Common Fluctuations in OECD Budget Balances

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Abstract

We analyze comovements in four measures of budget surpluses for 18 OECD countries for 1980–2008 with a dynamic latent factor model. The world factor in national budget surpluses declines substantially in the 1980s, rises throughout much of the 1990s to a peak in 2000, before declining again in the most recent period. This world factor explains a substantial portion of the variability in budget surpluses across countries. World factors in national output gaps, dividend-price ratios, and military spending significantly explain variation in the world budget surplus factor. The significant relationship between national output gaps and OECD measures of cyclically adjusted budget surpluses suggests that such cyclical measures inadequately adjust for the international business cycle. Sizable fluctuations in idiosyncratic components of national budget surpluses often readily relate to well known "unusual" country circumstances.

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1. Introduction

The prospect of vast U.S. budget deficits—12.3 percent of GDP in 2009—has returned fiscal issues to the front burner (Calmes, 2009). Analysts typically credit or blame the government for a country's fiscal situation. Leonhardt (2009), for example, apportions blame for prospective U.S. deficits to current and past presidents. Although Leonhardt (2009) more-or-less ignores the legislative branch, such assignments are appropriate in some sense: Governments decide how much to tax and spend and therefore are ultimately responsible for fiscal outcomes.

When analyzing fiscal balances, however, it is important to consider economic circumstances, because such circumstances determine the welfare implications and sustainability of fiscal policy. We analyze the effects of *international* circumstances in the present paper. Two observations motivate our focus on international aspects of fiscal balances. First, the growth in economic and financial interdependence over the postwar era increases the potential for international circumstances to influence national fiscal policies. Second, Neely 's (2003) casual examination of international comovements in fiscal balances illustrates the relevance of international influences in such matters.

We begin our analysis by estimating a dynamic factor model to identify the *latent world factor* underlying fiscal surpluses in 18 industrialized countries for 1980–2008. This world factor method captures covariation among many variables in a unified framework and has major advantages over alternative procedures for measuring comovments in national budget surpluses. For example, the performance of a few large countries will dominate a weighted average of national surpluses. Similarly, pair-wise correlations or related statistics are unwieldy, difficult to summarize, and fail to provide a unified framework.[1]

The estimated world budget surplus factor, which can be interpreted as a global budget surplus index, varies markedly over our sample: declining during the early 1980s and early 1990s, rising sharply for much of the 1990s to a peak in 2000, before declining again at the end of the sample. This world factor explains a substantial portion of the variability in four alternative national budget

[1]Researchers have recently employed dynamic latent factor models to measure global fluctuations in national real output growth and inflation rates; see, for example, Kose et al. (2003, 2008) with respect to real output growth and Ciccarelli and Mojon (2008), Monacelli and Sala (2009), and Neely and Rapach (2009) with respect to inflation.

surplus measures—net lending, the primary balance, and the cyclically adjusted net lending and primary balance—across countries. Reassuringly, although our procedure does not weight countries by output, it still explains a substantial part of the variability in the U.S. surpluses over the sample.

We then examine the relationships between the world budget surplus factor and estimated world factors in national output gaps, equity valuation ratios, unexpected inflation, and military spending. These variables are potentially important determinants of national budget surpluses and can be viewed as nearly predetermined with respect to fiscal balances. Estimated world factors in national output gaps, price-dividend ratios, and military spending significantly explain fluctuations in the world budget surplus factor. Surprisingly, the world output gap factor even significantly explains the world factor in cyclically adjusted surplus measures. This indicates that OECD cyclical adjustments do not remove all business cycle variation in such measures. The fact that the world dividend-price ratio factor explains movements in the world budget surplus factor highlights the importance of swings in international equity markets in determining common trends in national budget balances. Finally, the significant relationship between world military spending and world budget surplus factors points to the relevance of geopolitical events, such as the fall of the Berlin Wall.

In addition to discerning international trends in fiscal situations, the dynamic factor model decomposes a country's budget surplus into common and idiosyncratic components. We interpret the common component as the typical response of a country's budget surplus to international conditions. This allows one to evaluate whether the government's fiscal position is unusual, compared to its historical record of budget comovement with similar countries. The common component thus provides a useful benchmark against which to gauge government policies and to highlight the importance of particular national circumstances—for example, a war, tax changes, a financial crisis, or atypical terms of trade—versus common reactions to international economic conditions in determining fiscal balances and their sustainability. Substantial fluctuations in the estimated idiosyncratic components of countries' national budget surpluses often readily relate to well known

"unusual" country circumstances. For example, a sharp decline in the idiosyncratic component of Sweden's budget surplus in the early 1990s clearly corresponds to the Swedish banking crisis.

