

# Income Inequality and Current Account Imbalances\*

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## ABSTRACT

Econometric evidence shows that higher income inequality and financial liberalization—a common policy response to income inequality—are associated with significantly larger external deficits. To study this mechanism, we develop a DSGE model where investors' income share increases at the expense of workers. Workers respond by obtaining loans from domestic and foreign investors, which supports aggregate demand but generates current account deficits. Financial liberalization helps workers sustain higher consumption but results in even higher household debt and current account deficits. In emerging markets, workers cannot borrow from investors. Instead, investors deploy their surplus funds abroad, leading to current account surpluses.

*Keywords:* Current account imbalances; income inequality; financial liberalization

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## 1 INTRODUCTION

Global current account imbalances were a major source of financial sector fragility in the run-up to the 2007 worldwide financial crisis. Several authors, including Obstfeld and Rogoff (2009), Blanchard and Milesi-Ferretti (2009), Portes (2009) and Caballero et al. (2008), either partly attribute the crisis to the amplification effects of large current account imbalances and low world real interest rates, or suggest that the root causes of global current account imbalances and the financial crisis coincide.<sup>1</sup> The pre-crisis concern with U.S. current account deficits centered on the possibility of a run on the U.S. dollar and the danger of the dollar losing its status as the world's reserve currency.<sup>2</sup> While this has not happened, the perception that it is still a possibility arguably continues to contribute to financial vulnerability worldwide. Competing explanations for U.S. current account deficits include low public and private saving rates in the United States,<sup>3</sup> high public saving rates in the rest of the world [Bernanke (2005)], global underinvestment [Prasad et al. (2007); Rajan (2010)], demographics and productivity [Feroli (2003); Ferrero (2007)], and the role of the U.S. dollar as the world's reserve currency. But the phenomenon of persistently high current account deficits is not limited to the United States. We also observe deficits in a number of other developed economies, especially those in the English-speaking world. By studying the similarities between these countries' experiences, and their differences to surplus countries, we make progress toward explaining the deeper structural reasons for persistently large current account deficits.

We argue in this paper that what unites the experiences of the deficit countries is a steep increase in income inequality over recent decades that exhibits a clear empirical and theoretical link to deteriorations in those countries' current accounts. Our data and cross-country econometric analysis shows that increases in inequality can account for a substantial part of the observed current account deteriorations in countries like the United States or the United Kingdom. Moreover, our theoretical analysis lays out a dynamic stochastic general equilibrium (DSGE) model where current account deficits arise endogenously in response to higher domestic income inequality. The poor and middle class, who are assumed to not have direct access to international capital markets, start to borrow from the rich when they receive a smaller share of aggregate output. Thus, the drop in poor/middle class consumption is less than the drop in their income, while consumption (and investment) of the rich increases steeply. The net effect is an increase in domestic demand and therefore a current account deficit. In other words, the rich fund a significant part of their increased domestic lending by intermediating foreign savings.

The increase in income inequality is typically accompanied, or more commonly followed, by political interventions that try to support the living standards of those who suffer from stagnating real incomes. However, this is generally not done by directly confronting the sources of inequality, but rather by temporarily alleviating its consequences through access to cheap borrowing, in other words through financial liberalization. For the U.S. case, this argument has been prominently made by Rajan (2010). While financial liberalization succeeds in temporarily preventing a large drop in the consumption of poor and middle class households, this comes at the expense of ultimately

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<sup>1</sup>Other reasons for the crisis mentioned in the literature include excessive financial liberalization [Keys et al. (2010)] and excessively loose monetary policy either in the United States [Taylor (2009)] or globally [Bank for International Settlements (2008)].

<sup>2</sup>See Obstfeld and Rogoff (2001), Roubini and Setser (2004), Mann (2004) and Mussa (2004).

<sup>3</sup>The theoretical case for the link between low public saving rates and current account deficits is made in Kumhof and Laxton (2010). Empirical evidence is provided in Bluedorn and Leigh (2011).

much higher domestic debt levels, higher debt service, and therefore lower consumption. Financial liberalization generates a strong additional stimulus to workers' consumption, while at the same time slowing down capital accumulation, as investors increasingly prefer financial over real assets. This further increases current account deficits.

We also examine emerging economies, many of which have experienced rising income inequality accompanied by current account surpluses rather than deficits. We find that their large surpluses can also be explained by increases in income inequality, but in this case against the background of domestic financial markets that do not allow the poor and middle class to respond to lower incomes by borrowing. A short-sighted response to global imbalances might be to reduce these "financial market imperfections" in surplus countries. However, if this policy is administered without addressing the underlying income inequalities, it will result in a global rather than a regional increase in domestic indebtedness of the poor and middle class. While this would reduce cross-border financial fragilities, it would exacerbate domestic financial fragilities. Therefore, there is no long run alternative to directly addressing the income inequality problem. Financial liberalization buys time, but at the expense of an eventually much larger debt problem. On the other hand, reducing income inequality would reduce the tendency towards current account deficits in financially developed countries and current account surpluses in financially less developed countries.

Our work builds on Kumhof and Ranci re (2010), who show that in the United States there is a striking, but often overlooked, similarity between the pre-crisis periods of the Great Depression and the Great Recession, in that both periods exhibited a simultaneous increase in income inequality and in the indebtedness of the poor and middle class. The perception that household indebtedness had become unsustainably high was a key factor that contributed to eventually triggering these crises. Kumhof and Ranci re (2010) present a DSGE model where a financial crisis, driven by income inequality, high leverage and financial fragility, arises endogenously. High leverage occurs after several decades due to a bargaining power shock to income that favors high income households at the expense of all remaining households. This shock increases credit demand at the bottom of the income distribution due to a consumption smoothing or habit persistence motive. At the same time it increases credit supply at the top of the income distribution due to a wealth accumulation motive as in Carroll (2000). In other words, high income households recycle their gains from the bargaining process back to poor and middle income households through interest-bearing loans that grow over a period of decades.

Kumhof and Ranci re (2010) replicate several important stylized facts, including the sharply increasing debt-to-income ratio of the bottom 95% of the income distribution and a rapidly growing financial sector [Philippon (2008)]. However, two of the predictions of their model are counterfactual. This is due to the choice of a closed economy setting and to abstracting from financial liberalization. First, the model predicts a collapse in aggregate consumption that is driven by poor and middle class households. This is in contrast to the U.S. credit-fueled consumption boom, which was significantly financed through foreign savings. Second, the model predicts an increase in real interest rates, which is contrary to the data. This again abstracts from the interest-rate lowering effects of foreign savings, but it also abstracts from financial liberalization, which contributed to lower U.S. interest rates and further fueled the credit and consumption boom. This paper extends the framework of Kumhof and Ranci re (2010) to an open economy setting and adds financial liberalization shocks, which addresses both of these concerns.

The rest of the paper is organized as follows. [Section 2](#) discusses the related empirical and theoretical literature. [Section 3](#) discusses the stylized facts and presents an econometric panel data

analysis of current account determinants that adds proxies for income inequality and financial liberalization to a standard set of regressors. [Section 4](#) presents the model. [Section 5](#) presents model simulations that study the effects of increasing income inequality and financial liberalization. [Section 6](#) concludes.

## 2 RELATED LITERATURE

This section discusses the literature that is relevant to different aspects of our work. We begin with a survey of the empirical literature and then turn to the theoretical literature.

The empirical literature on the distribution of income and wealth focuses on describing long-run changes in the data [Piketty and Saez (2003), Piketty (2010), Atkinson et al. (2011)]. This literature concludes that the most significant change in most countries' income distribution has been a sharp increase in top income shares. Our model reflects this feature by studying the interactions between two types of agents that represent the top 5% and the bottom 95% of the income distribution.

A small but growing empirical literature has tried to connect growing income inequality to growing household indebtedness and to the U.S. origins of the financial crisis of 2007/8, most prominently Rajan (2010) and Reich (2010).<sup>4</sup> Both authors suggest that increases in borrowing have enabled the U.S. poor and middle class to maintain or increase their level of consumption while their real earnings stalled. However, this literature has so far limited itself to presenting stylized facts without interpreting them through the prism of a general equilibrium model. One consequence has been an ongoing debate as to whether the increase in credit was mainly driven by credit demand or credit supply. Kumhof and Ranci ere (2010) provide a general equilibrium model, and show that a shock to the income distribution must imply a simultaneous increase in both credit demand and credit supply, but with a more important role for credit supply, especially when the income shock is persistent.

Atkinson et al. (2011) document that the rise in top income shares over recent decades has been widespread. It has been observed not only in the United States but also in major English-speaking countries (Australia, Canada, New Zealand, United Kingdom) since the early 1980s, and, to a lesser extent and more recently, in some Nordic and peripheral European countries. Building on the work of Lebarz (2011), we document that these countries also exhibited high and growing levels of household borrowing and growing current account deficits. In other words, we find that the global increase in income inequality is systematically related to the global increase in current account imbalances. Moreover, the same countries exhibited financial liberalizations during this period. We find that there is a strong empirical relationship between financial liberalization and higher current account deficits.

There is a large literature that seeks to determine the fundamental factors that have shaped observed changes in the income distribution over the last thirty years, both in the United States and in other countries. They include increases in returns to education and increased use of performance pay [Lemieux et al. (2009), Lemieux (2006)], changes in unionization [Card et al. (2004)], foreign competition and jobs offshoring [Roberts (2010)], and government intervention in support of the rich [Hacker and Pierson (2010)]. We do not need to take a stand on a preferred explanation.

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<sup>4</sup>Berg and Ostry (2008) find, in a cross-section of countries, that countries with greater inequality exhibit growth spells that are more frequently interrupted by growth breakdowns.

Instead, we take the change in bargaining power over income as a primitive shock and explore its macroeconomic implications, similar to the approach of Blanchard and Giavazzi (2003).

Two strands of the theoretical literature are relevant to our paper. The literature on financial fragility has so far focused on the role of heterogeneity between patient and impatient households, including Diamond and Dybvig (1983) and more recent financial accelerator models applied to household debt and housing cycles [Iacoviello (2005)]. In these models, patient agents accumulate more wealth relative to impatient agents, while in our model agents who derive utility from wealth accumulate positive stocks of real and financial wealth over time. We find that this is appealing on the grounds of plausibility. Moreover, this paper documents that heterogeneity in income, indebtedness, and financial fragility across income groups are an important feature of the data for several countries. Therefore, our analysis of its implications complements the existing analyses based on heterogeneity in the degree of patience.

The theoretical literature on income inequality [Krueger and Perri (2006), Iacoviello (2008)] relates income inequality to increases in household debt by showing that an increase in the variance of idiosyncratic income shocks across all households generates a higher demand for insurance through credit markets. Broer (2009) extends that work to the open economy setting and finds that a rise in individual risk in the United States makes default on foreign borrowing less attractive, which allows higher household foreign borrowing against future income. This mechanism can operate alongside the mechanism we study in this paper, which is based on highly persistent<sup>5</sup> income inequality across two specific household groups, high income households and low/middle income households, instead of idiosyncratic income shocks across all households. We find that our model, when calibrated to the United Kingdom, matches the observed increase in the debt-to-income ratio of the bottom 95% of the income distribution by matching the change in the income share of the bottom 95%.

### 3 DATA AND ECONOMETRIC RESULTS

In sections 3.1 and 3.2 we document that over the last three decades the world economy has experienced increases in global current account imbalances and simultaneous increases in income inequality and financial liberalization in deficit countries. Section 3.4 presents econometric estimates of current account regressions that add income inequality and financial liberalization to a common list of explanatory variables.

**3.1 RISE IN GLOBAL INCOME INEQUALITY** This paper quantifies income inequality as the share of aggregate income going to the top 5% of the population, ordered by income. A number of research projects have studied the evolution of top income shares for over 20 countries. This work is documented in Atkinson et al. (2011), in a two-volume book by Atkinson and Piketty (2007, 2010), and in the world top incomes database.<sup>6</sup> Atkinson et al. (2011) document that most countries' top income shares declined in the first part of the 20th century, mainly because of negative

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<sup>5</sup>On the question of transitory versus persistent income shocks, the recent work of Kopczuk et al. (2010) shows that the increase in the variance of U.S. annual earnings observed since the 1970 reflects an increase in the variance of permanent rather than transitory earnings.

<sup>6</sup>This database is available at <http://g-mond.parisschoolofeconomics.eu/topincomes/>. It covers Argentina, Australia, Canada, China, Finland, France, Germany, India, Indonesia, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, the United Kingdom and the United States.



shocks to top capital incomes during the World Wars and the Great Depression. At that time, top incomes mostly consisted of capital income, so the drop in top income shares represented a drop in top wealth concentration. Top incomes did not start to rise again for two to three decades following World War II. Globally, [figure 1](#) shows that top 5% income shares followed a U-shape in the post-war era, with declines during the immediate post-war decades followed by increases in recent decades (the pattern for top 1% income shares looks very similar). However, the curvature of the U-shape varies considerably across countries. Starting in the early 1980s, top income shares increased substantially for the United States, the United Kingdom, Canada, Australia, Ireland and New Zealand (U-shape). Moderate or late increases (L/U-shape) were seen in Southern Europe (Spain, Portugal, Italy) and the Nordic countries (Sweden, Finland, Norway), and small or no increases (L-shape) were seen in Continental Europe (Germany, France, Netherlands, Switzerland) and in Japan.

