and FDI Equity over GDP

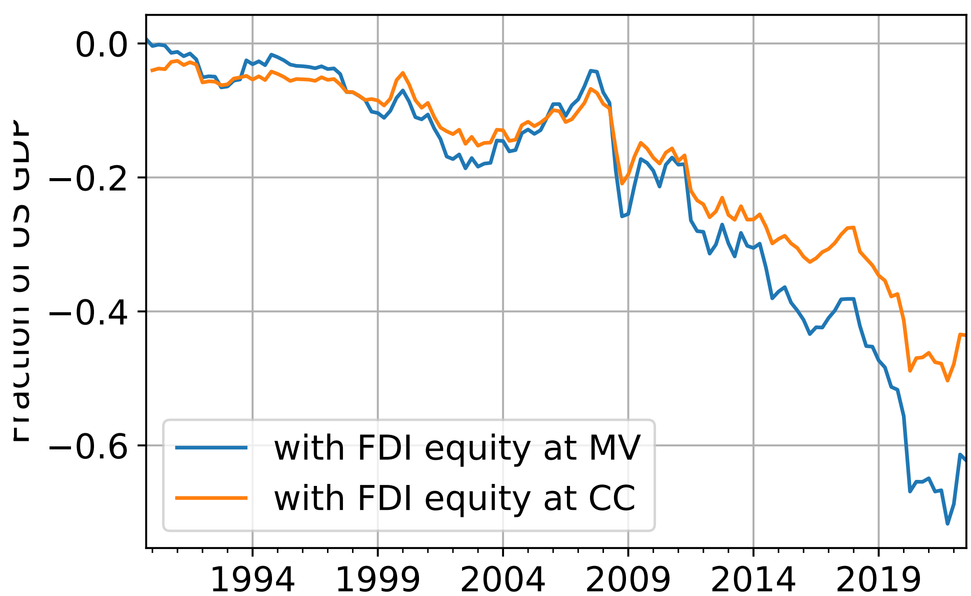

Figure B.2: U.S. NFA over GDP with FDI Equity Valued At Market Value and At Current Cost

C Using the Model for Measurement: Full Detail

We now describe the details of our recursive calibration procedure. The data we use to calibrate our model is nominal. The model we laid out in the text is real. One could introduce fluctuations in the general price level in our model. And one could assume that non-equity assets in the model are nominal; non-equity assets and liabilities in the data are, in fact, mostly nominal. However, if model agents have perfect foresight over the path for the price level, price level fluctuations will have no impact on real allocations. In particular, nominal interest rates will move one-for-one with expected inflation, and the path for the equilibrium real interest rate will be invariant to the path for the price level.

C.1 Nominal Bonds

But there is one aspect where changes in the price level will affect our calibration, which has to do with how changes in the nominal values of gross foreign assets and liabilities due to inflation are divided between net asset purchases on the current account versU.S. valuation changes in the balance of payments accounts. The measurement conventions used can affect the measured current account (see, for example, Box 1.1 in Obstfeld and Rogoff (1996).) We will assume that all changes in the nominal values of equity assets and liabilities, including those reflecting changes in the general price level, are counted as valuation effects. In contrast, we assume that there are no valuation effects for bonds, so that all changes in the nominal bond position show up on the current account. This assumption is consistent with the absence of valuation effects for nonequity liabilities in the national accounts. We measure gross inflation as the growth in the GDP deflator, P_{t+1}^D (in everything that follows, a superscript D denotes a data variable):

$$\pi_{t+1}^D = \frac{P_{t+1}^D}{P_t^D}.$$

Consider a version of the model in which bonds are nominal, and in which the current account includes the change in the nominal bond position. Given perfect foresight regarding the price level, the gross interest rate on the nominal bond between t and $t+1$ is

$$1 + r_{t+1}^{*nom} = (1 + r_{t+1}^*)\pi_{t+1}^D$$

so $r_{t+1}^{*nom} = (1 + r_{t+1}^*)\pi_{t+1} - 1$. The current account expression in eq. 21 now changes in that the term $\frac{1}{1+\rho}(r_{t+1}^* - \rho)B_t$ is replaced with $\frac{1}{1+\rho}(r_t^{*nom} - \rho)\frac{B_t^{nom}}{P_t}$. Note that for $\pi_{t+1} > 1$, this increases the measured current account (and the current account to gross value-added ratio).

To understand why introducing nominal bonds changes the current account but does not change real consumption or the NFA position in real terms, consider the following simplified version of the model which abstracts from equity and human wealth.

In the "real" version of this simplified model, consumption is

$$C_t = \frac{\rho}{1+\rho}(1 + r_{t+1}^*)B_t,$$

the current account is

$$CA_t = r^*_{t+1}B_t - C_t = \frac{1}{1+\rho}(r^*_{t+1} - \rho)B_t,$$

and the end of period NFA position is

$$B_{t+1} = B_t + CA_t = B_t + \frac{1}{1+\rho}(r^*_{t+1} - \rho)B_t = \frac{1 + r^*_{t+1}}{1+\rho}B_t.$$

In the "nominal" version of the model, consumption is

$$C_t = \frac{\rho}{1+\rho}(1 + r_t^{*nom})\frac{B_t^{nom}}{P_t},$$

Substituting in $\frac{B_t^{nom}}{P_{t-1}} = B_t$ and $r_t^{*nom} = (1 + r^*_{t+1})\pi_t - 1$ gives

$$C_t = \frac{\rho}{1+\rho}(1 + r^*_{t+1})\pi_t^D\frac{B_tP_{t-1}}{P_t} = \frac{\rho}{1+\rho}(1 + r^*_{t+1})B_t$$

which is identical to the expression in the "real" version of the model.

The current account is

$$\begin{aligned} CA_t &= r_t^{*nom}\frac{B_t^{nom}}{P_t} - C_t = r_t^{*nom}\frac{B_t^{nom}}{P_t} - \frac{\rho}{1+\rho}(1 + r_t^{*nom})\frac{B_t^{nom}}{P_t} \\ &= \frac{1}{1+\rho}\left(r_t^{*nom} - \rho\right)\frac{B_t^{nom}}{P_t} \end{aligned}$$

which differs from the expression in the "real" model.

The end of period NFA position is

$$\begin{aligned} \frac{B_{t+1}^{nom}}{P_t} &= \frac{B_t^{nom}}{P_t} + \frac{CA_t}{P_t} = \frac{P_{t-1}B_t}{P_t} + \frac{1}{1+\rho}\left(r_t^{*nom} - \rho\right)\frac{B_t^{nom}}{P_t} \\ &= \frac{P_{t-1}B_t}{P_t} + \frac{1}{1+\rho}\left((1 + r^*_{t+1})\pi_t^D - 1 - \rho\right)\frac{P_{t-1}B_t}{P_t} \\ &= \frac{1 + r^*_{t+1}}{1+\rho}B_t \end{aligned}$$

which again is identical to the real version of the model.

C.2 Data Series used

From the data, we have series for (1) corporate taxes paid, (2) wages and salaries, (3) corporate investment, and (4) consumption of fixed capital, all as shares of corporate value added. Denote these

$$(1)\ \frac{Taxes_t^D}{GVA_t^D}$$

$$(2)\ \frac{WL_t^D}{GVA_t^D}$$

$$(3)\ \frac{X_t^D}{GVA_t^D}$$

$$(4)\ \frac{CFC_t^D}{GVA_t^D}$$

We define earnings relative to value-added as

$$\frac{E_t^D}{GVA_t^D} = 1 - \frac{WL_t^D}{GVA_t^D} - \frac{Taxes_t^D}{GVA_t^D} - \frac{CFC_t^D}{GVA_t^D}.$$

We measure free cash flow from the corporate sector as

$$\frac{D_t^D}{GVA_t^D} = \frac{E_t^D}{GVA_t^D} + \frac{CFC_t^D}{GVA_t^D} - \frac{X_t^D}{GVA_t^D}$$

We also measure (5) growth in corporate value added, and (6) the replacement value of the capital stock, which is end of period, and whose model counter-part is Q_tK_{t+1}, and (7) U.S. corporate enterprise value. Denote these

$$(5)\ \frac{GVA_{t+1}^D}{GVA_t^D}$$

$$(6)\ \frac{K_t^D}{GVA_t^D}$$

$$(7)\ \frac{V_t^D}{GVA_t^D}$$

Note that from (3) and (4) we have net investment:

$$\frac{NetX_t^D}{GVA_t^D} = \frac{X_t^D}{GVA_t^D} - \frac{CFC_t^D}{GVA_t^D}$$

and from (3), (4) and (6) we can measure start of period capital (whose model counterpart is Q_tK_t) as

$$\frac{KS_t^D}{GVA_t^D} = \frac{K_t^D}{GVA_t^D} - \frac{X_t^D}{GVA_t^D} + \frac{CFC_t^D}{GVA_t^D} \tag{29}$$