While there is a vast fiscal literature on topics such as fiscal sustainability and the relation between deficits and growth, there is little work that characterizes international determinants of deficits in industrialized countries.[2] Neely (2003) casually studies recent correlations among national budget deficits and speculates that common shocks to technology, demographics, commodity prices, and political uncertainty drive this covariance. Aside from Neely's (2003) very short study, two literatures study the causes of deficits and therefore are tangentially related to the present issue of international influences on budget deficits. First, Roubini and Sachs's (1989) seminal empirical work, related to the theoretical study of Alesina and Tabellini (1990), presents evidence that OECD countries with short-tenure governments and coalition governments are more likely to experience deficits, although Edin and Ohlsson (1991) and de Haan and Sturm (1997) challenge the Roubini-Sachs findings. Second, Lane (2003) finds that OECD countries with volatile output and dispersed political power are more likely to exhibit procyclical fiscal policies, while Strawczynski and Zeira (2009) determine that expenditures and deficits react countercyclically to transitory shocks while government investment reacts procyclically to permanent shocks.

The remainder of the paper is organized as follows. Section 2 outlines the dynamic factor model and its estimation. Section 3 describes the data and reports dynamic factor model estimation results for national budget surpluses, output gaps, equity valuation ratios, unexpected inflation, and military spending. Section 4 analyzes the relationships between world factors in national budget surpluses and the other variables, while Section 5 examines idiosyncratic components in national budget surpluses. Section 6 concludes.

[2]For example, Corsetti and Roubini (1991), Chalk and Hemming (2000), and Heller (2005) consider tests of fiscal sustainability, while Dornbusch and Reynoso (1989), Kneller et al. (1999), Adam and Bevan (2005), and Heller (2005) analyze the relation between deficits and growth.

2. Econometric methodology

The dynamic latent factor model is given by

$$y_{i,t} = \beta_i f_t + \varepsilon_{i,t}, \tag{1}$$

where $y_{i,t}$ is the demeaned budget surplus as a share of GDP for country i ($i = 1,\ldots,N$) in year t ($t = 1,\ldots,T$).[3] The world factor, f_t, is common across all of the $N = 18$ OECD countries we consider and captures the source of global comovements in national budget surpluses. β_i is a loading measuring the response of an individual country's budget surplus to fluctuations in the world factor. The final term in (1), $\varepsilon_{i,t}$, is an idiosyncratic component or country-specific factor.

To make (1) a *dynamic* latent factor model, we permit f_t and $\varepsilon_{i,t}$ to follow autoregressive (AR) processes. Each idiosyncratic component follows an AR(p) process, while the world factor obeys an AR(q) process:

$$\varepsilon_{i,t} = \rho_{i,1}\varepsilon_{i,t-1} + \cdots + \rho_{i,p}\varepsilon_{i,t-p} + u_{i,t}, \tag{2}$$

$$f_t = \rho_{f,1} f_{t-1} + \cdots + \rho_{f,q} f_{t-q} + u_{f,t}, \tag{3}$$

where $u_{i,t} \sim N(0,\sigma_i^2)$, $u_{f,t} \sim N(0,\sigma_f^2)$, and $E(u_{i,t}u_{i,t-s}) = E(u_{f,t}u_{f,t-s}) = 0$ for $s \neq 0$. We set $p = q = 1$ when estimating the dynamic factor model in Section 3; the results are not sensitive to other non-zero values for p or q. We make the standard assumption that the shocks in (2) and (3), $u_{i,t}$ and $u_{f,t}$, respectively, are uncorrelated contemporaneously and at all leads and lags, implying that the world and country-specific factors are orthogonal.

Note that neither the signs nor scales of the factor and factor loadings are separately identified in (1). For example, multiplying the world factor by -2 and the loadings by $-1/2$ produces exactly the same model. To normalize the signs of the factor and loadings, we restrict the loading on the world factor for Australia—the first country (alphabetically) in our sample—to be positive. To normalize the scales, we assume that $\sigma_f^2 = 1$ (e.g., Sargent and Sims, 1977; Stock and Watson, 1989, 1993). The sign and scale normalizations lack economic content and do not affect any

[3] In the dynamic latent factor models discussed in Section 3, $y_{i,t}$ can also represent the demeaned national output gap, dividend-price ratio, unexpected inflation rate, or military spending as a share of GDP.

economic inference. Nevertheless, the factor loadings in Section 3 are typically positive, meaning that national budget surpluses are nearly all positively related to the world factor.