**3.2 RISE IN GLOBAL CURRENT ACCOUNT IMBALANCES** [Figure 2](#), which uses data from the IMF's World Economic Outlook 2010, shows the evolution of global current account balances starting in 1980. Among the deficit countries, many exhibited a nearly simultaneous large increase in income inequality, including the United States, the United Kingdom, Italy, Ireland and Portugal. Conversely, OECD countries that exhibited stable top income shares, including Germany, Japan, Switzerland and France, also experienced balanced current accounts or surpluses.

As [figure 3](#) illustrates, from approximately 1980 to 2000 (data coverage varies by country) there is a very strong negative cross-country correlation, of almost  $-0.8$ , between changes in top income shares and changes in current account balances among OECD countries. That is, an increase of one percentage point of the top 5% income share over the period corresponds to a deterioration of the current-account-to-GDP ratio of 0.8 percentage points. However, this correlation vanishes when emerging economies are included. A strength of our model is that it offers an explanation for both facts, where the key difference between OECD and developing countries is the state of development of financial markets.

**3.3 RISE IN GLOBAL HOUSEHOLD INDEBTEDNESS** The cause of the increase in global current account imbalances is a growing need, on the part of deficit countries, to finance a part of growing domestic household indebtedness through foreign savings provided by surplus countries.

[Figure 4](#) displays OECD data on household net borrowing as a percentage of GDP for the three sets of countries identified above. Households in U-shaped Anglo-Saxon countries increasingly became net borrowers, while households in L-shaped Continental European countries (plus Japan) became net lenders, with a trend that has been fairly stable since 1997. The trend for L/U shaped countries is intermediate, they were net lenders until 2002, but half of them became net borrowers by 2007, the same period when their income inequality increased the most. The OECD also produces data on the evolution of household sector saving as a percentage of disposable income, which are shown in [figure 5](#) for the same three sets of countries. The pattern is the same as for household borrowing to GDP ratios, with sharply decreasing saving rates for U-shaped countries, stable saving rates for L-shaped countries, and an intermediate pattern for L/U-shaped countries.

However, our theory stresses increases in borrowing among low and middle income households rather than aggregate borrowing or saving rates. This requires a more detailed look at data where there is much less uniform cross-country coverage available. While a series of very useful papers on the evolution of income, consumption, and wealth inequality has been published under the

Cross Sectional Facts for Macroeconomists project by the Review of Economic Dynamics, data on the evolution of leverage across the income distribution are difficult to find. Where they are available, the evidence for U-shaped countries suggests that the rise in leverage at the aggregate level has mostly been due to higher leverage of low and middle income households.

For the United States, Slesnick (2000), Heathcote et al. (2010), and Krueger and Perri (2006) stress that the rise in income inequality has been much more pronounced than the increase in consumption inequality, which implies increased borrowing for the purpose of consumption smoothing. Kopczuk et al. (2010) show that the increase in income inequality was not accompanied by an increase in income mobility, and that it was lifetime rather than transitory income shocks that were the driving force behind rising income inequality. Kumhof and Ranci ere (2010) show that the rise in aggregate household leverage has been exclusively due to an increase in leverage for the bottom 95% of the income distribution.

Starting in the late 1980s, the United Kingdom experienced similar diverging trends between income and consumption inequality, which are documented in Blundell and Preston (1998) and Blundell and Etheridge (2010). They also find similar results to Kopczuk et al. (2010) hold concerning transitory versus lifetime income shocks. Data on saving rates across the income distribution are documented by Crossley and O’Dea (2010), who show that from 1975 to 2007 the median saving rate of the top quintile of the income distribution increased, while the bottom quintile decreased. Data on leverage across the wealth distribution are only available for the years 2000 and 2005, and they show that aggregate leverage is mostly due to borrowing by the bottom 95% of households [Lebarz (2011)].

For Canada, Brzozowski et al. (2010) find that income inequality has increased substantially over the last 30 years. As for the United States and the United Kingdom, this has been accompanied by a much smaller rise in consumption inequality and similar results to Kopczuk et al. (2010) concerning transitory versus lifetime income shocks. As shown in Lebarz (2011), the observed increase in aggregate household leverage was mostly driven by the bottom 95% of households. For Australia and New Zealand, Lebarz (2011) documents similar facts as for the United States, the United Kingdom and Canada.

The Italian, Swedish and Spanish cases, which are discussed in Jappelli and Pistaferri (2010), Domeij and Floden (2010), and Pijoan-Mas and Sanchez-Marcos (2010), are different from the above countries in that they did not observe a clear increase in leverage that was limited to lower and middle income groups. For the case of the Germany (an L-shaped country), the evolution of income inequality, consumption inequality, and wealth inequality has been documented by Fuchs-Sch undeln et al. (2010). They find that inequality was relatively stable in West Germany until German reunification, and then trended upwards for wages and market incomes. However, disposable incomes and consumption display only a modest increase in inequality over the same period.<sup>7</sup>

**3.4 ECONOMETRIC ANALYSIS** Figure 3 provides evidence of a strongly negative cross-country correlation of around  $-0.8$  between changes in top 5% income shares and changes in current accounts. Over the last 30 years, countries that have experienced an increase in income inequality have tended to see their current account balances deteriorate. However, there are a number of other candidate explanations for current account deteriorations, some of which are likely correlated

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<sup>7</sup>Bach et al. (2011) find an increase in German top income shares starting in the late 1990s. However, they use different sources besides the World Top Incomes database, whose last available German data point (at this moment) is 1998.

with changes in the income distribution. To account for this issue, we perform a multivariate analysis of current account determinants using an unbalanced panel of 18 OECD countries over the period 1968-2006.<sup>8</sup> We build our econometric specifications starting from the benchmark of the panel estimation literature on current account determinants developed by Chinn and Prasad (2003), Gruber and Kamin (2005), Chinn and Ito (2008, 2009), and Chinn et al. (2011). We then test whether top income shares and proxies for financial liberalization have additional explanatory power when they are added to the explanatory variables commonly used in this literature.

**3.4.1 ECONOMETRIC METHODOLOGY** Before turning to regressions, we test for the presence of a unit root in our panel using the heterogenous panel unit root test of Im et al. (2003). We find that the current account-to-GDP ratio is trend stationary in our sample. As a consequence, we model the dynamics of the current account through the dynamic panel specification,

$$CA_{i,t} - CA_{i,t-1} = (\alpha - 1)CA_{i,t-1} + \beta X_{i,t} + \eta_i + \varepsilon_{i,t}, \quad (1)$$

where  $i$  and  $t$  represent country and time,  $CA_{i,t}$  is the current account as a share of GDP,  $X_{i,t}$  is a set of covariates including potential lags and a time dummy,  $\eta_i$  is a country-specific effect, and  $\varepsilon_{i,t}$  is a random disturbance.

To estimate (1), we use the GMM estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998), which controls for country-specific effects and accounts for endogeneity in the explanatory variables.<sup>9</sup> Specifically, we allow the explanatory variables to be correlated with current and previous realizations of the error term, but assume future realizations of the error term do not affect current values of the explanatory variables. We account for country fixed effects by estimating the following difference equation, where lagged levels—at the exclusion of the first lag—are used as internal instruments:

$$CA_{i,t} - CA_{i,t-1} = \alpha(CA_{i,t-1} - CA_{i,t-2}) + \beta(X_{i,t} - X_{i,t-1}) + \varepsilon_{i,t} - \varepsilon_{i,t-1} \quad (2)$$

The consistency of the GMM estimates depends on whether lagged values of the explanatory variables are valid instruments in the current account regression. We address this issue by considering two specification tests. The first is a Sargan test of over-identifying restrictions, which tests the overall validity of the instruments. The second test examines whether the differenced error term is second-order serially correlated.

In addition to GMM dynamic panel estimation, we propose an alternative methodology based on Pesaran and Smith (1995), Pesaran (1997), and Pesaran and Shin (1998). We consider this additional specification because our goal is to test whether top income shares have additional explanatory power for not only the short-run dynamics of the current account, but also for its long-run dynamics. This approach exploits the fact that the sample we use for estimation is a “data field”, in the sense that it is characterized by time-series and cross-section dimensions of similar magnitude. The objective is to jointly estimate both a long-run relationship and short-run adjustment dynamics between the current account and its determinants. The main requirements for the validity of this

<sup>8</sup>The sample of countries is constrained by the availability of data on top income shares (see footnote 6)

<sup>9</sup>The literature on current account estimation has mostly either ignored the issue of the endogeneity of the regressor due to the dynamic nature of the panel or has solved it using a 2SLS estimator in the absence of fixed effects in the regression. Regressions that reproduce these alternative empirical specifications, again adding the top income share variable, are available from the authors upon request. The results are consistent with the results we report in this paper.



methodology are that, first, there exists a long-run relationship among the variables of interest and, second, that the dynamic specification of the model is sufficiently augmented so that the regressors are strictly exogenous and the resulting residuals are serially uncorrelated. Pesaran and coauthors label this the “autoregressive distributed lag (ARDL) approach” to long-run modeling. Applied to the current account, the estimated ARDL(p,q) model can be written in error-correction form,

$$CA_{i,t} - CA_{i,t-1} = \sum_{j=1}^{p-1} \gamma_i \Delta CA_{i,t-j} + \sum_{j=0}^{q-1} \delta_i \Delta X_{i,t-j} + \phi_i [CA_{i,t-1} - \eta_i - \beta_i X_{i,t-1}] + \varepsilon_{i,t}, \quad (3)$$

where  $\gamma_i$  and  $\delta_i$  are the short-run coefficients on lagged changes in the current account and the covariates,  $\beta_i$  are the long-run coefficients on the covariates and  $\phi$  is the speed of adjustment to the long-run relationship. The term in square brackets contains the long-run relationship, which acts as a forcing equilibrium condition. While this methodology allows for cross-country heterogeneity in the long-run and short-run coefficients as well as in the speed of adjustment, the size of our panel limits us to using a *dynamic fixed effects estimator* that restricts heterogeneity to the intercept ( $\eta_i$ ).

The set of control variables is based on the variables selected by Chinn and Prasad (2003), Chinn and Ito (2008, 2009), and Chinn et al. (2011). They include the government budget balance, the stock of net foreign assets to GDP, relative per capita income, youth and old dependency ratios, average real GDP growth, volatility of the terms of trade, the trade-to-GDP ratio, and the private credit-to-GDP ratio.

We add to this list the top 5% income share, using the dataset of Atkinson et al. (2011), and a proxy for financial liberalization. Good proxies for financial liberalization are difficult to construct. While the private credit-to-GDP ratio is used in the empirical literature as a proxy for financial development, we find that private credit from other financial institutions better captures financial liberalization in advanced countries, where it has fostered the development of intermediation outside the commercial banking sector. Thus, we distinguish between private credit from deposit money banks and private credit from other financial institutions (financial companies specializing in credit cards, car loans, mortgage origination, etc.). In the United States, private credit from other financial institutions increased five-fold between 1980 and 2008 (from 37% to 150% of GDP), while private credit from deposit money banks only increased moderately (from 55% to 65% of GDP).

Table 1 provides a description of the variables. The data are used at an annual frequency in both the GMM estimation and the ARDL estimation. The short size of our panel makes it impracticable to use multi-year averages in the GMM estimation to identify the long-run dynamics of the current account. Instead we use the ARDL methodology to disentangle the short-run dynamics from the long-run dynamics.<sup>10</sup>

**3.4.2 RESULTS** Table 2 reports the GMM estimation results. The Sargan and serial-correlation specification tests fail to reject the hypothesis of correct identification. The first column lists the set of possible regressors, and the remaining columns show the results of five alternative specifications. The first is a baseline specification with a commonly used list of explanatory variables for the current account, while the remaining columns add the top income shares (either 5% or 1%) and different measures of private credit as additional explanatory variables.

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<sup>10</sup>Using five-year averages does not guarantee that short-run and business cycle dynamics are filtered out.

All regressions find a significant positive coefficient of 0.73 to 0.77 on the once-lagged current account deficit, which is similar in magnitude to the estimate in Faruqee and DeBelle (1996). Trade openness has a positive and significant effect on current account balances, a result in line with Chinn and Ito (2008) and Chinn et al. (2011). Demography variables also affect the current account balance in the expected direction. For instance, the old dependency ratio negatively affects the current account balance because of dissaving by the old. The government structural balance does not have a significant effect on the current account balance.<sup>11</sup>

All regressions report a significant coefficient near  $-0.1$  for the top 5% income share, and near  $-0.3$  for the top 1% income share. The interpretation of these estimates is that an increase in the top 5% income share by one percentage point results, *ceteris paribus*, in a deterioration of the current account balance by approximately 0.1 percentage points of GDP in the current period. However, given the persistent dynamics of both current account balances and top income shares, the effect of such an increase is persistent, with the medium-term deterioration of the current account estimated to range between 0.25 and 0.3 percentage points.<sup>12</sup> Similarly, we estimate that a one percentage point increase in the top 1% income share would lead to a deterioration of the current account of 0.6 percentage points. Between the late 1970s and 2006, the United Kingdom experienced an increase in the top 5% income share of around 10 percentage points. Similar magnitudes were observed in the United States. This suggests a current account deterioration of at least 1 percent of GDP and of over 2 percent of GDP in the longer run. This is roughly equal to the actual current account deterioration experienced by the United Kingdom over this period, which suggests that this channel is economically significant.