We measure (8) the revaluation U.S. foreign equity assets in t in nominal dollar terms, (9) the value of U.S.-owned foreign equity, and (10) the value of foreign-owned equity in the

U.S.

$$(8)\ \frac{VAFA_t^D}{GVA_t^D}$$

$$(9)\ \frac{U.S.FA_t^D}{GVA_t^D}$$

$$(10)\ \frac{U.S.FL_t^D}{GVA_t}$$

Finally we have (11) the current account, and (12) a series for foreign corporate dividend income

$$(11)\ \frac{CA_t^D}{GVA_t^D}$$

$$(12)\ \frac{D_t^{*D}}{GVA_t^D}.$$

We use these 12 empirical time series to identify quarterly time series for 12 time-varying model parameters: $\tau_t, g_{t+1}, \delta_t, Q_t, \lambda_t^*, \lambda_t, \bar{g}_{t+1}, r_{t+1}^*, \alpha_{t+1}, \mu_{t+1}, \mu_{t+1}^*, Q_t^*$. To make the notation more compact, we henceforth use lower case letters to denote data ratios relative to value-added; e.g., $x_t^D = X_t^D/GVA_t^D$.

C.3 Rate of Time Preference

We set ρ so that the sample average current dividend yield for U.S. corporations (current dividend over end of period enterprise value) is consistent with being on a balanced growth path. Suppose the economy is on a balanced growth path with a constant r^* and a constant growth rate g. For consumption to grow at rate g requires

$$1 = \frac{1}{1+\rho}\frac{1+r^*}{1+g}$$

so

$$\frac{1}{1+\rho} = \frac{1+g}{1+r^*}$$

The balanced growth path dividend yield D/V satisfies

$$1 = \frac{(1+g)}{(r^*-g)}\frac{D}{V},$$

which implies

$$r^* = (1+g)\frac{D}{V} + g$$

Substituting that expression into the discount factor expression gives

$$\frac{1}{1+\rho} = \frac{1+g}{(1+g)\frac{D}{V}+(1+g)} = \frac{1}{\frac{D}{V}+1}$$

so the discount rate consistent with consumption growth at rate g is

$$\rho = \frac{D}{V}$$

Thus, we set ρ equal to the average dividend yield over our sample period:

$$\rho = \mathbb{E}\left[\frac{d_t^D}{v_t^D}\right]$$

C.4 Time-Varying Parameters

We now describe how we recursively identify all 12 of our time-varying parameters.

1. τ_t : Our model assumes that taxes are proportional to value-added. Thus, to ensure the model replicates the observed path for taxes paid we set

$$\tau_t = \frac{Taxes_t^D}{GVA_t^D}.$$

2. g_{t+1} : In our model, both Z_t and z_{Ht} impact the level of equilibrium output. At each date t, we specify z_{Ht} and z_{Ht}^* as parametric functions of other model parameters, where the functions have the property that in equilibrium $Y_t = Y_t^* = Z_t$. We describe those functions at the end of the calibration description. We can then identify g_{t+1} from

$$1 + g_{t+1} = \frac{Z_{t+1}}{Z_t} = \frac{GVA_{t+1}^D}{GVA_t^D}\frac{1}{\pi_{t+1}^D}$$

which ensures that model real value-added tracks U.S. corporate real value added. We normalize $Z_0 = 1$.

3. δ_t : Model depreciation is proportional to the start of period capital stock. Thus,

$$\delta_t = \frac{cfc_t^D}{ks_t^D}$$

where start-of-period capital ks_t^D is given by eq. 29.

4. Q_t : We can measure the growth rate for Q_t as follows. The perpetual inventory equation in units of capital is a model identity

$$K_{t+1} = (1 - \delta_t)K_t + X_t$$

Thus

$$\begin{aligned} Q_t K_{t+1} &= Q_t K_t - \delta_t Q_t K_t + Q_t X_t \\ &= \frac{Q_t}{Q_{t-1}} Q_{t-1} K_t - \delta_t Q_t K_t + Q_t X_t \end{aligned}$$

which implies

$$\frac{Q_t}{Q_{t-1}} = \frac{Q_t K_{t+1} + \delta_t Q_t K_t - Q_t X_t}{Q_{t-1} K_t}$$

Recognizing that our data is nominal, we implement this as

$$\begin{aligned} \frac{Q_t}{Q_{t-1}} &= \frac{K_t^D - NetX_t^D}{\pi_t^D K_{t-1}^D} \\ &= \frac{(1+g_t)\left(k_t^D - netx_t^D\right)}{k_{t-1}^D} \end{aligned}$$

We normalize the initial $Q_0 = 1$.

5. λ_t^* : We measure the growth in the foreign enterprise value using equity asset revaluation data and the foreign equity position as follows.

   (a) Let V_t^{*D} denote the nominal data value of the foreign corporate sector at t. We have

   $$VAFA_{t+1}^D = \lambda_t^* (V_{t+1}^{*D} - V_t^{*D})$$

   The value of U.S. owned foreign equity at the end of t is

   $$U.S.FA_t^D = \lambda_t^* V_t^{*D}$$

   Thus.we can identify the nominal growth rate of foreign enterprise value, V_{t+1}^{*D}/V_t^{*D}, by taking the ratio of valuation effects to the value of the stock at the end of the previous period:

   $$\frac{GVA_{t+1}^D}{GVA_t^D}\frac{vafa_{t+1}^D}{U.S.fa_t^D} = \frac{\lambda_t^*(V_{t+1}^{*D} - V_t^{*D})}{\lambda_t^* V_t^{*D}} = \frac{V_{t+1}^{*D}}{V_t^{*D}} - 1$$

   (b) To pin down the *level* of foreign enterprise value we assume that the foreign Buffett ratio is initially equal to the U.S. value:

   $$v_0^{*D} = v_0^D$$

   (c) Given the assumption that foreign nominal value added grows at the value added in the U.S., the growth rate in the foreign Buffett ratio is then identified as

   $$\frac{v_{t+1}^{*D}}{v_t^{*D}} = \frac{\frac{V_{t+1}^{*D}}{V_t^{*D}}}{(1+g_{t+1})\pi_{t+1}^D} = \frac{\frac{GVA_{t+1}^D}{GVA_t^D}\frac{vafa_{t+1}^D}{U.S.fa_t^D} + 1}{(1+g_{t+1})\pi_{t+1}^D} = \frac{vafa_{t+1}^D}{U.S.fa_t^D} + \frac{1}{(1+g_{t+1})\pi_{t+1}^D}$$

   which gives U.S. the level of v_t^{*D} for each date t.

   (d) Then we identify λ_t^* from

   $$\lambda_t^* = \frac{U.S.fa_t^D}{v_t^{*D}}$$

6. λ_t : We identify this from U.S. equity liabilities and U.S. enterprise value:

$$(1-\lambda_t) = \frac{U.S.fl_t^D}{v_t^D}$$

7. $\bar{g}_{t+1}$: We identify $\bar{g}_{t+1}$ using (1) a valuation equation, and (2) the current account. The value of firms in the model is given by

$$V_t = \frac{\mathbb{E}_t\left[D_{t+1}\right]}{r^*_{t+1} - \bar{g}_{t+1}}$$

where expected dividends are given by expected earnings minus expected net investment:

$$\begin{aligned}\mathbb{E}_t\left[D_{t+1}\right] &= \mathbb{E}_t\left[E_{t+1}\right] - \mathbb{E}_t\left[X_{t+1} - \delta_{t+1}Q_{t+1}K_{t+1}\right] \\ &= E_{t+1} + \delta_{t+1}Q_{t+1}K_{t+1}\left(1 - \frac{Q_t}{Q_{t+1}}\right) - \bar{g}_{t+1}Q_tK_{t+1}\end{aligned}$$

(note that realized earnings differ from expected earnings because unexpected changes in the replacement cost of capital at $t+1$ affect realized consumption of fixed capital). Thus,

$$\left(r^*_{t+1} - \bar{g}_{t+1}\right)V_t = E_{t+1} + \delta_{t+1}Q_{t+1}K_{t+1}\left(1 - \frac{Q_t}{Q_{t+1}}\right) - \bar{g}_{t+1}Q_tK_{t+1} \tag{30}$$