The dynamic factor model attributes comovements in national budget surpluses solely to the world factor, f_t, via the factor loadings, β_i. That is, f_t tracks common fluctuations in national budget surpluses. To provide further intuition, consider two extremes. First, if $\sigma_i^2 = 0$ and $\beta_i \neq 0$ for all i, then $y_{i,t} = \beta_i f_t$ for all i, so that national budget surpluses are perfectly correlated. At the other extreme, if $\beta_i = 0$ and $\sigma_i^2 \neq 0$ for all i, then $y_{i,t} = \varepsilon_{i,t}$ for all i, so that the national budget surpluses are completely uncorrelated. Of course, the patterns in the data are likely to fall between these extremes.

More formally, we can decompose the variation in a country's budget surplus into the share attributable to the world factor, f_t, and the idiosyncratic component, $\varepsilon_{i,t}$. Given that the factors are orthogonal, this variance decomposition is straightforward to compute for country i:

$$\theta_i^{world} = \beta_i^2 \text{var}(f_t)/\text{var}(y_{i,t}), \tag{4}$$

$$\theta_i^{country} = \text{var}(\varepsilon_{i,t})/\text{var}(y_{i,t}), \tag{5}$$

where

$$\text{var}(y_{i,t}) = \beta_i^2 \text{var}(f_t) + \text{var}(\varepsilon_{i,t}). \tag{6}$$

θ_i^{world} ($\theta_i^{country}$) is the proportion of the total variability in country i's budget surplus attributable to the world factor (idiosyncratic component). As discussed above, the world factor will explain a larger proportion of the variation in countries with high β_i and low $\text{var}(\varepsilon_{i,t})$ values. That is, these countries will have a higher θ_i^{world} (and lower $\theta_i^{country}$) and thus be more closely tied to global fluctuations in national budget surpluses.

We could include additional factors in (1) corresponding to, for example, regions, exchange rate systems, or trading blocs. Since all factors are assumed orthogonal, however, the inclusion of additional factors will not affect the estimates of f_t, β_i, or θ_i^{world} in the dynamic latent factor model and so will not affect any of our inferences concerning the world factor.

Because the latent nature of the world factor precludes the use of conventional regression meth-

ods, we follow Otrok and Whiteman (1998) and Kose et al. (2003, 2008) in estimating the model with a Bayesian approach using a Markov Chain Monte Carlo (MCMC) algorithm. We draw from the joint posterior distribution of the world factor, idiosyncratic components, and model parameters by successively drawing from a series of conditional distributions. We compute posterior distribution properties for the world factor, idiosyncratic components, and model parameters based on 10,000 MCMC replications after 2,000 burn-in replications. Otrok and Whiteman (1998) detail the estimation procedure. Because θ_i^{world} and $\theta_i^{country}$ are functions of the model parameters and data, the MCMC algorithm also implies a posterior draw for these statistics for each MCMC replication.

To implement Bayesian analysis, we use the following diffuse conjugate priors, which are similar to those used in Otrok and Whiteman (1998) and Kose et al. (2003, 2008):

$$\beta_i \sim N(0,1) \;\; (i = 1,\ldots,N), \tag{7}$$

$$(\rho_{i,1},\ldots,\rho_{i,p})' \sim N[0, \text{diag}(1, 0.5, \ldots, 0.5^{p-1})] \;\; (i = 1,\ldots,N), \tag{8}$$

$$(\rho_{f,1},\ldots,\rho_{f,q})' \sim N[0, \text{diag}(1, 0.5, \ldots, 0.5^{q-1})], \tag{9}$$

$$\sigma_i^2 \sim IG(6, 0.001) \;\; (i = 1,\ldots,N), \tag{10}$$

where IG denotes the inverse-gamma distribution. Equations (8) and (9) imply that the prior distributions for the AR parameters become more tightly centered on zero as the lag length increases. The prior for the idiosyncratic shock variances given by (10) is very diffuse; Otrok and Whiteman (1998) point out that only the first two moments exist for this proper prior. The results reported in this paper are not sensitive to reasonable perturbations of these priors.

We also assume that the AR processes in (2) and (3) are stationary, which implies that national budget surpluses are $I(0)$ processes.[4] This assumption is consistent with the fact that an intertemporal government budget constraint implies an $I(0)$ budget deficit.