Table 2 shows that our proxy for financial liberalization is negatively related to the current account in all regressions but not statistically significant in the GMM regressions. We show that this changes in the ARDL regressions, which are able to separately identify the long-run effects of financial liberalization. Table 3 presents the results of the ARDL estimation of long- and short-run parameters linking the current account balance to its determinants. The consistency and efficiency of the dynamic fixed effects estimates relies on several specification conditions. The first is that the regression residuals are serially uncorrelated and that the explanatory variables are exogenous. We satisfy these conditions by including 2 lags of the current account balance and 1 lag of the top 5% income share and each control variable. We do not expand the lag structure further because of restrictions imposed by degrees of freedom. The second specification condition requires accounting for both country-specific effects and cross-country common factors. By allowing for a different intercept for each country, we control for country-specific effects, and by using cross-sectionally demeaned data,<sup>13</sup> we eliminate cross-country common factors.

The coefficient on the error-correction term is negative and less than one in absolute value, which is consistent with stationarity of current account dynamics and convergence towards the long-run equilibrium relationship.<sup>14</sup> The current account is negatively related in the long run to the

<sup>11</sup>This is in contrast with the recent results of Bluedorn and Leigh (2011). These authors use “action-based” measures of fiscal policy rather than changes in the cyclically-adjusted government balance.

<sup>12</sup>The dynamics of the current account are modeled through the autoregressive specification  $CA_t = \alpha_1 CA_{t-1} + \alpha_2 CA_{t-2} + \beta X_t + u_t$ , where the top 5% income share is included in  $X_t$ . To estimate the medium-run effect of a one percentage point increase in the top 5% income share, we compute the ratio  $\beta/(1 - \alpha_1 - \alpha_2)$ .

<sup>13</sup>Cross-sectional demeaning is performed using GDP weights as is standard in the empirical literature on the current account. Demeaned variables are constructed as  $\bar{X}_{i,t} = X_{i,t} - \sum_{i=1}^J (GDP_{i,t} X_{i,t}) / \sum_{i=1}^J GDP_{i,t}$ , where  $i$  indexes each country in the sample of  $J$  countries.

<sup>14</sup>If  $\alpha$  is the lagged coefficient for the current account in the ARDL(1,  $q$ ) representation  $CA_{i,t} = \alpha CA_{i,t-1} +$

old dependency ratio. Moreover, it is positively related to the trade-to-GDP ratio and negatively related to the private-credit-to-GDP ratio, which is consistent with the GMM results.

Once again, we find that the current account balance is negatively and significantly linked to the top 5% and top 1% income shares in the long run. The estimates are lower than for the GMM estimation, but still economically very significant, with magnitudes near  $-0.15$ .<sup>15</sup> The short-run coefficients are correctly signed but not significant.

Private credit from other financial institutions has a negative long-run impact on current account balances, and the estimates are always highly statistically significant and robust to changes in explanatory variables. For a given country, we estimate that a one percentage point increase in the cross sectional deviation of this ratio corresponds to roughly a 5 percentage point deterioration in the current-account-to-GDP ratio. For instance, between 1980 and 2008 the ratio of private credit from other financial institutions to GDP experienced a much more sizeable increase in the United States than the mean increase in the other countries of the panel. The cross-sectional deviation is 0.7 percentage points, which explains a deterioration of around  $0.7 \times 5 = 3.5$  percentage points of the current account-to-GDP ratio. If financial liberalization is an endogenous response to an increase in inequality, as Rajan (2010) claims for the United States, estimated coefficients for top income shares may capture part of the effect of financial liberalization.

## 4 ECONOMIC MODEL

The world economy consists of two countries, Home and Foreign, with Home's share of the world population given by  $\omega$ . The Foreign economy features a representative household and firm, while the Home economy consists of investors, who own the economy's capital stock and are net lenders in financial markets, workers, who earn income exclusively through labor earnings and are net borrowers in financial markets, and firms, who combine capital and labor to produce aggregate output.

**4.1 HOME INVESTORS** Investors maximize their lifetime utility function, given by,

$$E_0 \sum_{t=0}^{\infty} \beta_i^t \left\{ \frac{(c_t^i)^{1-\frac{1}{\sigma_i}}}{1-\frac{1}{\sigma_i}} + \xi_d \log \left( d_t + \frac{\xi_f}{\xi_d} e_t f_t \right) + \xi_k \log(\kappa_k + k_t) \right\}, \quad (4)$$

where  $c_t^i$  is investors' consumption,  $d_t$ ,  $f_t$  and  $k_t$  are domestic bank deposits, foreign bonds and physical capital held between periods  $t$  and  $t+1$ , and  $e_t$  is the real exchange rate, expressed in units of domestic consumption per unit of foreign consumption. Real and financial assets are imperfect substitutes in investors' preferences. Domestic and foreign financial assets are also imperfect substitutes, as utility terms compensate investors for a steady state return differential between domestic deposits and foreign bonds, in a similar fashion to money-in-the-utility-function specifications. But due to the additive fashion in which the two financial assets enter utility, with coefficients  $\xi_d$  and  $\xi_f$  that are close in magnitude, the degree of asset substitutability is much higher than that between real and financial assets. The coefficient  $\kappa_k$  determines the sensitivity of investment in physical capital to increases in investors' income.

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$\sum_{j=0}^q \delta X_{i,t-j} + \mu_i + \varepsilon_{i,t}$ , then the coefficient of convergence is  $\phi = -(1 - \alpha)$ . We can thus verify that the estimate of around  $\alpha = 0.7$  obtained in the GMM estimation corresponds to our estimate for  $\phi$  of about  $-0.3$ .

<sup>15</sup>The long run coefficient estimate for the top 1% income share varies between  $-0.3$  and  $-0.4$ , which is also slightly lower than the GMM estimate.

Investors' budget constraint is given by

$$e_t f_t q_t^* + d_t q_t^d = e_t f_{t-1} + d_{t-1} + r_{k,t} k_{t-1} - p_t^{ci} c_t^i - p_t^{inv} I_t + \Pi_t^b, \quad (5)$$

where  $q_t^d$  is the time  $t$  price of one unit of domestic bank deposits that matures in period  $t + 1$ , and  $q_t^*$  is the time  $t$  price of foreign bonds, in units of the foreign good. The rental rate of capital is denoted by  $r_{k,t}$  and  $I_t$  is investment. Investor consumption and investment goods,  $c_t^i$  and  $I_t$ , are produced using Cobb-Douglas technologies in domestic and foreign output, with home bias share coefficients  $\gamma_c$  and  $\gamma_I$ . All relative prices have the price of domestic output as numeraire, with  $p_t^{ci}$  and  $p_t^{inv}$  representing the relative prices of investor consumption goods and investment goods. Investors are the owners of a monopolistically competitive banking sector and receive the profits of that sector  $\Pi_t^b$  as a lump-sum payment each period. Capital accumulation is given by  $k_t = (1 - \delta)k_{t-1} + I_t$ , where  $\delta$  is the physical depreciation rate. Let  $\lambda_t^i$  be the multiplier of (5). Then we obtain the following first-order optimality conditions for domestic deposits, foreign bonds and physical capital,

$$1 = \beta_i E_t \left( \frac{\lambda_{t+1}^i}{\lambda_t^i q_t^d} \right) + \frac{\xi_d}{\left( d_t + \frac{\xi_f}{\xi_d} e_t f_t \right) \lambda_t^i q_t^d}, \quad (6)$$

$$1 = \beta_i E_t \left( \frac{\lambda_{t+1}^i \frac{e_{t+1}}{e_t}}{\lambda_t^i q_t^*} \right) + \frac{\xi_f}{\left( d_t + \frac{\xi_f}{\xi_d} e_t f_t \right) \lambda_t^i q_t^*}, \quad (7)$$

$$1 = \beta_i E_t \left( \frac{\lambda_{t+1}^i (r_{t+1}^k + p_{t+1}^{inv} (1 - \delta))}{\lambda_t^i p_t^{inv}} \right) + \frac{\xi_k}{(\kappa_k + k_t) \lambda_t^i p_t^{inv}}, \quad (8)$$

where  $\lambda_t^i = 1/(p_t^{ci} (c_t^i)^{1/\sigma_i})$ . These conditions represent the different ways in which investors can respond to additional income gained through redistributive shocks. Namely, they can increase their consumption, investment in physical capital, and investment in financial assets. An increase in financial assets can take the form of larger holdings of domestic financial assets at unchanged holdings of net foreign assets or additional foreign borrowing to finance even larger increases in domestic financial assets. Investors act as financial intermediaries for foreign funds, because workers do not have direct access to foreign financial markets.

**4.2 HOME WORKERS** Workers maximize their lifetime utility function, given by,

$$E_0 \sum_{t=0}^{\infty} \beta_w^t \left\{ \frac{(c_t^w)^{1 - \frac{1}{\sigma_w}}}{1 - \frac{1}{\sigma_w}} \right\}, \quad (9)$$

where  $c^w$  is worker consumption. Workers inelastically supply one unit of labor per period. Their budget constraint is given by

$$\ell_t q_t = \ell_{t-1} + p_t^{cw} c_t^w - w_t, \quad (10)$$

where  $q_t$  is the time  $t$  price of one unit of domestic bank loans,  $\ell_t$ , that matures in period  $t + 1$ ,  $w_t$  is the real wage, and  $p_t^{cw}$  is the relative price of worker consumption goods. The latter are produced using a Cobb-Douglas technology in domestic and foreign output, with the same home bias share coefficient,  $\gamma_c$ , as in the investor consumption goods technology.

Let  $\lambda_t^w$  be the multiplier of (10). Then we obtain the following first-order optimality condition for bank loans,

$$1 = \beta_w E_t \left( \frac{\lambda_{t+1}^w}{\lambda_t^w q_t} \right), \quad (11)$$

where  $\lambda_t^w = 1/(p_t^{cw}(c_t^w)^{1/\sigma_w})$ . Workers respond to income lost through redistributive shocks by either reducing consumption or increasing borrowing from investors.

**4.3 HOME BANKS** Financial liberalization is introduced by allowing for shocks to the intermediation spread of an imperfectly competitive banking sector. There is a continuum of banks. Bank  $z \in [0, 1]$  makes loans of variety  $\ell_t(z)$ . Each bank is competitive in the deposit market and attracts homogenous deposits from investors at the gross interest rate  $1/q_t^d$ . Banks are monopolistically competitive in the loans market, where each bank makes loans at gross interest rate  $1/q_t(z)$ , and where borrowers demand a Dixit-Stiglitz aggregate of loan varieties denoted by  $\ell_t$ , with elasticity of substitution  $\theta_t$ . Banks maximize profits, given by,

$$(1/q_t(z))\ell_t(z) - (1/q_t^d)\ell_t(z), \quad (12)$$

by choosing their loan interest rate  $q_t(z)$  subject to a Dixit-Stiglitz demand function for their loan variety. This yields the optimality condition

$$1/q_t = (1/q_t^d)s_t, \quad (13)$$

where the spread is given by  $s_t = (\theta_t + 1)/\theta_t$ . Banks' profits are given by  $\Pi_t^b = d_t(q_t^d - q_t)$ . We assume that the spread follows an autoregressive stochastic process that is given by  $s_t = (1 - \rho_s)\bar{s} + \rho_s s_{t-1} + \varepsilon_t^s$ , where  $\varepsilon_t^s \sim i.i.d.N(0, \sigma_s^2)$ .