This equation has two unknowns: r^*_{t+1} and $\bar{g}_{t+1}$. Thus we need another equation to identify $\bar{g}_{t+1}$. In our baseline calibration, we use the model expression for the current account. Recall that the equilibrium model current account is very sensitive to $\bar{g}_{t+1}$: all else equal, a higher value for expected trend growth implies a higher value for human capital, $H_t = \frac{W_{t+!}L_{t+1}}{r^*_{t+1}-\bar{g}_{t+1}}$, translating to higher desired consumption, and a larger current account deficit. The current account expression, in the version of the model with nominal bonds explained above, is

$$CA_t = \frac{1}{1+\rho}\left[\left(\frac{D_t}{V_t} - \rho\right)\lambda_{t-1}V_t + \left(\frac{D_t^*}{V_t^*} - \rho\right)\lambda^*_{t-1}V_t^* + (r_t^{*nom} - \rho)\frac{B_t^{nom}}{P_t} + (W_tL_t - \rho H_t)\right] \tag{31}$$

where $H_t = \frac{W_{t+1}L_{t+1}}{r^*_{t+1}-\bar{g}_{t+1}}$ and $r_t^{*nom} = \left((1+r^*_{t+1})\pi_t^D - 1\right)$. Given eq. 30, the denominator of the H_t term can be expressed as

$$r^*_{t+1} - \bar{g}_{t+1} = \frac{\mathbb{E}_t\left[E_{t+1}\right]}{V_t} - \bar{g}_{t+1}\frac{Q_tK_{t+1}}{V_t}$$

Substituting that into the current account expression, we can solve for $\bar{g}_{t+1}$ as

$$\begin{aligned}\bar{g}_{t+1} &= \frac{\mathbb{E}_t\left[E_{t+1}\right]}{Q_t K_{t+1}} - \frac{V_t}{Q_t K_{t+1}} \rho W_{t+1} L_{t+1} \\ &\times \left[\left(\frac{D_t}{V_t} - \rho \right) \lambda_{t-1} V_t + \left(\frac{D_t^*}{V_t^*} - \rho \right) \lambda_{t-1}^* V_t^* + \left[\left((1+r_{t+1}^*) \pi_t^D - 1 \right) - \rho \right] \frac{B_t^{nom}}{P_t} + W_t L_t - (1 + \end{aligned}$$

The data analogue is (dividing date t nominal data variables by P_t and date $t+1$ variables by P_{t+1})

$$\begin{aligned}\bar{g}_{t+1} &= \frac{\mathbb{E}_t\left[E_{t+1}^D\right]}{\pi_{t+1} K_t^D} - \frac{V_t^D}{K_t^D} \rho \frac{W L_{t+1}^D}{P_{t+1}^D} \\ &\times \left[\left(\frac{D_t^D}{V_t^D} - \rho \right) \lambda_{t-1} \frac{V_t^D}{P_t^D} + \left(\frac{D_t^{*D}}{V_t^{*D}} - \rho \right) \lambda_{t-1}^* \frac{V_t^{*D}}{P_t^D} + \left[\left((1+r_{t+1}^*) \pi_t^D - 1 \right) - \rho \right] \frac{B_t^{nom}}{P_t^D} + \frac{W L_t^D}{P_t^D} \end{aligned}$$

Expressing data values relative to data value-added gives

$$\begin{aligned}\bar{g}_{t+1} &= (1+g_{t+1}) \frac{\mathbb{E}_t\left[e_{t+1}^D\right]}{k_t^D} - (1+g_{t+1}) \frac{v_t^D}{k_t^D} \rho w l_{t+1}^D \\ &\times \left[\left(\frac{d_t^D}{v_t^D} - \rho \right) \lambda_{t-1} v_t^D + \left(\frac{d_t^{*D}}{v_t^{*D}} - \rho \right) \lambda_{t-1}^* v_t^{*D} + \left[\left((1+r_{t+1}^*) \pi_t^D - 1 \right) - \rho \right] b_t^{nom} + w l_t^D - (1 + \end{aligned}$$

There are two variables on the right-hand side of this equation that are neither data objects nor parameters that we have recovered in previous steps. Those are r_{t+1}^* and b_t^{nom} (the non-equity position relative to value-added carried into period t.) But we can recover these parameters sequentially through time: given r_t^* and b_t^{nom}, we can solve for $\bar{g}_{t+1}$, then for r_{t+1}^* (following step 8 below) and other date $t+1$ parameters, and finally for the equilibrium value for b_{t+1}^{nom}.

Alternatives

(a) We might have an external estimate for $\bar{g}_{t+1}$.

(b) We might have an external estimate for $\left(r_{t+1}^* - \bar{g}_{t+1}\right)$ – for example, $r_{t+1}^* - \bar{g}_{t+1} = average\left(\frac{D_{t+1}^D}{V_t^D}\right)$. We then immediately obtain $\bar{g}_{t+1}$ from eq. 30

$$\begin{aligned}\bar{g}_{t+1} &= \frac{\mathbb{E}_t\left[E_{t+1}\right]}{Q_t K_{t+1}} - \left(r_{t+1}^* - \bar{g}_{t+1}\right) \frac{V_t}{Q_t K_{t+1}} \\ &= \frac{\mathbb{E}_t\left[E_{t+1}\right]}{Q_t K_{t+1}} - average\left(\frac{D_{t+1}^D}{V_t^D}\right) \frac{V_t}{Q_t K_{t+1}}\end{aligned}$$

In the data, that is identified as

$$
\begin{aligned}
\bar{g}_{t+1} &= \frac{\mathbb{E}_t\left[E^D_{t+1}\right]}{\pi^D_{t+1}K^D_t} - average\left(\frac{D^D_{t+1}}{V^D_t}\right)\frac{V^D_t}{K^D_t} \\
&= (1+g_{t+1})\frac{\mathbb{E}_t\left[e^D_{t+1}\right]}{k^D_t} - average\left(\frac{D^D_{t+1}}{V^D_t}\right)\frac{v^D_t}{k^D_t}
\end{aligned}
$$

(c) Suppose we want to identify $\bar{g}_{t+1}$ from an equation assuming perfect foresight about future dividends (note that this is NOT strictly consistent with our baseline expectations model – here we think of it as a separate auxiliary model which informs the parameter vector for $\{\bar{g}_{t+1}\}$.)

$$
V_t = \frac{D_{t+1}}{r_{t+1} - \bar{g}_{t+1}}
$$

Then we can replace $(r_{t+1} - \bar{g}_{t+1})$ in our model valuation equation (30) with $\frac{D_{t+1}}{V_t}$

$$
\begin{aligned}
\left(r_{t+1} - \bar{g}_{t+1}\right)V_t &= \mathbb{E}_t\left[E_{t+1}\right] - \bar{g}_{t+1}Q_tK_{t+1} \\
D_{t+1} &= \mathbb{E}_t\left[E_{t+1}\right] - \bar{g}_{t+1}Q_tK_{t+1}
\end{aligned}
$$

which we can operationalize empirically as

$$
\begin{aligned}
\bar{g}_{t+1} &= \frac{\mathbb{E}_t\left[E^D_{t+1}\right] - D^D_{t+1}}{\pi_{t+1}K^D_t} \\
&= (1+g_{t+1})\frac{\left(\mathbb{E}_t\left[e^D_{t+1}\right] - d^D_{t+1}\right)}{k^D_t}
\end{aligned}
$$

8. r^*_{t+1} : Given $\bar{g}_{t+1}$ we next identify r_{t+1}. The key valuation equation can rearranged as

$$
r^*_{t+1} = \frac{\mathbb{E}_t[E_{t+1}]}{V_t} + \bar{g}_{t+1}\left(\frac{V_t - Q_tK_{t+1}}{V_t}\right)
$$

But note that we are working with nominal data, and $\mathbb{E}_t[E_{t+1}]$ is dated one period later than the other variables. Thus we implement this as

$$
\begin{aligned}
r_{t+1} &= \frac{\mathbb{E}_t[E^D_{t+1}]}{\pi_{t+1}V^D_t} + \bar{g}_{t+1}\left(1 - \frac{K^D_t}{V^D_t}\right) \\
&= (1+g_{t+1})\frac{\mathbb{E}_t[e^D_{t+1}]}{v^D_t} + \bar{g}_{t+1}\left(1 - \frac{k^D_t}{v^D_t}\right)
\end{aligned}
$$

9. α_{t+1} : Given r_{t+1}, the expression for the labor share and the FOC for investment identify μ_{t+1} and α_{t+1}. The former can be expressed as

$$
\frac{W_{t+1}L_{t+1}}{Y_{t+1}}\frac{1}{(1-\tau_{t+1})(1-\alpha_{t+1})} = \frac{1}{\mu_{t+1}}
$$