**4.4 HOME FIRMS** Firms are owned by investors and operate the economy's aggregate production technology

$$y_t = A(\chi k_{t-1})^\alpha (1 - \chi)^{1-\alpha}, \quad (14)$$

where  $A$  is a scale factor that normalizes the economy's calibrated steady state output level. We assume that the number of firms equals the number of workers and that all firms and workers are identical. Factor returns are determined by the outcome of a decentralized but segmented Nash bargaining problem over the real wage, where firms negotiate on behalf of their owners, investors. Specifically, at the beginning of each period each firm is matched with exactly one worker to bargain over the real wage. If bargaining fails, no output is produced, no wage is paid, and agents must wait one period before being able to bargain again. Workers' outside options assumed to be zero. Denoting workers' bargaining power by  $\eta_t$ , we have

$$\max_{w_t} (W_{h_t})^{\eta_t} (K_{h_t})^{1-\eta_t}, \quad (15)$$

where  $W_{h_t} = \lambda_t^w w_t$  is workers' surplus, and  $K_{h_t} = f_{h_t} - w_t$  is investors' surplus. The marginal product of labor,  $f_{h_t}$ , is given by  $f_{h_t} = (1 - \alpha)y_t/h_t$ . The first-order condition of the bargaining problem, given by,

$$w_t = \eta_t f_{h_t}. \quad (16)$$



sets the real wage equal to workers' bargaining power times the marginal product of labor. This implies that  $\eta_t \in [0, \frac{1-\chi}{1-\alpha}]$ . The standard competitive (and efficient) outcome obtains at a bargaining power of one. The rental rate of capital is determined residually as  $r_{k,t} = (y_t - w_t(1-\chi))/(\chi k_{t-1})$ . We assume that workers' bargaining power follows an autoregressive stochastic process given by  $\eta_t = (1-\rho)\bar{\eta} + \rho\eta_{t-1} + \varepsilon_t^\eta$ , where  $\varepsilon_t^\eta \sim i.i.d.N(0, \sigma_\eta^2)$ .

**4.5 FOREIGN AGENTS** The foreign representative household is both an investor and a worker and maximizes lifetime utility, given by,

$$E_0 \sum_{t=0}^{\infty} \beta^t \left\{ \frac{(c_t^*)^{1-\frac{1}{\sigma^*}}}{1-\frac{1}{\sigma^*}} + \xi_{f^*} \log(\kappa_{f^*} + f_t^*) + \xi_{k^*} \log(\kappa_{k^*} + k_t^*) \right\}. \quad (17)$$

where  $c_t^*$  is Foreign consumption, and  $f_t^*$  and  $k_t^*$  are bonds and physical capital held between periods  $t$  and  $t+1$ . Similar to Home investors, real and financial assets are imperfect substitutes. Models in the open economy literature are frequently calibrated so that net foreign assets take a very long time to return to their steady state value. We replicate this feature by calibrating the coefficient  $\kappa_{f^*}$  so that the largest stable root in the linear model is very close to one. We thereby extend the work of Schmitt-Grohe and Uribe (2003) to an environment with wealth in the utility function.

Foreign households' budget constraint is given by

$$f_t^* q_t^* = f_{t-1}^* + r_{k,t}^* k_{t-1}^* + w_t^* - p_t^{c^*} c_t^* - p_t^{inv^*} I_t^*, \quad (18)$$

where we have assumed, as for Home workers, that Foreign households inelastically supply one unit of labor. Capital accumulation is given by  $k_t^* = (1-\delta^*)k_{t-1}^* + I_t^*$ . Let  $\lambda_t^*$  be the multiplier of (18). Then  $\lambda_t^* = 1/(p_t^{c^*} (c_t^*)^{(1/\sigma^*)})$ , and the first-order optimality conditions for foreign bonds and physical capital are

$$1 = \beta_* E_t \left( \frac{\lambda_{t+1}^*}{\lambda_t^* q_t^*} \right) + \frac{\xi_{f^*}}{(\kappa_{f^*} + f_t^*) \lambda_t^* q_t^*}, \quad (19)$$

$$1 = \beta_* E_t \left( \frac{\lambda_{t+1}^* (r_{t+1}^{k^*} + p_{t+1}^{inv^*} (1-\delta^*))}{\lambda_t^* p_t^{inv^*}} \right) + \frac{\xi_{k^*}}{(\kappa_{k^*} + k_t^*) \lambda_t^* p_t^{inv^*}}. \quad (20)$$

The Foreign aggregate production technology is given by

$$y_t^* = A^* (k_{t-1}^*)^{\alpha^*} (h_t^*)^{1-\alpha^*}, \quad (21)$$

where  $y_t^*$  is Foreign output,  $A^*$  is a scale factor that normalizes Foreign's steady state output level,  $k_t^*$  is Foreign capital and  $h_t^*$  is Foreign labor. Foreign factor prices are determined in competitive factor markets. Thus,  $w_t^* h_t^* = (1-\alpha^*) y_t^*$  and  $r_{k,t}^* k_{t-1}^* = \alpha^* y_t^*$ . Foreign consumption and investment goods,  $c_t^*$  and  $I_t^*$ , are produced using Cobb-Douglas technologies in domestic and foreign output.

**4.6 EQUILIBRIUM** In equilibrium all households maximize their respective lifetime utilities, and goods, labor and financial markets clear. The Home and Foreign goods market clearing conditions are

$$\omega y_t = \omega \chi (c_t^{ih} + I_t^h) + \omega (1-\chi) c_t^{wh} + (1-\omega) (c_t^{h^*} + I_t^{h^*}), \quad (22)$$

$$(1-\omega) y_t^* = (1-\omega) (c_t^{f^*} + I_t^{f^*}) + \omega \chi (c_t^{if} + I_t^f) + \omega (1-\chi) c_t^{wf}. \quad (23)$$

For Home and Foreign labor, the inelastic labor supply assumptions imply  $h_t = 1 - \chi$  and  $h_t^* = 1$ . The market clearing conditions for domestic and international financial markets are given by

$$(1 - \chi)\ell_t = \chi d_t, \quad (24)$$

$$\omega \chi f_t + (1 - \omega) f_t^* = 0. \quad (25)$$

To close the model, the current account equation, written from Home's perspective is given by

$$\chi e_t f_t q_t^* = \chi e_t f_{t-1} + \frac{1 - \omega}{\omega} (c_t^{h^*} + I_t^{h^*}) - e_t (\chi (c_t^{if} + I_t^f) + (1 - \chi) c_t^{wf}). \quad (26)$$

## 5 SIMULATION RESULTS

This section discusses the model's calibration, the computational methodology, and simulation results.

**5.1 CALIBRATION** The steady state of the model is calibrated to UK data. We choose the United Kingdom for two reasons. First, it is among the countries that experienced the largest increases in income inequality since the late 1970s. Second, its share in world GDP is more representative of several other deficit countries than the United States. Since we are interested in the period from the late 1970s until just before the 2007 financial crisis, we use data from 1979-2007, depending on availability, to calibrate the model. We calibrate the initial steady state workers' debt-to-income ratio and net-foreign-liabilities-to-GDP ratio to their 1980 values (1979 values were not available), given that our interest is in the subsequent evolution of these variables.

The relative country size,  $\omega$ , is calibrated so that Home accounts for 4.5% of world GDP, which equals both the 1979 value and the 1979-2007 sample average for the United Kingdom. We set the domestic population size of investors,  $\chi$ , to 0.05.

In the utility functions, the intertemporal elasticity of substitution equals 0.5 for all agents. The Home coefficient on domestic financial investments,  $\xi_d$ , is set to obtain an initial workers' debt-to-income ratio of 60 percent, which equals the UK value for 1980 according to DeBelle (2004). The Home coefficient on foreign bond holdings,  $\xi_f$ , is set to obtain an initial net foreign liabilities to GDP ratio of 8 percent, also equal to the UK value in 1980. We calibrate  $\kappa_{f^*}$  so that the elasticity of international interest rates with respect to net foreign liabilities is positive but very small.

The remaining coefficients of agents' utility functions imply a steady state gross real interest rate on domestic and foreign loans and a steady state gross return to capital after depreciation equal to 1.05. The steady state gross deposit rate equals 1.02, implying a steady state banking spread,  $s$ , equal to 3 percent.

We set the coefficients  $\kappa_k$  and  $\kappa_k^*$  to ensure that the elasticity of physical investment with respect to income shocks is significantly lower than the elasticity of financial investment. Since investors own the entire capital stock, their per capita capital stock is very large relative to per capita loans. Introducing capital and loans into the utility function additively would imply that the elasticity of these two forms of wealth with respect to income shocks would be very similar. This would imply a very large, and unrealistic, increase in the elasticity of physical investment. Introducing the two forms of wealth separably, and calibrating  $\kappa_k$  and  $\kappa_k^*$  appropriately, avoids that implication. It also allows us to obtain a unique steady state value for the stocks of loans and deposits.

The factor share coefficient of the production technology,  $\alpha$ , is calibrated to obtain an investment-to-GDP ratio of 17.5 percent, which is approximately equal to both the value in the early 1980s and

the sample average for 1979-2007. The depreciation rate equals 10 percent per annum. The Cobb-Douglas share coefficients of the trade technologies are calibrated to produce consumption goods imports-to-GDP ratios of 6 percent and investment goods imports-to-GDP ratios of 7.2 percent, based on 1979-2007 sample averages.

Finally, we calibrate the persistence of the two shock processes to  $\rho_\eta = \rho_s = 0.995$ . This is based on the observation that changes to realized top income shares and to UK financial system regulation have been close to permanent. We assume that this was fully expected by households. Calibration of the two shock processes as unit roots is infeasible for computational reasons.

**5.2 COMPUTATIONAL METHODOLOGY** Our model is designed to match the persistent growth in both income inequality and household debt observed over past decades. Because this implies highly persistent and very large deviations of state variables from their initial steady state values, a local solution method is inadequate to accurately capture the long-run dynamics. Thus, we obtain a global nonlinear solution using a time-iterative policy function algorithm, which exploits the theory of monotone operators. Monotone operators have useful theoretical and numerical properties. For example, a monotone operator is used to prove existence and uniqueness of equilibrium of non-optimal economies by Coleman (1991). This solution technique discretizes the state space and iteratively solves for updated policy functions that satisfy equilibrium until a specified tolerance criterion is reached. For additional information and examples of how the algorithm is applied to conventional real business cycle and new Keynesian models see Richter et al. (2011).

**5.3 INCREASED INEQUALITY** Figure 6 simulates a cumulative 10 percent decline in workers' bargaining power over a period of 18 years. By the end of the third decade following the initial shock this leads to a real wage drop of around 7 percent and an increase in the return to capital of around 3 percentage points. The bottom right panel shows that this income redistribution closely matches the change in the top 5% income share in UK data for the period 1979-2007.

The third row shows workers' responses to their income losses. Higher loans from investors increase workers' leverage, or debt-to-income ratio, from 60 percent to 140 percent after 30 years. This increase, while very large, is still less than what was observed in the data. In the short run, higher debt allows workers to reduce their consumption by less than the drop in their wage, but in the longer run workers' consumption continues to fall even when their real wage starts to recover (mainly due to a rising capital stock). The reason is that by this time debt service consumes a far larger and growing portion of workers' disposable income, around 7 percent compared to 3 percent in the original steady state.

The second row shows that investors respond to their income gains by increasing consumption (by 50 percent after 30 years), increasing physical investment (by 12 percent after 30 years), and increasing loans to workers (by 110 percent after 30 years, with significant further growth thereafter).<sup>16</sup> However, in an open economy there is a fourth possibility—increased loans to workers financed by borrowing from foreign investors. Or, to put it differently, in an open economy workers can obtain loans not only from domestic investors, but also from foreign investors. Loans from foreign investors are intermediated by domestic investors. This effect is shown in the fourth row, which shows a decline in net foreign assets that reaches 8 percent of GDP by year 30, accompanied by a deterioration in the current account that reaches just over 0.4 percent of GDP around year 20,

<sup>16</sup>As mentioned above, calibration of the parameter  $\kappa_k$  in investors' preferences is critical for determining the relative changes in physical versus financial investments.

with the current account gradually closing thereafter. However, this effect is significantly smaller than the current account deterioration experienced by the United Kingdom since the late 1970s.<sup>17</sup>

The current account deteriorates because aggregate demand grows faster than aggregate supply. Investors' consumption and investment demand grows rapidly as their income share increases, while workers' consumption demand, which represents a much larger share of aggregate demand, declines as their income share decreases. This decline however is limited by the presence of financial markets that channel a large share of investors' gains back to workers as interest bearing loans, and that in addition are able to draw on foreign savings to increase loans even further. In [section 5.4](#) we show that without these financial markets current account surpluses emerge rather than a deficits.

**5.4 INCREASED INEQUALITY ACCOMPANIED BY FINANCIAL LIBERALIZATION** [Figure 7](#) first reproduces the simulation of [figure 6](#) as a black solid line, and then adds an alternative scenario, shown as a blue dashed line, where the same loss in bargaining power is accompanied by a reduction in the banking spread by 150 basis points over the first 10 years. This is a simple representation of UK financial liberalization during the "Thatcher years".

The main effect of this change is to make investors direct a much larger share of their additional income to financial rather than real investments. Workers borrow much more heavily, to the point that their consumption does not drop at all during the first decade despite a steep loss in income. Relative to the previous scenario, this further stimulates aggregate demand, and at the same time it restrains aggregate supply by slowing down capital accumulation. This results in a much larger increase in the rate of return to capital. Workers' debt-to-income ratio now reaches around 170 percent after 30 years, which is much closer to matching (in fact, slightly exceeding) actual UK values during the period, while still matching the observed top 5% income share. In the long run, this high debt burden further increases debt servicing costs, so that by around year 20 workers' consumption drops below the values observed in the previous scenario.