The second is

$$\begin{aligned} Q_t(1+r^*_{t+1}) &= \mathbb{E}_t[(1-\tau_{t+1})\frac{\alpha_{t+1}}{\mu_{t+1}}\frac{Y_{t+1}}{K_{t+1}} + (1-\delta_{t+1})Q_{t+1}] \\ &= (1-\tau_{t+1})\frac{\alpha_{t+1}}{\mu_{t+1}}\frac{Y_{t+1}}{K_{t+1}} + (1-\delta_{t+1})Q_t] \end{aligned}$$

which implies

$$\frac{r^*_{t+1}+\delta_{t+1}}{\alpha_{t+1}(1-\tau_{t+1})}\frac{Q_t K_{t+1}}{Y_{t+1}} = \frac{1}{\mu_{t+1}} \tag{32}$$

Combining those two expressions gives

$$\alpha_{t+1} = \frac{\left(r^*_{t+1}+\delta_{t+1}\right) Q_t K_{t+1}}{W_{t+1}L_{t+1} + \left(r^*_{t+1}+\delta_{t+1}\right) Q_t K_{t+1}}$$

which we implement as

$$\begin{aligned} \alpha_{t+1} &= \frac{\left(r^*_{t+1}+\delta_{t+1}\right) K^D_t/P^D_t}{WL^D_{t+1}/P^D_{t+1} + \left(r^*_{t+1}+\delta_{t+1}\right) K^D_t/P^D_t} \\ &= \frac{\left(r^*_{t+1}+\delta_{t+1}\right) k^D_t}{(1+g_{t+1})wl^D_{t+1} + \left(r^*_{t+1}+\delta_{t+1}\right) k^D_t} \end{aligned}$$

10. μ_{t+1} : We can plug the solution for α_{t+1} into the labor's share expression for solve for μ_{t+1}.

$$\mu_{t+1} = \frac{(1-\tau_{t+1})(1-\alpha_{t+1})}{wl^D_{t+1}}$$

Given μ_{t+1} and $z_{H,t+1}$ from eq. 33 we have $z_{L,t+1} = z_{H,t+1}/\mu_{t+1}$.

11. μ^*_{t+1} : We use the valuation formula to infer μ^*_{t+1}. Recall that we assume the rest of the world shares the U.S. tax rate and the U.S. growth rate. Recall that we have a series for V^{*D}_t/GVA^D_t. We know that

$$V^*_t = Q^*_t K^*_{t+1} + \frac{\Pi^*_{t+1}}{r^*_{t+1}-\bar{g}_{t+1}}$$

and

$$\begin{aligned} Q^*_t K^*_{t+1} &= \frac{(1-\tau_{t+1})\alpha_{t+1}}{(r^*_{t+1}+\delta_{t+1})\mu^*_{t+1}} Y_{t+1} \\ \Pi^*_{t+1} &= \frac{(1-\tau_{t+1})(\mu^*_{t+1}-1)}{\mu^*_{t+1}} Y_{t+1} \end{aligned}$$

Thus

$$\mu^*_{t+1} = \frac{(1-\tau_{t+1})(1+g_{t+1})\left(\frac{\alpha_{t+1}}{(r_{t+1}+\delta_{t+1})} - \frac{1}{(r_{t+1}-\bar{g}_{t+1})}\right)}{v_t^{*D} - \frac{(1-\tau_{t+1})(1+g_{t+1})}{(r_{t+1}-\bar{g}_{t+1})}}$$

(One might wonder why Q^*_t does not show up in the expression for $Q^*_t K^*_{t+1}$. The logic is that equilibrium K^*_{t+1} is proportional to Q_t^{*-1}; when Q^*_t is high, investment is low)

12. Q^*_t : We assume $Q^*_0 = Q_0 = 1$. Foreign dividends at date t are given by

$$D^*_t = (1-\tau_t)Y^*_t - W^*_t L^*_t - Q^*_t(K^*_{t+1} - (1-\delta_t)K^*_t)$$

That can be rearranged to give

$$Q^*_t = \frac{D^*_t - (1-\tau_t)Y^*_t + W^*_t L^*_t + Q^*_t K^*_{t+1}}{(1-\delta_t)K^*_t}$$

At each date t (initially for $t = 0$) we can solve for K^*_{t+1} from the foreign FOC for investment (recall that agents expect $Q^*_{t+1} = Q^*_t$). In particular, the rest of world version of eq. 32 gives

$$K^*_{t+1} = \frac{\alpha_{t+1}(1-\tau_{t+1})Z_{t+1}}{Q^*_t(r^*_{t+1}+\delta_{t+1})\mu^*_{t+1}}$$

Substituting that expression into the previous one, and dividing through by output (recall $Y_t = Y^*_t$) gives

$$Q^*_t = \frac{\frac{D^*_t}{Y_t} - (1-\tau_t) + \frac{W^*_t L^*_t}{Y^*_t} + \frac{\alpha_{t+1}(1-\tau_{t+1})}{(r^*_{t+1}+\delta_{t+1})\mu^*_{t+1}}(1+g_{t+1})}{(1-\delta_t)\frac{K^*_t}{Y^*_t}}$$

We have model expressions for $\frac{W^*_t L^*_t}{Y^*_t}$ and $\frac{K^*_t}{Y^*_t}$ and a data series for $\frac{D_t^{*D}}{GVA_t^D}$ which identify Q^*_t given Q^*_{t-1} :

$$Q^*_t = \frac{\frac{D_t^{*D}}{GVA_t^D} - (1-\tau_t) + \frac{(1-\tau_t)(1-\alpha_t)}{\mu^*_t} + \frac{\alpha_{t+1}(1-\tau_{t+1})}{(r^*_{t+1}+\delta_{t+1})\mu^*_{t+1}}(1+g_{t+1})}{(1-\delta_t)\frac{(1-\tau_t)\alpha_t}{(r^*_{t+1}+\delta_t)\mu^*_t}\frac{1}{Q^*_{t-1}}}.$$

Thus we can iteratively construct a sequence for Q^*_t.

C.5 Functions for $z_{H,t+1}$ and $z^*_{H,t+1}$

The functions for $z_{H,t+1}$ and $z^*_{H,t+1}$ are derived as follows.

1. (a) The optimality condition for investment, eq. 11 simplifies, given $E[Q_{t+1}] = Q_t$, to

$$r^*_{t+1} = \frac{R_{t+1}}{Q_t} - \delta_{t+1}$$

which pins down R_{t+1} given r^*_{t+1} (which is known at t).

(b) The first-order condition for capital 9 in conjunction with the production function 6 then pins down K_{t+1} as

$$K_{t+1} = Z_{t+1} \left(z_{H,t+1}\right)^{\frac{1}{1-\alpha_{t+1}}} \left(\frac{\left(r_{t+1} + \delta_{t+1}\right) \mu_{t+1} Q_t}{(1-\tau_{t+1})\alpha_{t+1}}\right)^{\frac{1}{\alpha_{t+1}-1}}$$

so output is given by

$$\begin{aligned} Y_{t+1} &= z_{H,t+1} K_{t+1}^{\alpha_{t+1}} Z_{t+1}^{1-\alpha_{t+1}} \\ &= Z_{t+1} \left(z_{H,t+1}\right)^{\frac{1}{1-\alpha_{t+1}}} \left(\frac{\left(r_{t+1} + \delta_{t+1}\right) \mu_{t+1} Q_t}{(1-\tau_{t+1})\alpha_{t+1}}\right)^{\frac{\alpha_{t+1}}{\alpha_{t+1}-1}} \end{aligned}$$

Note, from the expressions for capital and output, that Z_{t+1} and $z_{H,t+1}$ affect inputs and output symmetrically.

(c) It follows that $Y_{t+1} = Y^*_{t+1} = Z_{t+1}$ when

$$\begin{aligned} z_{H,t+1} &= \left(\frac{\left(r_{t+1} + \delta_{t+1}\right) \mu_{t+1} Q_t}{(1-\tau_{t+1})\alpha_{t+1}}\right)^{\alpha_{t+1}} \\ z^*_{H,t+1} &= \left(\frac{\left(r_{t+1} + \delta_{t+1}\right) \mu^*_{t+1} Q^*_t}{(1-\tau_{t+1})\alpha_{t+1}}\right)^{\alpha_{t+1}} \end{aligned} \tag{33}$$

D Comparison of our Measurement Procedure to that in Prior Papers

Our use of a simple macro finance model to measure factors driving the change in the division of income in the U.S. Corporate Sector into compensation for labor and physical capital and profits and the valuation of that sector has several antecedents in the literature. Here we describe how our work extends and refines this prior work.

Barkai (2020) and Karabarbounis and Neiman (2019) focus on measuring the division of income in the U.S. Corporate Sector into compensation for labor and physical capital and profits. These papers do not use data on the market valuation of the sector. Specifically, these papers start with estimates of the cost of capital r^*_{t+1} and then follow procedures analogous to those that we follow in steps 1 and 2 above to arrive at analogs of our estimates of the share of labor in costs $1 - \alpha_t$ and the share of corporate income left over to pay investors after deducting compensation of physical capital Π_t/Y_t. Karabarbounis and Neiman (2019) highlight that estimates of the "factorless income" share Π_t/Y_t derived using this procedure are very sensitive to the estimate of the cost of capital r^*_{t+1} used as an input into the measurement procedure. The principal measurement issue here is that it is difficult to arrive directly at an estimate of the appropriate cost of capital for the corporate sector r^*_{t+1} as it is difficult to measure the equilibrium gap between this cost of capital and the observed yields on government bonds due to considerations of risk and any liquidity or convenience yields on government bonds.

Our measurement procedure is more closely related to that in Farhi and Gourio (2018), Eggertsson, Robbins, and Wold (2021), and in the baseline case with no adjustment costs for investment studied in Crouzet and Eberly (2021).[39] Farhi and Gourio (2018) in particular argue that one need not build up an estimate of the cost of capital r^*_{t+1} from data on government bond yields and estimates of the equity premium and any convenience yield on those bonds. Instead, all three of these papers argue that one can proceed as we do in the third step of our measurement procedure by including measures of firm valuation V_t as well as the replacement value of the capital stock $Q_t K_{t+1}$ in the analysis. These papers arrive at estimates of the cost of capital r^*_{t+1} using analogs of equation (24) or (25) by making assumptions about the relationship between expected growth from $t+1$ on, $\bar{g}_{t+1}$, and observed historical growth rates.

We extend the measurement done in these papers in two respects.

First, we bring in the current account in equation (21) as an additional data series that can be used to measure both the cost of capital r^*_{t+1} and expected growth $\bar{g}_{t+1}$ when used in conjunction with equation (24). In proceeding in this way, our model gives an accounting of the factors driving the joint dynamics of flows, stocks, and market valuation of the U.S. Corporate Sector as well as the U.S. Current Account.

Second, we conduct a sensitivity analysis of our measurement of r^*_{t+1} to alternative assumptions regarding the expected growth rate $\bar{g}_{t+1}$. Specically, in subsection XX, we present measures of r^*_{t+1} using only U.S. Corporate data and equation (24) where we make alternative assumptions about either expected growth $\bar{g}_{t+1}$ or the valuation multiple for profits given by $1/(r^*_{t+1} - \bar{g}_{t+1}$. We consider four cases. In the first, expected growth $\bar{g}_{t+1}$ is set equal to the trend of growth rates of value added for the Corporate Sector from an HP filter of that time series. In the second, expected growth $\bar{g}_{t+1}$ is set equal to ten-year forecasts of GDP growth from the Survey of Professional Forecasters. In the third, we set the valuation multiple for profits equal to a constant $1/(r^*_{t+1} - \bar{g}_{t+1}$. In the fourth, we set the valuation multiple for profits $1/(r^*_{t+1} - \bar{g}_{t+1}$ equal to the realized value of dividends at $t+1$ over firm value at t (D_{t+1}/V_t). In this last case, we are assuming that agents' expectations for dividends realized at t are equal to the realized value of these dividends each period. In this way, we examine the sensitivity of the measurement procedure followed in Farhi and Gourio (2018), Eggertsson, Robbins, and Wold (2021), and in the baseline case with no adjustment costs for investment studied in Crouzet and Eberly (2021) to alternative assumptions about expected growth.

As shown in subsection 7 above, we find that the values of r^*_{t+1} obtained from equation (24) under these four alternative assumptions are remarkably similar outside of the period around the peak of the Tech boom in stocks in 2000. Accordingly, we find from this sensitivity exercise that the conclusion that profits or factorless income in the U.S. Corporate sector have risen substantially over the past 10 years is robust to alternative assumptions about growth rates that agents expect going forward. As discussed above, the intuition for this finding is that in the data, the last term for the inverse of Tobin's Q in equation (24) is close enough to one that the value of r^*_{t+1} that satisfies this equation is not very sensitive to alternative assumptions about growth $\bar{g}_{t+1}$. At the same time, as pointed out by Aguiar and Gopinath (2007), the implications of the model for the current account are highly sensitive

[39] Greenwald, Lettau, and Ludvigson (2021) conduct a related measurement exercise that develops a richer model of the dynamics that agents in the model expect but that does not use data on measures of the reproduction value of the stock of physical capital or investment. They conclude, as do these other papers, that a large portion of the increase in the market valuation of U.S. corporations is due to an increase in the share of value added paid to the owners of these firms.

to these four alternative assumptions for the expected growth rate $\bar{g}_{t+1}$ because the value of human wealth is highly sensitive to alternative assumptions for $r^*_{t+1} - \bar{g}_{t+1}$. Thus, in our baseline measurement in which we include the current account, we find a very stable value of $r^*_{t+1} - \bar{g}_{t+1}$.[40]

In our measurement, we have abstracted from the role of unmeasured intangible capital in accounting for the increase in value of the U.S. Corporate sector.[41] While we recognize that firms do make many investment that are not currently included in the measures that we use of the reproduction value of firm capital stocks and that firms' likely generate substantial quasi-rents from these past investments, we abstract from unmeasured capital for two reasons.

First, in the aggregate data on capital stocks not measured by the BEA cited in Corrado et al. (2022), there is no trend in the stock of such capital relative to value added over the past decade or more. Hence, incorporating these estimates of unmeasured capital would not serve to explain much of the rise in the market valuation of U.S. Corporations over the past decade.[42]

Second, if one were to postulate that the observed increase in the valuation of U.S. Corporations was accounted for by a large increase in investment in and accumulation of forms of capital that are not measured in the National Income and Product Accounts, then one would also have to postulate that U.S. Corporations had simultaneously experienced a very large increase in productivity that allowed them to maintain measured value added growing along a smooth trend and large free cash flow as observed in the data. This would be required because, absent such an increase in productivity, and increase in investment in unmeasured capital would decrease measured output and measured free cash flow. Thus, while one could conduct a measurement exercise such as ours that matched observed flows, stocks, and market valuations of U.S. Corporations and that attributed the large increase in the valuation and payouts from this sector to an increase in accumulated unmeasured capital rather than to profits (rents), such an exercise would require what seem like implausibly large increases in productivity to allow the U.S. Corporate sector to maintain a steadily growing path of measured output while simultaneously dramatically increasing investment in forms of unmeasured capital. In the context of our model, these increases in productivity would be unexpected shocks from the perspective the agents in our model and thus the model would still attribute a large portion of the increase in the valuation of U.S. corporations to unexpected capital gains to owners of firms rather than as an anticipated reward for previous investments.

[40]The intuition for this finding is close to that in Lustig and Van Nieuwerburgh (2008) regarding the observed insensitivity of consumption to changes in financial wealth and the lack of correlation of innovations to consumption with innovations to financial wealth.

[41]Hall (2001) argued that unmeasured intangible capital played an important role in accounting for the boom in the valuation of U.S. firms in the late 1990's. Eisfeldt and Papanikolaou (2014), Belo et al. (2022), Eisfeldt, Kim, and Papanikolaou (2022) and the papers cited therein argue that measured of intangible capital drawn from firms' accounting statements that is not included in the National Income and Product Accounts help account for the valuation of firms in the cross section.

[42]This statement must be qualified in that we do not consider adjustment costs together with unmeasured forms of capital. Crouzet and Eberly (2021) argue that considering the interaction of these two model assumptions may have a significant impact on the conclusions drawn regarding the drivers of firm value in the aggregate.

E Extended Model with Terms of Trade Effects

In our simple baseline model, all domestic intermediate varieties have the same price, and because domestic and foreign final output are the same good, the prices of domestic and foreign intermediates are identical. Thus, in that model, a rise in output wedges for U.S. firms does not change the price that consumers pay for U.S.-produced relative to foreign-produced goods.

We now briefly consider an extended version of the model, in which domestically produced intermediates produce a composite domestic good A, while foreign intermediates are combined to produce a composite foreign final good B. Goods A and B are traded and used symmetrically in each country as imperfectly substitutable inputs in the production of final consumption and investment goods. In this extended model, the equilibrium price of good B relative to good A – the terms of trade – will depend on how much of good B is produced relative to good A. Thus, whether a rise in U.S. output wedges improves or worsens the terms of trade will depend on whether the rise in U.S. output wedges is associated with an expansion or a contraction in U.S. production.