However, the most dramatic change is observed for the current account, which now deteriorates by around 2 percentage points by year 10 and 1.5 percentage points in the longer run. This is very close to observed UK current account behavior during the period. The reason is that aggregate demand now increases faster and aggregate supply increases more slowly than in the previous scenario. Furthermore, the compression in spreads results in a combination of lower loan interest rates and higher deposit interest rates. Higher deposit rates raise the attractiveness of domestic deposits relative to foreign bonds for domestic investors, given that the interest rate on foreign loans does not change significantly because of the small size of Home relative to the rest of the world. This creates an incentive to invest in domestic deposits financed by foreign loans, which fuels the stronger growth in aggregate demand.<sup>18</sup>

**5.5 EMERGING MARKETS: THE ROLE OF CREDIT CONSTRAINTS** So far both the empirical and theoretical parts of our paper have focused exclusively on developed economies. We have found that greater income inequality, with or without added financial liberalization, creates pres-

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<sup>17</sup>Data for the UK current account-to-GDP ratio are presented as 5-year moving averages to dampen the substantial short-run volatility of this variable.

<sup>18</sup>While these results suggest that the rise in income inequality can explain almost the entire deterioration in UK current account deficits since the late 1970s, this does not imply that the deterioration was unavoidable. For example, tighter fiscal or financial sector policies could have leaned against these effects.

tures for the current account to deteriorate. However, greater inequality has been a more general worldwide phenomenon that has also been observed in many emerging economies that have been among the major suppliers of funds to the deficit countries. In other words, these countries have run current account surpluses instead of deficits, despite worsening inequality.

This raises the question of whether emerging economies' experiences contradict our results. This section shows that with an appropriate modification of the model emerging economies provide further support by helping to explain the supply side of global current account imbalances. The key difference in our specification of an emerging economy is the nature of financial markets. In many of these countries it is much more difficult for the poor and middle class to borrow than in the United States or the United Kingdom, because of what is generally referred to as "financial market imperfections". Conversely, it is more difficult for the rich to invest their additional income in domestic financial instruments, while access to foreign financial instruments remains available. For illustrative purposes we model "financial market imperfections" in the simplest possible way, by assuming that Home workers are restricted to consuming their wage income, with zero debt, and with foreign financial wealth as the only financial asset entering investors' utility function. For ease of comparison with the previous simulations, all other aspects of the baseline calibration remain exactly as they were for the United Kingdom. In other words, this is a generic emerging economy, rather than being calibrated to a specific country. The shocks are only to bargaining power, since a reduction in spreads cannot occur in the absence of a domestic credit market.

Figure 8 shows the results as a red dash-dotted line overlaid on our previous results. Relative to the previous simulations, workers' consumption drops more steeply, given their inability to borrow. Investors increase investments in the two alternatives that remain available to them, physical capital and foreign financial assets. This results in an external surplus. Without domestic financial markets investors channel their funds abroad and generate foreign rather than domestic demand. Therefore, the increase in investors' consumption and investment is no longer sufficient to offset the significantly steeper decrease in workers' consumption. As aggregate demand drops relative to aggregate supply, the current account improves, with a surplus that exceeds 0.5 percent of GDP by year 20 and gradually closes thereafter. While this is clearly not the entire explanation for the large surpluses of countries like China, it makes a significant contribution to that explanation and resolves the apparent contradiction mentioned above.

## 6 CONCLUSION

This paper makes both an empirical and a theoretical case that increases in income inequality tend to lead to increases in current account deficits in developed economies.

Our stylized facts and cross-sectional econometric evidence are strongly supportive of this hypothesis. They suggest that the magnitude of the effect is large, to the point that for the United Kingdom it can approximately explain the entire current account deterioration experienced between the late 1970s and 2007. Furthermore, financial liberalization, which has often been a policy response to increased income inequality, is also empirically associated with larger external deficits.

We build a DSGE model that helps explain the transmission mechanism from higher income inequality to higher domestic indebtedness and eventually higher foreign indebtedness. The key feature of the model is that the economy consists of two groups of households, a small group of the very rich (investors) and the majority (workers), who compete over income shares in a bargaining game. When workers' income share declines at the expense of investors, investors respond by



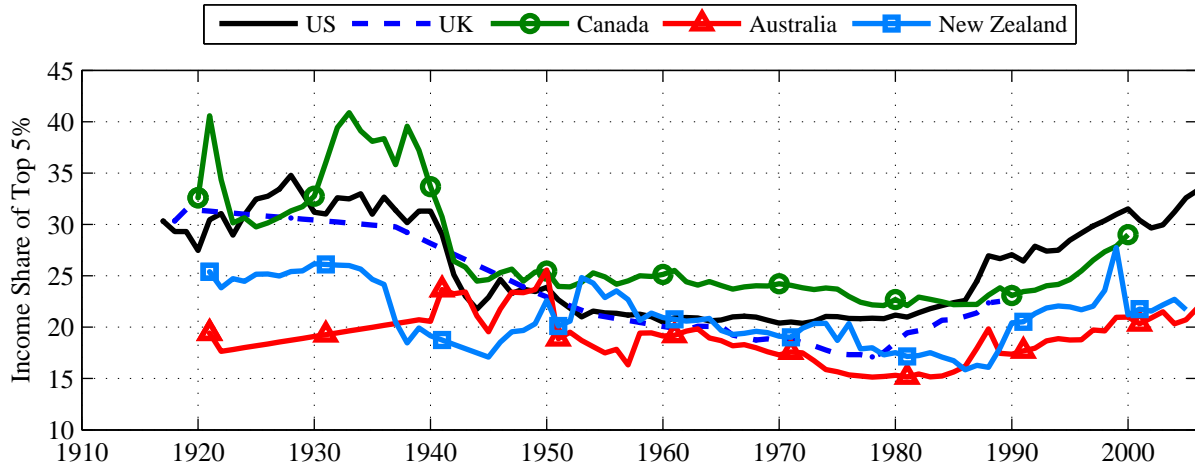
lending part of the income they gained back to workers. In addition, in an open economy they benefit from the ability to intermediate foreign savings to domestic workers. This lending stimulates aggregate demand and increases current account deficits, despite a significant drop in workers' consumption.

If the policy response to greater inequality includes financial liberalization, this helps workers smooth consumption in the short run, but comes at the cost of higher household debt, higher debt service, and ultimately lower consumption in the long run. Furthermore, it leads to much larger current account deficits as investors take advantage of the attractive lending environment by intermediating larger foreign savings. This has the effect of not only further stimulating aggregate demand, but also holding back aggregate supply as investors prefer financial over real investments.

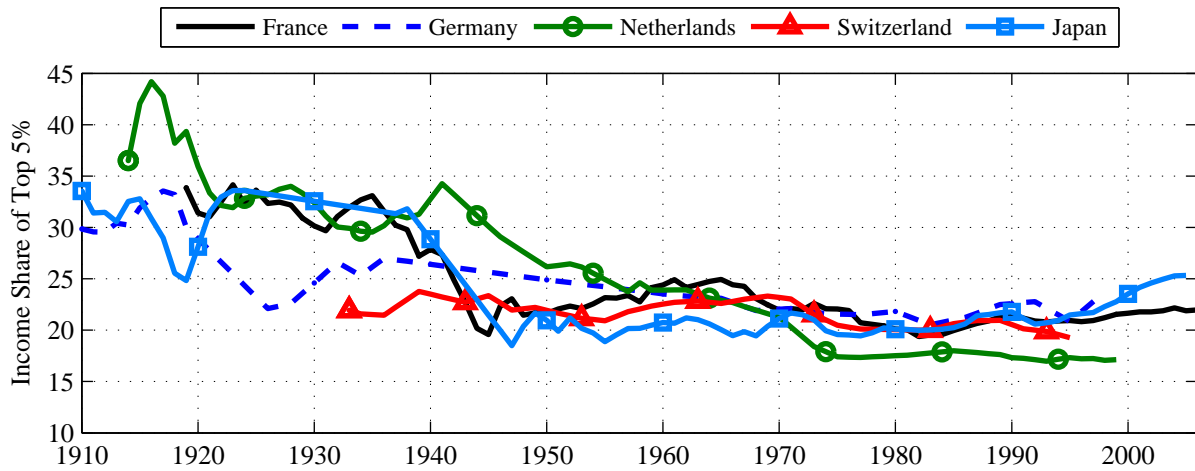
Finally, the model can also be used to understand the supply side of global current account imbalances, the export of funds, and current account surpluses of many important emerging economies. At first these experiences may suggest a shortcoming of our approach, because many of these surplus countries also experienced steep increases in income inequality. But on closer inspection this case actually strengthens our results, as long as the model is appropriately modified to take account of the fact that typical emerging economies are characterized by what is commonly referred to as "financial market imperfections". This means that in such economies workers cannot borrow from investors when their income share declines. Instead they have to reduce their consumption (relative to an often fast-growing trend, of course). In such economies higher inequality necessitates an export-oriented growth model, where the domestic wealthy end up deploying their additional income in foreign rather than domestic financial assets. Reduced domestic demand and investment in foreign financial assets imply current account surpluses instead of deficits.

A short-sighted response to global imbalances could be to reduce these "financial market imperfections" in surplus countries. However, if lending is liberalized without addressing the underlying income inequalities, the result would simply be an increase in indebtedness inside surplus countries (between the rich and the rest of the population), rather than between countries. In other words, there would be a globalized rather than a regional increase in domestic indebtedness of the poor and middle class. While this would reduce cross-border financial imbalances, it would exacerbate domestic debt-to-income ratios. We have abstracted from the possibility of crises for the purpose of this paper, but higher debt-to-income ratios would very likely increase the vulnerability to crises, as in Kumhof and Rancière (2010). In the long run, there is simply no way around addressing the income inequality problem itself. Financial liberalization in surplus countries buys time, but at the expense of an eventually much larger debt problem.

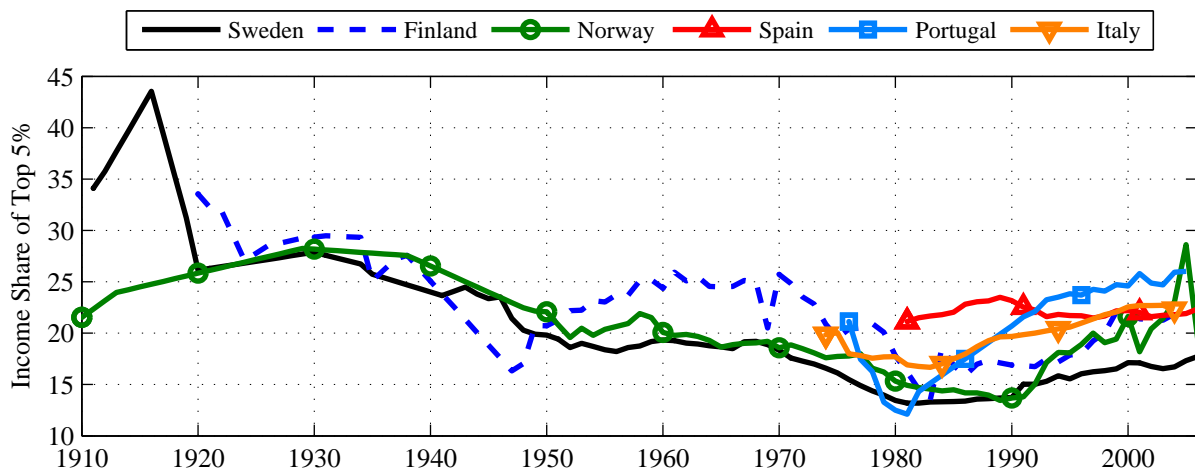
Many of the policy options for reducing income inequality, which involve either reducing workers' relative tax burdens or strengthening their bargaining power over wages, are fraught with difficulties [Kumhof and Rancière (2010)]. These include the danger of driving investment to other jurisdictions if reductions in labor income taxes are financed through increases in capital income taxes. Solutions might include more progressive labor income taxes that leave average tax rates unchanged or alternatively financing lower labor income taxes across all income levels through higher taxes that do not distort economic incentives, including appropriately designed taxes on rents, specifically on profits from investments in land, natural resources, and the financial sector. The costs of directly strengthening the bargaining power of workers must be weighed against the potentially very serious consequences of further financial difficulties. It may be difficult to strengthen bargaining power due to international competition, but necessary if current trends in domestic and international indebtedness continue.