A pure output wedge shock – one in which output wedges go up because follower firms become less productive and z_L falls – will be associated with a decline in U.S. output and an increase in the price of U.S.-produced goods relative to foreign ones. This terms of trade effect will ameliorate the negative welfare consequences of a pure output wedge shock for U.S. consumers. This is an optimal tariff argument: just like a tax on exports, a pure increase in domestic output wedges reduces the supply of U.S.-produced goods and increases their relative price. However, note that an increase in U.S. output wedges may be associated with either a decline or a rise in the production of U.S. goods, depending on whether the rise in output wedges reflects a decline in z_L (which reduces U.S. output) or a rise in z_H (which boosts U.S. output). In our baseline calibration of our baseline model, we constructed a combination of changes to z_L and z_H with the property that the rise in U.S. output wedges neither expands nor reduces U.S. output. We now show that if we were to follow the same strategy in the extended model in which goods A and B are imperfect substitutes, there would be no change in the equilibrium terms of trade. And in the absence of such a change, all the positive and normative implications of the increase in output wedges would be identical to those in the baseline model described in the main text.

In particular, consider an extension of the baseline model in which domestically produced varieties are combined to produce a composite domestic intermediate A and a composite foreign intermediate B, where the quantites of these composites are denoted by Y_A and Y_B. Thus,

$$\begin{aligned} Y_A &= \left[\int_0^1 Y_i^{(\theta-1)/\theta} di\right]^{\theta/(\theta-1)} \\ Y_B &= \left[\int_0^1 Y_i^{*(\theta-1)/\theta} di\right]^{\theta/(\theta-1)} \end{aligned}$$

These two composites are combined to produced the final conusmption and investment goods using a CES aggregator function G. Let A and A^* and B and B^* denote the quantities of the two composite goods used in producing the final consumption and investment goods in the two countries. Thus,

$$\begin{aligned} C + K' - (1-\delta)K &= G(A,B) \\ C^* + K^{*\prime} - (1-\delta)K^* &= G^*(A^*,B^*). \end{aligned}$$

Assume the aggregators for producing final goods are identical in the two economies:

$$\begin{aligned} G(A,B) &= 2^{\frac{1}{1-\varepsilon}} \left[A^{(\varepsilon-1)/\varepsilon} + B^{(\varepsilon-1)/\varepsilon}\right]^{\frac{\varepsilon}{\varepsilon-1}} \\ G^*(A^*,B^*) &= 2^{\frac{1}{1-\varepsilon}} \left[A^{*(\varepsilon-1)/\varepsilon} + B^{*(\varepsilon-1)/\varepsilon}\right]^{\frac{\varepsilon}{\varepsilon-1}}. \end{aligned}$$

Here, the parameter ε defines the elasticity of substitution between locally produced intermediates and foreign-produced ones.

Market clearing requires

$$\begin{aligned} Y_A &= A + A^* \\ Y_B &= B + B^*. \end{aligned}$$

Let P_A and P_B denote the prices of good A and B relative to the domestic final consumption good and similarly for P_A^* and P_B^*. Given that all intermediate varieties are symmetric, in equilibrium $Y_A = Y_i$, $Y_B = Y_i^*$, $P_A = P_i$ and $P_B^* = P_i^*$.

Note that because the aggregators for producing domestic and foreign consumption goods are identical, the relative price of foreign to domestic conusmption (the real exchange rate) in this model is one, and thus $P_A = P_A^*$ and $P_B = P_B^*$.

The first order conditions for intermediate-good-producing firms in this economy are identical to those in the baseline model. But we cannot immediately equate the prices P_A and P_B to the price of the final consumption good, which is normalized to one. Rather, these prices are pinned down by two conditions. First, the first-order conditions for final-good-producing firms ties the relative price of B to A to the relative quantities produced:

$$\frac{Y_B}{Y_A} = \frac{B}{A} = \frac{B^*}{A^*} = \left(\frac{P_B}{P_A}\right)^{-\varepsilon}. \tag{34}$$

Second, final-good-producing firms are competitive, so that the price of producing one unit of final consumption must equal the price of one unit of consumption (which is normalized to one). If domestic firms are producing one unit of output, then the quantities A and B must satisfy

$$\begin{aligned} G(A,B) &= 1 = 2^{\frac{1}{1-\varepsilon}} \left[A^{(\varepsilon-1)/\varepsilon} + B^{(\varepsilon-1)/\varepsilon}\right]^{\frac{\varepsilon}{\varepsilon-1}} \\ 1 &= 2^{\frac{1}{1-\varepsilon}} A \left[1 + \left(\frac{B}{A}\right)^{(\varepsilon-1)/\varepsilon}\right]^{\frac{\varepsilon}{\varepsilon-1}}, \end{aligned}$$

which, given (34), implies

$$A = 2^{\frac{-1}{1-\varepsilon}} \left[1 + \left(\frac{P_B}{P_A}\right)^{1-\varepsilon}\right]^{\frac{-\varepsilon}{\varepsilon-1}}.$$

So the cost of producing one unit of the final consumption good is

$$
\begin{aligned}
& P_A 2^{\frac{-1}{1-\varepsilon}} \left[1+\left(\frac{P_B}{P_A}\right)^{1-\varepsilon}\right]^{\frac{-\varepsilon}{\varepsilon-1}} + P_i^* 2^{\frac{-1}{1-\varepsilon}} \left[1+\left(\frac{P_B}{P_A}\right)^{1-\varepsilon}\right]^{\frac{-\varepsilon}{\varepsilon-1}} \left(\frac{P_B}{P_A}\right)^{-\varepsilon} \\
= \;& 2^{\frac{-1}{1-\varepsilon}} \left(P_A^{1-\varepsilon}+P_B^{1-\varepsilon}\right)^{\frac{1}{1-\varepsilon}}.
\end{aligned}
$$

If this cost is to equal to the price of consumption, which is one, then

$$P_A^{1-\varepsilon}+P_B^{1-\varepsilon}=2. \tag{35}$$

Proposition 1 *If*

$$\frac{z_H^*}{z_H}=\left(\frac{\mu^*}{\mu}\right)^{\alpha+\frac{1-\alpha}{1+\sigma}}, \tag{36}$$

then $P_A = P_B = 1$ and allocations are independent of ε and are identical to those in the one good model in the main text.

Proof:

Bertrand competition among intermediate-good-producing firms gives the same price expressions as in the one-good model, which we reproduce here:

$$
\begin{aligned}
P_A &= \frac{\mu}{z_H}\left(\frac{W}{Z(1-\alpha)}\right)^{1-\alpha}\left(\frac{R}{\alpha}\right)^{\alpha} \\
P_B &= \frac{\mu^*}{z_H^*}\left(\frac{W^*}{Z(1-\alpha)}\right)^{1-\alpha}\left(\frac{R^*}{\alpha}\right)^{\alpha}.
\end{aligned}
$$

Taking the ratio of these two prices (and recalling that $R = R^*$), we get

$$\frac{P_B}{P_A}=\frac{\mu^*}{\mu}\left(\frac{z_H^*}{z_H}\right)^{-1}\left(\frac{W^*}{W}\right)^{(1-\alpha)}. \tag{37}$$

From the two FOCs for labor supply, we have

$$\frac{L^*}{L}=\left(\frac{W^*}{W}\right)^{1/\sigma}.$$

Thus, the ratio of foreign to domestic output is

$$\frac{Y_B}{Y_A}=\frac{z_H^*}{z_H}\left(\frac{K^*}{K}\right)^{\alpha}\left(\frac{L^*}{L}\right)^{1-\alpha}=\frac{z_H^*}{z_H}\left(\frac{K^*}{K}\right)^{\alpha}\left(\frac{W^*}{W}\right)^{(1-\alpha)/\sigma}. \tag{38}$$

Multiplying together expressions (37) and (38), we get

$$\frac{P_B}{P_A}\times\frac{Y_B}{Y_A}=\frac{\mu^*}{\mu}\left(\frac{K^*}{K}\right)^{\alpha}\left(\frac{W^*}{W}\right)^{(1-\alpha)(1+\sigma)/\sigma}. \tag{39}$$

From equation (9 at home and abroad, with a common value of $R = R^*$, we have

$$\frac{K^*}{K} = \frac{\mu}{\mu^*}\frac{P_B}{P_A}\frac{Y_B}{Y_A} = \left(\frac{K^*}{K}\right)^{\alpha}\left(\frac{W^*}{W}\right)^{(1-\alpha)(1+\sigma)/\sigma}.$$

or

$$\frac{K^*}{K} = \left(\frac{W^*}{W}\right)^{(1+\sigma)/\sigma}$$

Substituting this into (39) gives

$$\frac{P_B}{P_A}\frac{Y_B}{Y_A} = \frac{\mu^*}{\mu}\left(\frac{W^*}{W}\right)^{(1+\sigma)/\sigma}$$

or, using eq. (34) to substitute out Y_B/Y_A,

$$\left(\frac{P_B}{P_A}\right)^{1-\varepsilon} = \frac{\mu^*}{\mu}\left(\frac{W^*}{W}\right)^{(1+\sigma)/\sigma}. \tag{40}$$

Now we can combine eqs. (37) and (40) to solve for $\frac{W^*}{W}$ as a function of exogenous parameters:

$$\frac{W^*}{W} = \left(\left(\frac{z_H^*}{z_H}\right)^{-(1-\varepsilon)}\left(\frac{\mu^*}{\mu}\right)^{-\varepsilon}\right)^{\frac{1}{\frac{(1+\sigma)}{\sigma}-(1-\alpha)(1-\varepsilon)}} \tag{41}$$

Now recall eq. (35),

$$P_A^{1-\varepsilon} + P_B^{1-\varepsilon} = 2,$$

which can be written as

$$P_A^{1-\varepsilon}\left(1 + \left(\frac{P_B}{P_A}\right)^{1-\varepsilon}\right) = 2.$$

using eq: (40) again and then substituting in eq: (41) gives

$$\begin{aligned} P_A^{1-\varepsilon}\left(1 + \frac{\mu^*}{\mu}\left(\frac{W^*}{W}\right)^{(1+\sigma)/\sigma}\right) &= 2 \\ P_A^{1-\varepsilon}\left(1 + \frac{\mu^*}{\mu}\left(\left(\frac{z_H^*}{z_H}\right)^{-(1-\varepsilon)}\left(\frac{\mu^*}{\mu}\right)^{-\varepsilon}\right)^{\frac{\frac{1+\sigma}{\sigma}}{\frac{(1+\sigma)}{\sigma}-(1-\alpha)(1-\varepsilon)}}\right) &= 2. \end{aligned}$$

Now substitute in the expression for $\frac{z_H^*}{z_H}$ in the statement of the Proposition, eq. (36), which gives

$$P_A^{1-\varepsilon}(2) = 2,$$

which implies $P_A = 1$. Eq. (35) then implies $P_B = 1$.

Given $P_B = P_A = 1$, it is immediate that the budget constraints for domestic and foreign households are identical to the baseline one-good model and thus that all equilibrium

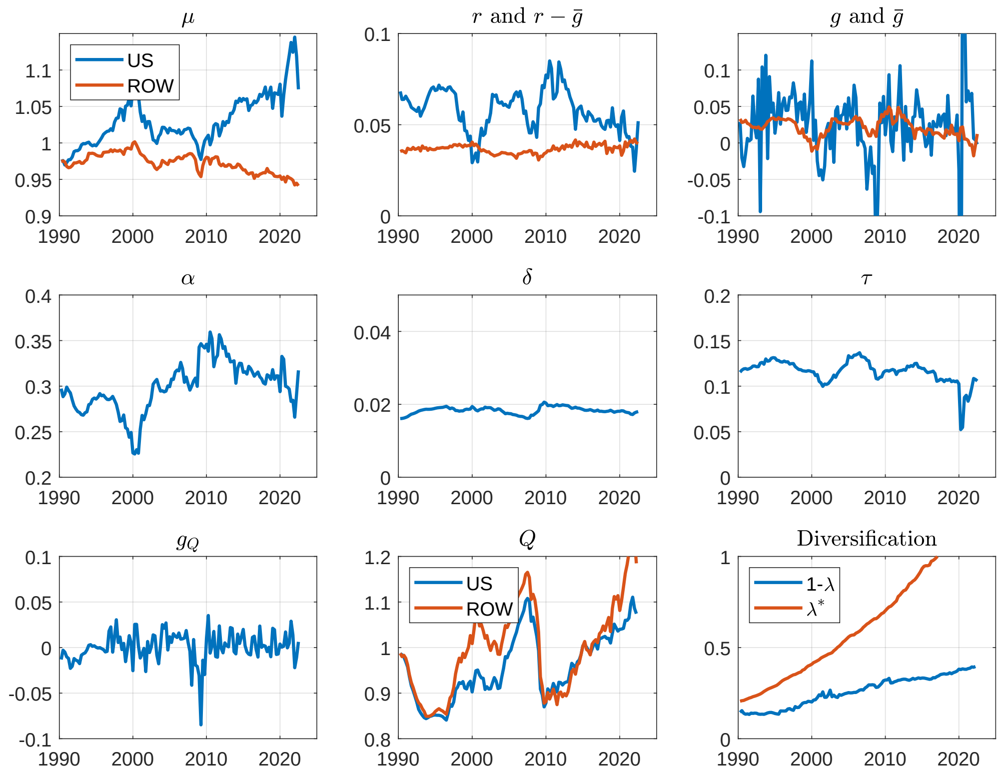

Figure F.1: All Parameter Values

allocations are identical.

F All Parameter Values

G Extended Current Account Decomposition

The current account contribution from domestic equity in eq. (21) can be expressed as

$$
\begin{aligned}
\frac{\lambda_{t-1}}{1+\rho}\left(D_t - \rho V_t\right) &= \frac{\lambda_{t-1}}{1+\rho}\left[D_t - \rho\left(\left(e_t + (1+r_t^*)\right)V_{t-1} - D_t\right)\right] \\
&= \lambda_{t-1}\left(\mathbb{E}_{t-1}[D_t] - (Q_t X_t - \mathbb{E}_{t-1}[Q_t X_t]) - \frac{\rho}{1+\rho} e_t V_{t-1} - \frac{\rho}{1+\rho}(1+r_{t+1}^*)V_{t-1}\right) \\
&= \lambda_{t-1}\left(\frac{r_{t+1}^* - \rho}{1+\rho} V_{t-1} - \bar{g}_t V_{t-1} - \frac{\rho}{1+\rho} e_t V_{t-1} - (Q_t X_t - \mathbb{E}_{t-1}[Q_t X_t])\right)
\end{aligned}
$$

The first two terms here relate to predictable factors. If domestic equity pays the expected return r^*_{t+1}, desired net saving is given by $\frac{r^*_{t+1}-\rho}{1+\rho}V_{t-1}$. Fo this desired saving to boost foreign asset purchases, desired saving must exceed expected growth in the value of domestic assets, $\bar{g}_t V_{t-1}$. Thus higher (expected) returns or lower expected growth will both translate into a more positive current account.

The next two terms show the impact on the current account of news shocks at t. If domestic assets pay an unexpected positive excess return between $t-1$ and t ($e_t > 0$) then there is a wealth effect on desired consumption, which reduces desired saving by $-\frac{\rho}{1+\rho}e_t V_{t-1}$. In addition, if news at t leads to more investment than was expected at $t-1$, U.S. households will finance that difference by borrowing.

The contributions from all these effects are proportional to domestic ownership of domestic equity, λ_{t-1}. An analogous decomposition applies to the foreign equity term.

Thus, the model current account can be expressed as

$$\begin{aligned} CA_t \quad = \quad & \left(\frac{r^*_{t+1}-\rho}{1+\rho} - \bar{g}_t\right)\left(\lambda_{t-1}V_{t-1} + \lambda^*_{t-1}V^*_{t-1}\right) \\ & -\frac{\rho}{1+\rho}\left(\lambda_{t-1}e_t V_{t-1} + \lambda^*_{t-1}e^*_t V^*_{t-1}\right) \\ & -\lambda_{t-1}(Q_t X_t - \mathbb{E}_{t-1}[Q_t X_t]) - \lambda^*_{t-1}(Q^*_t X^*_t - \mathbb{E}_{t-1}[Q^*_t X^*_t]) \\ & +\frac{r^*_{t+1}-\rho}{1+\rho}B_t + \frac{1}{1+\rho}\left(\frac{W_t L_t}{H_t} - \rho\right)H_t \end{aligned} \tag{42}$$

Figure G.1 plots the novel terms in the current account decomposition according to 42. It shows that the low income yield on U.S. equity in the 1990s reflected unexpectedly strong U.S. investment (see also Figure 13), and widening current account deficits during this period reflect Americans borrowing from abroad to finance that investment. Conversely, unexpectedly weak U.S. investment explains some of the high income yield on U.S. equity around the Great Recession, and the associated narrowing of the U.S. current account.