(a) Anglo-Saxon Countries (U-shaped), 1913-2006

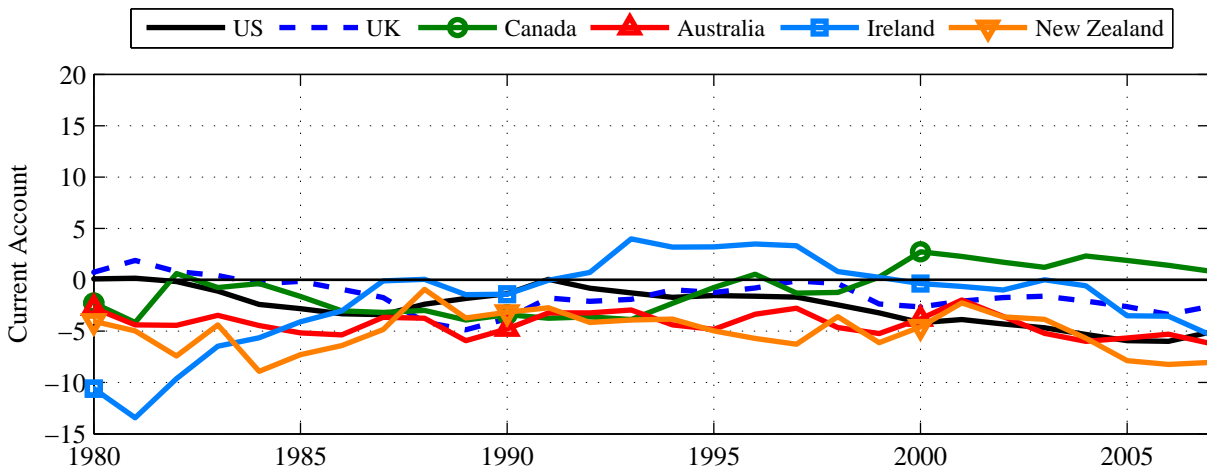


(b) Continental Europe and Japan (L-shaped), 1910-2007

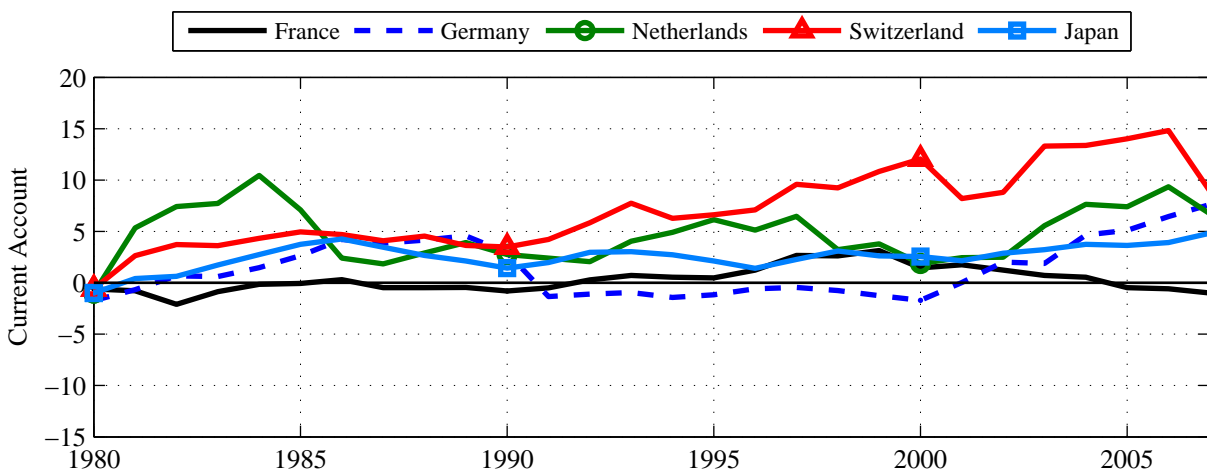


(c) Southern Europe and Nordic Countries (U/L-shaped), 1911-2006

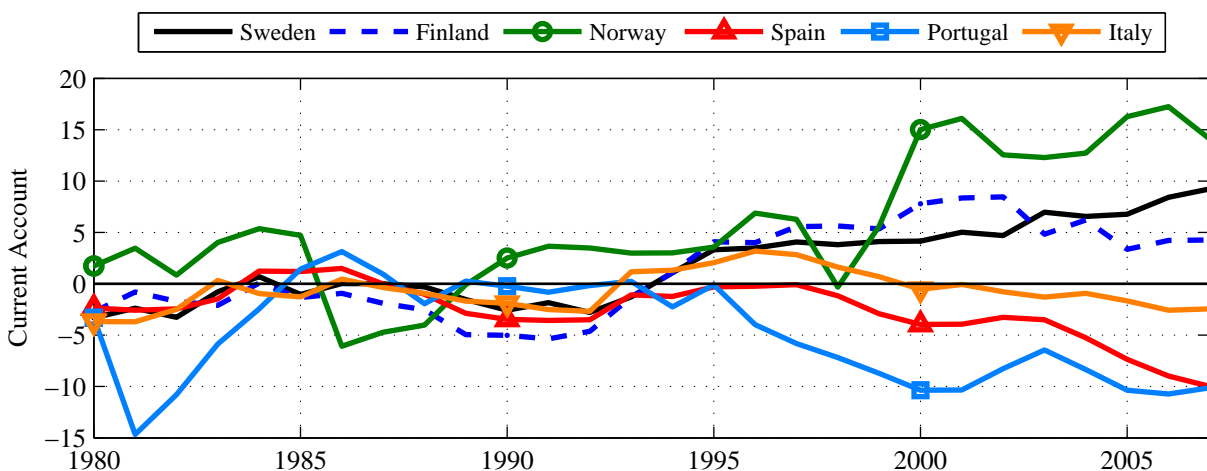
Figure 1: Income share of top 5 percent by country (percent)



(a) Anglo-Saxon Countries (U-shaped), 1913-2006



(b) Continental Europe and Japan (L-shaped), 1910-2007



(c) Southern Europe and Nordic Countries (U/L-shaped), 1911-2006

Figure 2: Global Current Account Balances, 1980-2010 (percent of GDP)

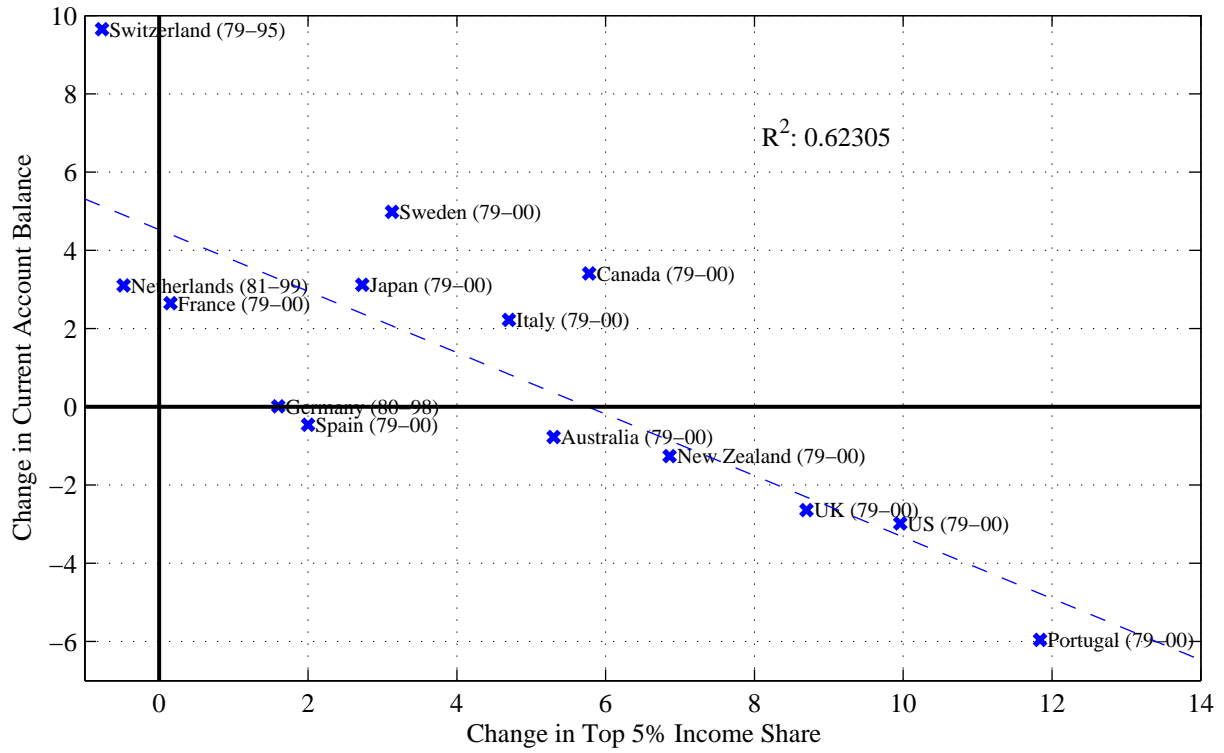
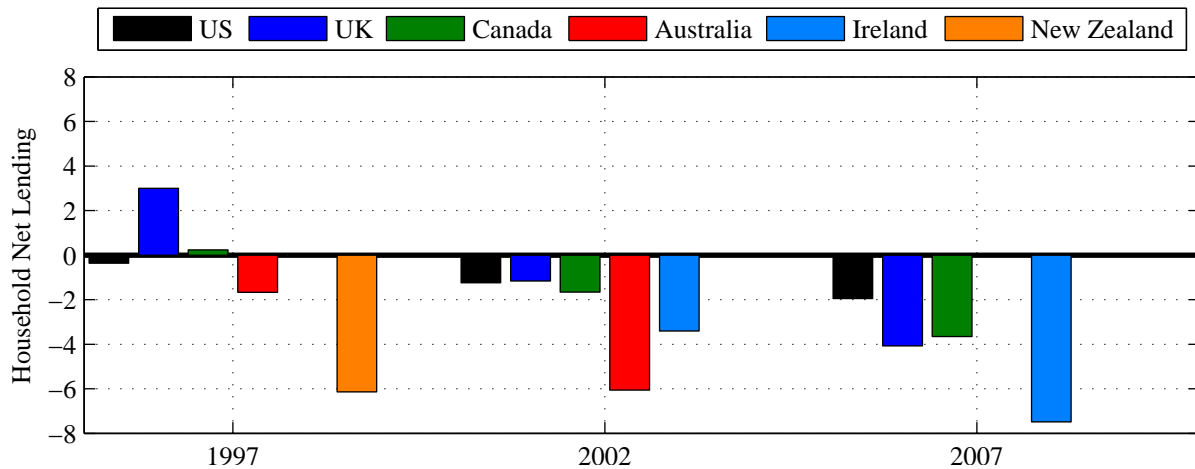
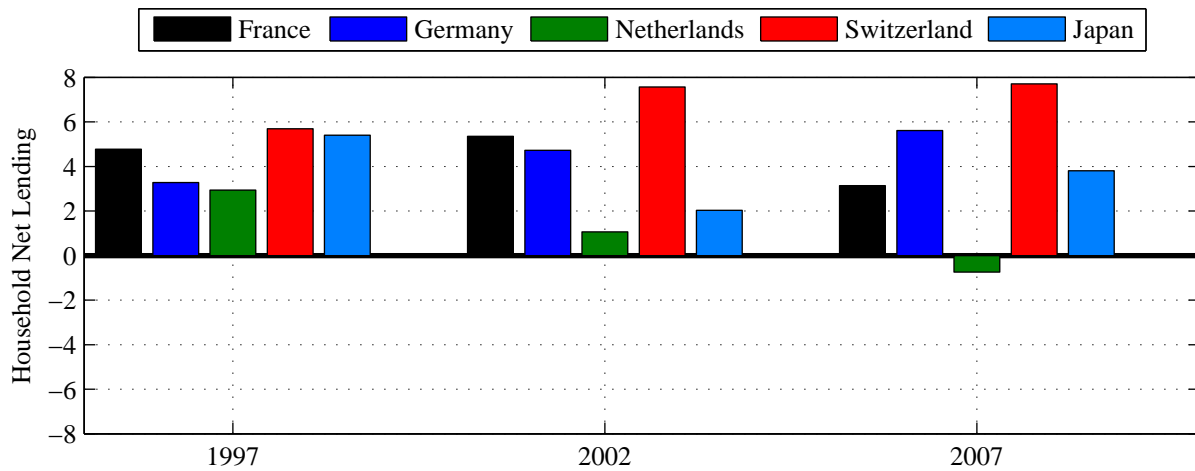


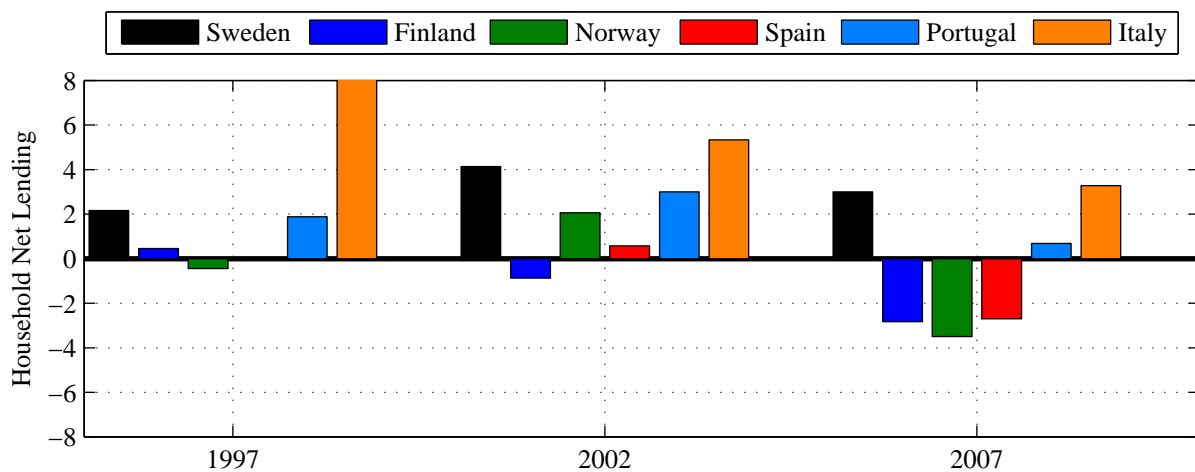
Figure 3: Changes in Current Accounts and Top Income Shares, 1980-2000 (percent)