We can similarly decompose valuation effects into a predictable component versU.S. the impact of shocks. Note that the excess return to domestic equity between $t-1$ and t can be expressed as

$$\begin{aligned} e_t \quad & = \quad \frac{D_t + V_t}{V_{t-1}} - 1 + r^*_{t+1} \\ & = \quad \frac{D_t + V_t}{V_{t-1}} - \frac{\mathbb{E}_{t-1}[D_t] + (1+\bar{g}_{t-1})V_{t-1}}{V_{t-1}} \end{aligned}$$

Thus, the equity liability revaluation term can be expressed as

$$\begin{aligned} -(1-\lambda_{t-1})(V_t - V_{t-1}) \quad & = \quad -(1-\lambda_{t-1})\left(\bar{g}_{t-1}V_{t-1} + e_t V_{t-1} - D_t + \mathbb{E}_{t-1}[D_t]\right) \\ & = \quad -(1-\lambda_{t-1})\left(\bar{g}_{t-1}V_{t-1} + e_t V_{t-1} + Q_t X_t - \mathbb{E}_{t-1}[Q_t X_t]\right) \end{aligned}$$

A similar expression applies for the revaluation of U.S. foreign equity assets. In this expression $\bar{g}_{t-1}V_{t-1}$ captures the expected change in asset values due to trend growth, while the other terms reflect surprise components: a positive excess return on U.S. equity inflates

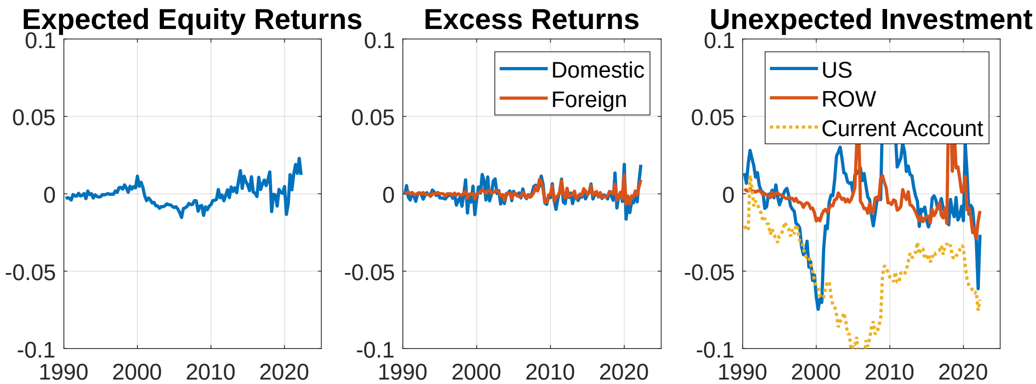

Figure G.1: Alternative Current Account Decomposition

U.S. liabilities, as does unexpected U.S. investment.[43]

Note that expected equity return term plotted here is almost perfectly correlated with the return to human wealth term plotted in Figure 15: both are approximately proportional to $r^*_{t+1} - \bar{g}_t - \rho$. However, human wealth, on average, is 6.8 times larger than the value of U.S. corporations, and thus fluctuations in $r^*_{t+1} - \bar{g}_t$ impact the current account primarily through that channel. Note also that the wealth effects associated with excess returns to equity also have only a modest impact on the current account.

[43]For example, if households learn at t that the cost of capital moving forward r^*_{t+1} will be lower, domestic investment and the value of domestic firms will increase. And this unexpected revaluation will occur even in an economy with no output wedges ($\mu = 1$), and thus no excess returns ($e_t = 0$).

H Portfolio That Delivers Perfect Insurance

Consider news shocks at t about the value for $z_{L,t+1}$ that impact next period's markup, $\mu_{t+1} = \frac{z_H}{z_{L.t+1}}$. Assume constant productivity z_H for leader domestic firms. We abstract here from taxation and from all other shocks. Bonds and foreign equity pay a constant return r^* and global productivity grows at a constant rate $\bar{g}$. The assumption that shocks to z_L are revealed one period in advance means that the domestic capital stock can be adjusted in response to those shocks to ensure that the rental rate net of depreciation is always equal to r^*. Thus, in this economy there are effectively two assets: (1) shares in domestic intermediate firms (whose return is risky and varies with news shocks to $z_{L,t+1}$) and (2) all other forms of saving, which pay a safe return r^*.

Suppose $z_{L,t+1} = z_{L,t} + \varepsilon_{t+1}$ where ε_{t+1} is a mean zero shock. Agents choose portfolios at $t-1$, and at t they learn about ε_{t+1}. Asset values reset at t, as does the expected present value of human wealth. In the model in the text, we assumed agents perceived zero variance for the ε_{t+1} shock, so they were indifferent about portfolios. If agents perceive a positive variance for ε_{t+1}, foreign risk-neutral agents will remain indifferent about their portfolio, as long as all assets pay the same expected return. Domestic risk averse agents will now want a portfolio such that shocks to ε_{t+1} have zero impact on total wealth at t and thus on consumption on t. We now characterize the impact of a shock to ε_{t+1} on consumption, and solve for the portfolio that provides perfect insurance.

Proposition: If $\lambda_{t-1} = \frac{1-\alpha}{1-\mu_t\alpha}$, where $\mu_t = \frac{z_H}{z_{L,t}}$, then domestic households achieve perfect insurance against pure markup shocks, in that small news shocks at date t about the value of $z_{L,t+1}$ do not impact consumption at date t.

Special case. If $\mu_{t+1} = 1$, then $\lambda_t = 1$ (zero diversification) delivers perfect insurance.

Proof: Recall that equiibrium consumption with logarithmic utility is given by

$$C_t = \rho Wealth_t$$

where

$$\begin{aligned} Wealth_t \quad &= \quad W_t L_t + \frac{W_{t+1}L_{t+1}}{r^* - \bar{g}} + \lambda_{t-1}\left(\Pi_t + \frac{\Pi_{t+1}}{r^* - \bar{g}}\right) \\ &\quad + \lambda_{t-1}\left(R_t K_t + (1-\delta)Q_t K_t\right) + \lambda^*_{t-1}\left(D^*_t + V^*_t\right) + (1+r^*)B_t \end{aligned} \tag{43}$$

Imagine a shock to $z_{L,t+1}$ that households learn about at t. The shock has no impact on $W_t L_t$, Π_t, or any of the terms in the second line of eq. 43. How does it affect $W_{t+1}L_{t+1} + \lambda_{t-1}\Pi_{t+1}$?

Equilibrium allocations at $t+1$ (given $L_{t+1} = 1$) are given by

$$\begin{aligned} K_{t+1} \quad &= \quad \left(\frac{r^* + \delta}{\alpha z_{L,t+1}}\right)^{\frac{1}{(\alpha-1)}}, \\ Y_{t+1} \quad &= \quad z_H \left(\frac{r^* + \delta}{\alpha z_{L,t+1}}\right)^{\frac{\alpha}{(\alpha-1)}}, \end{aligned}$$

$$\begin{aligned} W_{t+1}L_{t+1} &= \frac{1-\alpha}{\mu_{t+1}}Y_{t+1} = z_{L,t+1}(1-\alpha)\left(\frac{r^*+\delta}{\alpha z_{L,t+1}}\right)^{\frac{\alpha}{(\alpha-1)}}, \\ \Pi_{t+1} &= \frac{\mu_{t+1}-1}{\mu_{t+1}}Y_{t+1} = (z_H - z_{L,t+1})\left(\frac{r^*+\delta}{\alpha z_{L,t+1}}\right)^{\frac{\alpha}{(\alpha-1)}}. \end{aligned}$$

Thus

$$W_{t+1}L_{t+1} + \lambda_{t-1}\Pi_{t+1} = (z_{L,t+1}(1-\alpha) + \lambda_{t-1}(z_H - z_{L,t+1}))\left(\frac{r^*+\delta}{\alpha z_{L,t+1}}\right)^{\frac{\alpha}{(\alpha-1)}}$$

Now consider shocks to $z_{L,t+1}$. For a generic value for λ_{t-1}, the impact of a marginal shock to ε_{t+1}, evaluated at $\varepsilon_{t+1} = 0$, is given by

$$\frac{\partial\left(W_{t+1}L_{t+1} + \lambda_{t-1}\Pi_{t+1}\right)}{\partial\varepsilon_{t+1}}|_{\varepsilon_{t+1}=0} = \frac{1}{1-\alpha}\left(\frac{r^*+\delta}{z_{L,t}\alpha}\right)^{\frac{\alpha}{(\alpha-1)}}\left((1-\alpha) - \lambda_{t-1} + \frac{z_H}{z_{L,t}}\alpha\lambda_{t-1}\right)$$

This is equal to zero at

$$\lambda_{t-1} = \frac{1-\alpha}{1-\frac{z_H}{z_{L,t}}\alpha} = \frac{1-\alpha}{1-\mu_t\alpha}.$$