(a) Anglo-Saxon Countries (U-shaped)



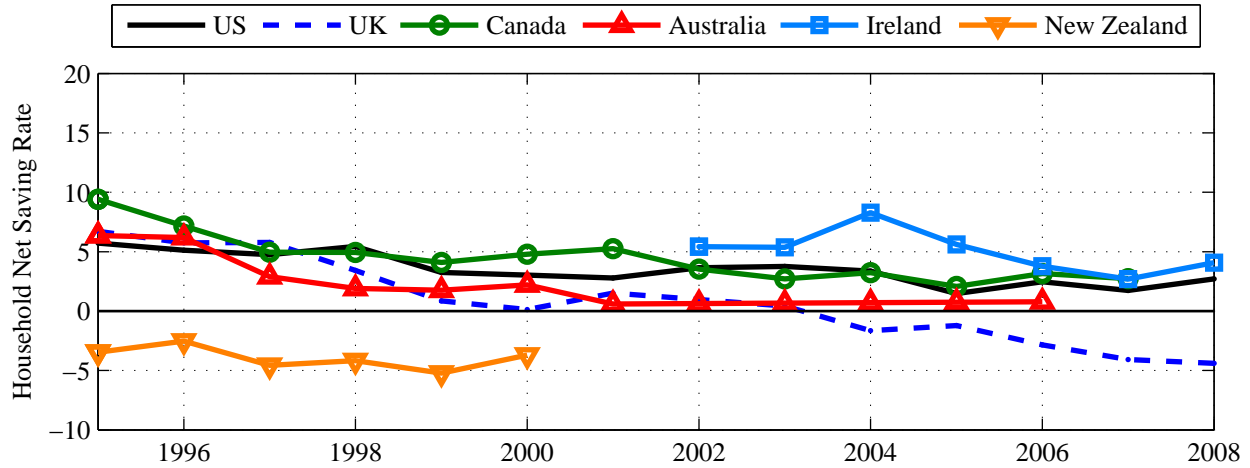
(b) Continental Europe and Japan (L-shaped)



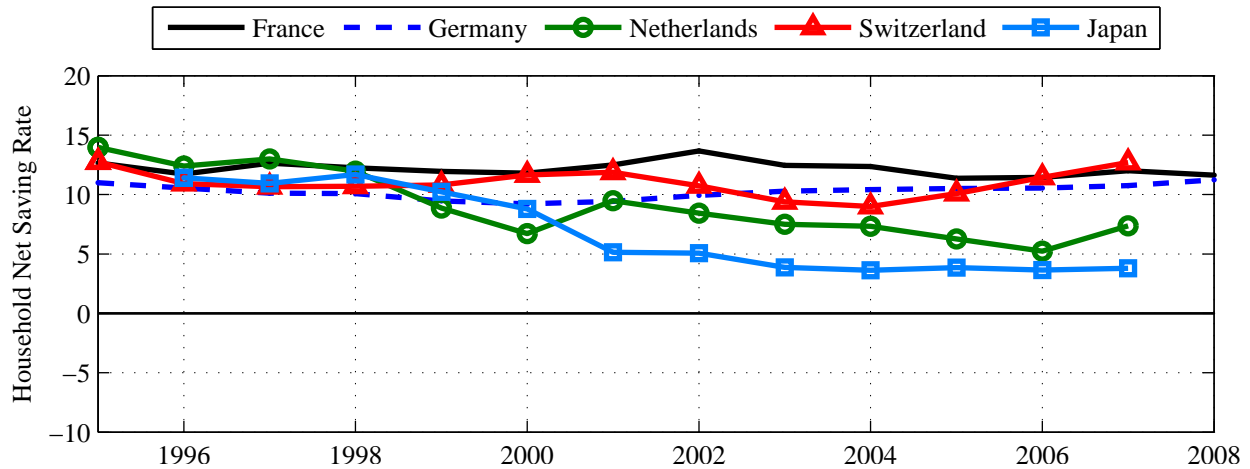
(c) Southern Europe and Nordic Countries (U/L-shaped)

Figure 4: Net Lending/Borrowing by Households and Non-Profits (percent of GDP)

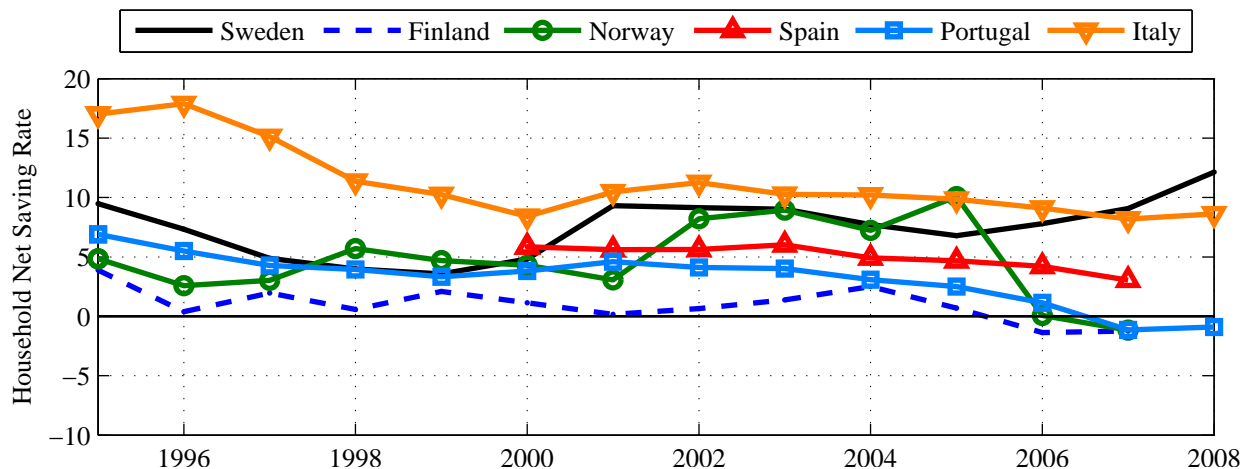




(a) Anglo-Saxon Countries (U-shaped)



(b) Continental Europe and Japan (L-shaped)



(c) Southern Europe and Nordic Countries (U/L-shaped)

Figure 5: Household Net Saving Rate (percentage of disposable income)

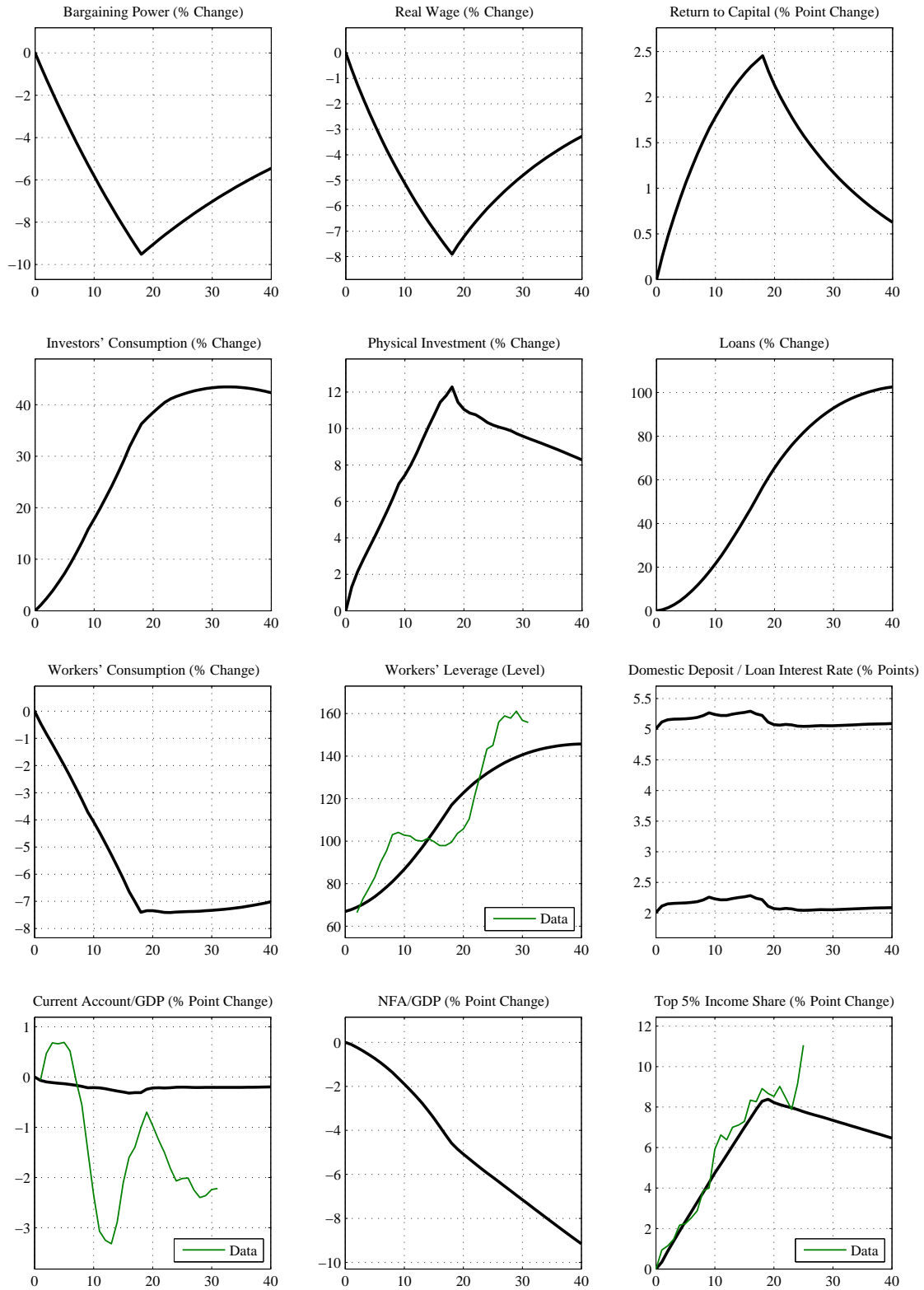


Figure 6: Increased inequality

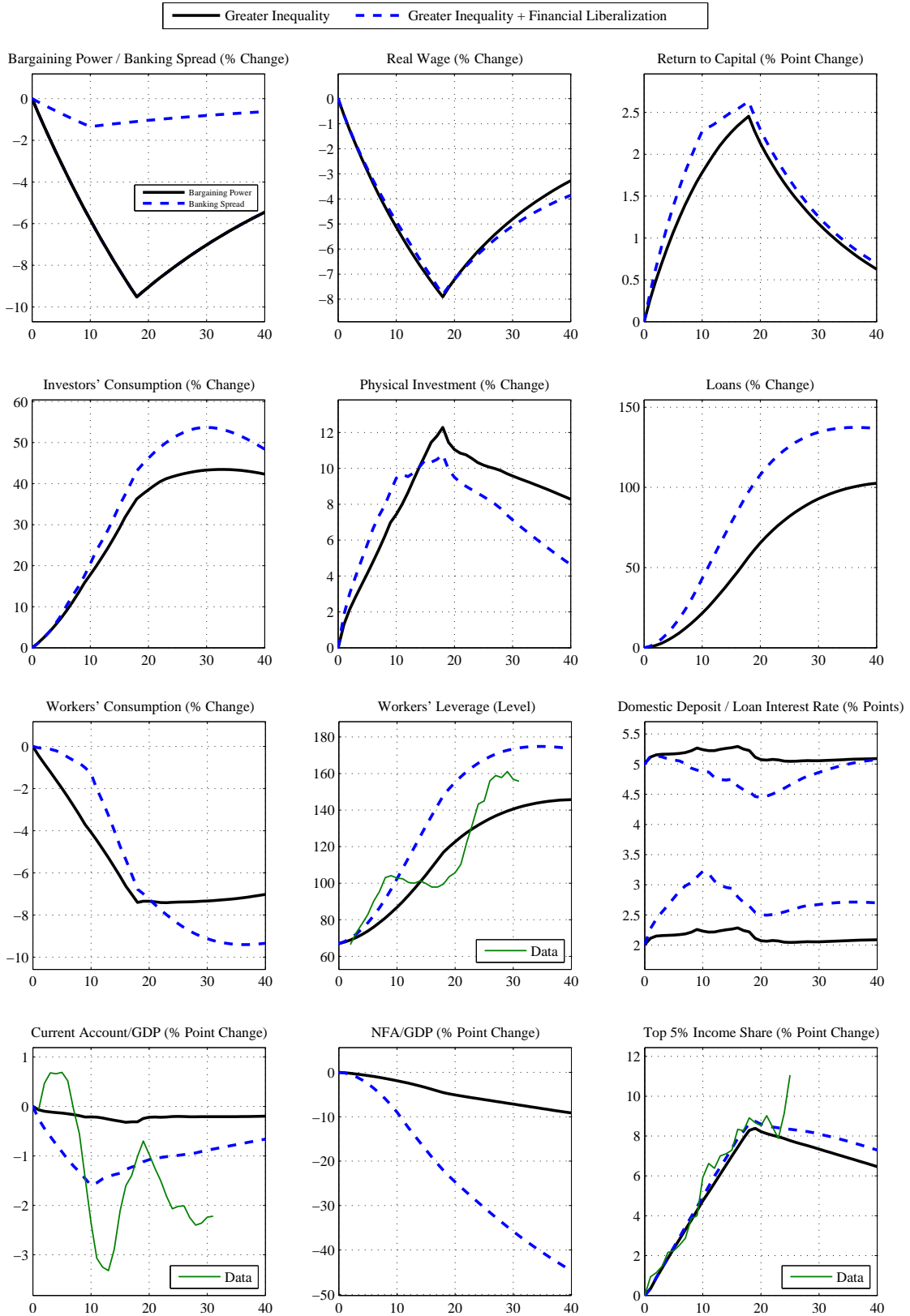


Figure 7: Increased inequality accompanied by financial liberalization

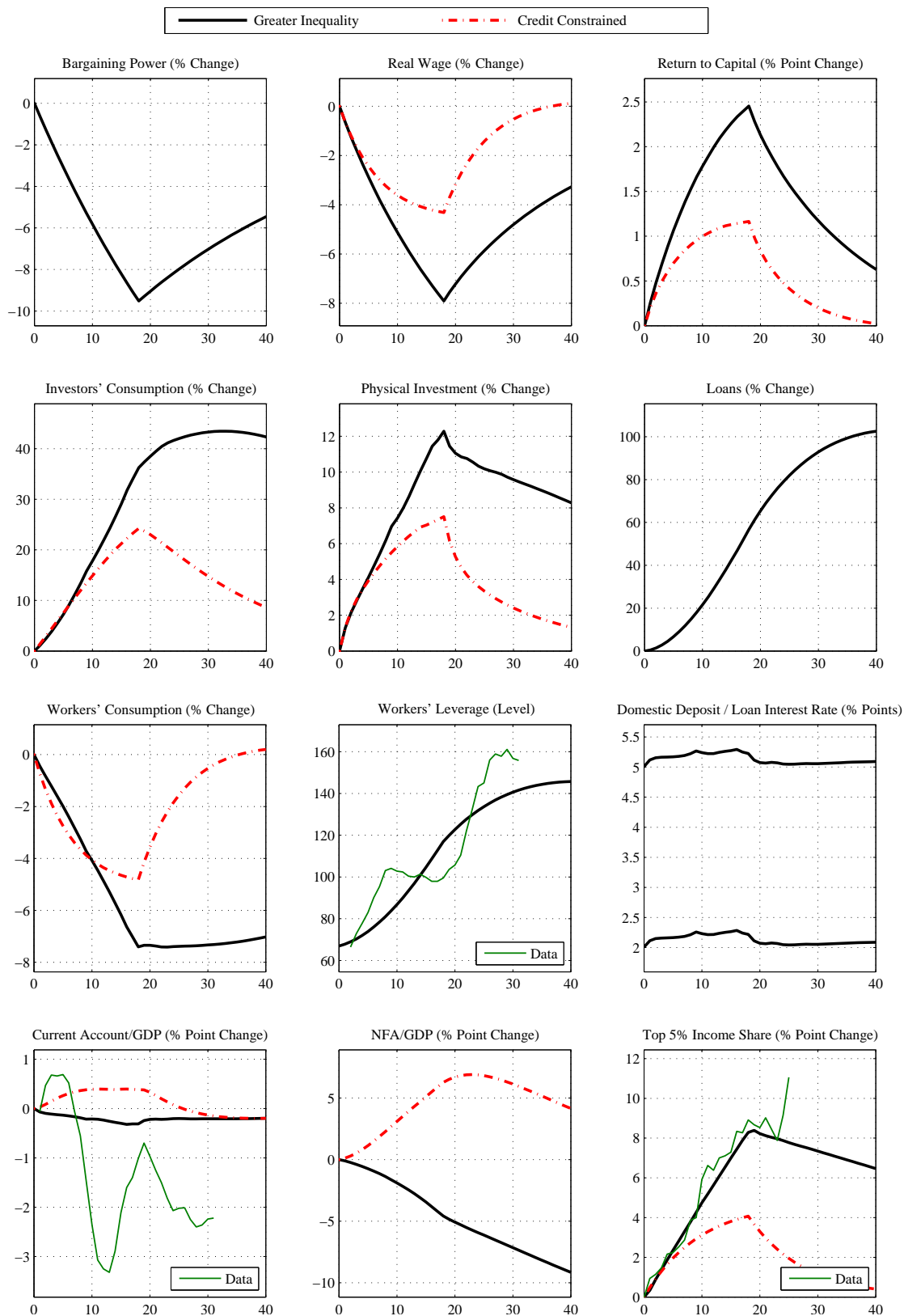


Figure 8: Emerging economies - the role of credit constraints

Table 1: Variable Definitions

Variables	Definition and construction	Source
Top 1% and 5% income share	Share of income of the top 1% and 5% of the income distribution	The World Top Incomes Database
CA (% of GDP)	Current Account Balance, ratio to GDP	World Economic Outlook (2011)
NFA (% of GDP)	Stock of Net Foreign Assets, ratio to GDP	Lane & Milesi-Ferretti
Gov structural balance (% of GDP)	General Government Budget Balance, percent of GDP	IMF's International Financial Statistics
Government debt (% of GDP)	Governement Debt in percentage of GDP	OECD Economic Outlook (2010)
Relative income (% of GDP)	Per capita income, adjusted by PPP exchange rates, measured relative to the U.S. (range 0 to 1)	Penn World Table (2010)
Youth dependency ratio	Youth dependency ratio, population under 15 relative to the population between 15 and 65	World Development Indicators (2010)
Old dependency ratio	Old dependency ratio, population over 65 relative to the population between 15 and 65	World Development Indicators (2010)
Average GDP growth	Average real GDP growth	World Development Indicators (2010)
Terms of trade	Terms of trade and terms of trade volatility	World Development Indicators (2010)
Trade (% of GDP)	Openness indicator: ratio of exports plus imports of goods and non factor services to GDP	World Development Indicators (2010) & IFS
Private credit (% of GDP)	Ratio of private credit to GDP, decomposed into private credit from deposit money banks and private credit from other financial institutions (FI)	World Bank Financial Structure Database (2011)
Interest rate	Real interest rate: Lending rate minus the rate of inflation based on GDP deflators	World Development Indicators (2010)
Dependency	Other demographic dependency variables	UN World Population Prospects (2010)

Table 2: Dynamic Panel GMM Estimation<sup>†</sup> (Dependent variable: CA (% of GDP))

Regressor	Regression 1	Regression 2	Regression 3	Regression 4	Regression 5
Lag of CA (% of GDP)	0.778*** (0.0623)	0.750*** (0.0556)	0.752*** (0.0572)	0.731*** (0.0557)	0.732*** (0.0595)
Lag 2 of CA (% of GDP)	-0.114** (0.0550)	-0.133** (0.0644)	-0.133** (0.0619)	-0.107* (0.0611)	-0.109* (0.0587)
Top 5% income share	-	-0.111*** (0.0427)	-0.122*** (0.0370)	-	-
Top 1% income share	-	-	-	-0.271*** (0.0855)	-0.304*** (0.0751)
NFA (% of GDP)	5.799*** (0.801)	5.477*** (1.680)	4.907** (2.106)	6.147*** (1.729)	5.640** (2.267)
Lag of NFA (% of GDP)	-2.689** (1.102)	-3.247** (1.428)	-3.273* (1.721)	-3.478** (1.394)	-3.447** (1.712)
Gov structural balance (% of GDP)	-0.0223 (0.0410)	0.00274 (0.0548)	-0.000661 (0.0567)	0.0674 (0.0503)	0.0644 (0.0516)
Relative income (% of GDP)	-0.000136 (9.28 <sup>-5</sup> )	-0.000197** (9.03 <sup>-5</sup> )	-0.000162 (0.000112)	-0.000185* (0.000101)	-0.000145 (0.000120)
Old dependency ratio	-2.794 (2.071)	-4.183** (1.746)	-3.918* (2.166)	-2.305 (1.988)	-1.629 (2.260)
Youth dependency ratio	2.776* (1.640)	2.712* (1.527)	3.132** (1.411)	3.624** (1.581)	4.330*** (1.474)
Trade (% of GDP)	0.0556*** (0.0132)	0.0511*** (0.0139)	0.0518*** (0.0138)	0.0554*** (0.0141)	0.0545*** (0.0142)
Private credit (% of GDP)	0.201 (0.550)	-0.347 (0.735)	-	0.219 (0.621)	-
Private credit by banks (% of GDP)	-	-	-0.629 (0.878)	-	0.0533 (0.866)
Private credit by other FI (% of GDP)	-	-	-0.785 (0.698)	-	-0.444 (0.704)
Constant	-1.199** (0.535)	0.769 (0.493)	0.949 (0.758)	0.685 (0.578)	0.909 (0.720)
Sargan Test ( <i>p</i> -value)	0.2737	0.1875	0.1567	0.2925	0.2561
2nd Order Serial Correlation ( <i>p</i> -value)	0.6040	0.6417	0.8595	0.4804	0.6556
Number of Countries	14	14	14	13	13
Number of Observations	265	222	220	196	194

<sup>†</sup> Robust standard errors are in parentheses. \*\*\**p* < 0.01, \*\**p* < 0.05, \**p* < 0.1



Table 3: ARDL Estimation<sup>†</sup> (Dependent variable: CA (% of GDP))

Variables	Regression 1	Regression 2	Regression 3	Regression 4
Long-Run Coefficients				
Top 5% income share	-0.139 (0.110)	-0.171* (0.0893)	-	-
Top 1% income share	-	-	-0.449*** (0.0913)	-0.470*** (0.0875)
Youth dependency ratio	5.288 (3.725)	6.699** (3.157)	6.267* (3.725)	7.295** (3.412)
Old dependency ratio	-6.058 (6.626)	-5.075 (5.422)	-4.635 (7.196)	-4.228 (5.940)
Trade (% of GDP)	0.183*** (0.0488)	0.180*** (0.0494)	0.202*** (0.0489)	0.200*** (0.0515)
Private credit (% of GDP)	-2.913** (1.397)	-	-3.141** (1.383)	-
Private credit of banks (% of GDP)	-	-2.633* (1.360)	-	-2.985** (1.452)
Private credit from other FI (% of GDP)	-	-4.532** (1.823)	-	-4.341*** (1.673)
Error Correction Coefficients				
Phi	-0.322*** (0.0562)	-0.330*** (0.0475)	-0.327*** (0.0655)	-0.335*** (0.0593)
Short-Run Coefficients				
$\Delta$ Relative income (% of GDP)	-0.000928*** (0.000330)	-0.000902*** (0.000333)	-0.000915** (0.000367)	-0.000885** (0.000373)
$\Delta$ Top 5% income share	0.106 (0.0658)	0.112 (0.0687)	-	-
$\Delta$ Top 1% income share	-	-	0.0963 (0.0608)	0.103 (0.0690)
$\Delta$ Gov structural balance (% of GDP)	0.0752 (0.0621)	0.0732 (0.0650)	0.0764 (0.0717)	0.0738 (0.0760)
$\Delta$ Trade (% of GDP)	-0.0520 (0.0396)	-0.0531 (0.0377)	-0.0368 (0.0432)	-0.0382 (0.0411)
$\Delta$ GDP growth	0.00679 (0.0937)	0.00701 (0.0936)	0.000130 (0.105)	-8.53 <sup>-5</sup> (0.105)
$\Delta$ NFA (% of GDP)	5.826** (2.262)	5.863** (2.645)	5.897** (2.720)	6.019* (3.169)
Lag of $\Delta$ CA (% of GDP)	0.152*** (0.0531)	0.151*** (0.0491)	0.133** (0.0606)	0.131** (0.0560)
Lag 2 of $\Delta$ CA (% of GDP)	-0.0325 (0.0559)	-0.0315 (0.0580)	-0.0350 (0.0546)	-0.0341 (0.0562)
Intercept	-0.487 (0.654)	-0.330 (0.527)	-0.419*** (0.154)	-0.390*** (0.113)
No. Countries	14	14	13	13
No. Observations	353	351	318	316

<sup>†</sup> Estimation based on a Dynamic Fixed Effect-ARDL(2, 1) specification. Robust standard errors (clustered at country level) are in parentheses. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$

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