We could estimate the dynamic latent factor model using principal components in a classical, rather than Bayesian, framework. Stock and Watson (2002) and Bai (2003) show that princi-

[4]We enforce the stationarity restrictions by discarding draws of the AR parameters that do not satisfy the restrictions. We do the same to enforce the sign restriction on the factor loading for Australia. Inadmissible AR parameters and Australian loadings are rarely drawn, especially after the burn-in replications.

pal components provide consistent estimates of the factors and parameters in (1), and Bai (2003) provides asymptotic distribution theory for statistical inference. While Bai (2003) derived the asymptotic behavior of his estimator, we are uncertain of its properties in a sample of the size we use here. Principal component factor and parameter estimates are similar to the Bayesian point estimates, but we report only the Bayesian estimates for brevity.[5]

3. Dynamic latent factor model estimation results

3.1. Data

We consider four OECD measures of a country's fiscal position: (i) net lending as a share of GDP, (ii) primary balance as a share of GDP, (iii) cyclically adjusted net lending as a share of potential GDP, (iv) cyclically adjusted primary balance as a share of potential GDP. Net lending is the most common measure of a country's fiscal situation—it is the general government budget surplus. The primary balance excludes interest payments from net lending. Cyclically adjusted net lending and primary balances are attempts by the OECD to measure the fiscal balance if the output gap were zero.[6] We use data from all 18 OECD countries that have full-data samples for each of the four measures for the period 1980 to 2008 (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Greece, Iceland, Ireland, Italy, Japan, the Netherlands, Norway, Spain, Sweden, the United Kingdom, and the United States).

We wish to explain the common variation in our budget surplus measures with other variables that can reasonably be viewed as predetermined with respect to the budget surplus. The output gap is an obvious candidate to explain cyclically unadjusted surpluses. Another candidate is the dividend-price ratio, a proxy for transitory but potentially persistent fluctuations in equity prices that provide temporary revenues through capital gains taxes. For example, the U.S. dividend yield

[5]The complete principal component estimates are available upon request from the authors.

[6]The OECD denotes the four measures as "central government net lending—as a percentage of GDP," "government primary balance—as a percentage of GDP," "cyclically adjusted government net lending—as a percentage of potential GDP," and "cyclically adjusted government primary balance—as a percentage of potential GDP." The OECD describes their cyclical adjustment method at http://www.oecd.org/dataoecd/0/61/36336878.pdf.

and U.S. capital gains taxes as a share of GDP have a correlation of -0.62 from 1970 to 2008. Unexpected inflation has potential effects on debt financing. Finally, we consider whether trends in military spending help to explain budget balances. Governments might treat defense spending variation as they typically treat wars, as a temporary change in expenditures to be accommodated by deficit financing rather than suboptimal discrete changes in taxation.

We use output gap and CPI price level data from the OECD and dividend-price ratio data from Global Financial Data.[7] We obtain military spending data from various issues of World Military Expenditures and Arms Transfers (WMEAT), which is compiled by the U.S. Department of State, Bureau of Verification and Compliance and obtained from the Inter-University Consortium for Political and Social Research (ICPSR).[8] Military spending is measured as a share of GDP.

3.2. Summary statistics

Table 1 reports summary statistics for the fiscal surplus measures from 1980 to 2008. The average fiscal surplus (net lending) was -2.4 percent of GDP and the average standard deviation was 3.4 percentage points. Extreme deficits or surpluses were fairly common: seven of the 18 countries exhibited at least one deficit exceeding 10 percent of GDP, while four experienced at least one surplus exceeding 5 percent of GDP. Cyclically adjusted deficits were somewhat less variable than the unadjusted deficits, with a standard deviation of 2.8 percentage points. The average primary balances were near zero, indicating that government revenues matched expenditures during this sample, when one excludes interest payments on previously accumulated debt.

Figure 1 shows the time series of annual fiscal surpluses for the 18 OECD countries during the 1980–2008 sample. The solid (dashed) blue lines indicate (cyclically adjusted) net lending, while the solid (dashed) red lines indicate the (cyclically adjusted) primary balance. The cyclical

[7]The OECD denotes these variables as "Output gap of the total economy" and "Consumer Price Index." We measure unexpected inflation as the first difference in the CPI inflation rate (Atkeson and Ohanian, 2001). Full-sample dividend-price ratio data are unavailable for Iceland, Ireland, and Spain, and we exclude these countries when estimating the dividend-price ratio world factor in Section 3.4.

[8]The current issue of the WMEAT is available at http://www.state.gov/t/vci/rls/rpt/wmeat/, while back issues were downloaded from http://www.icpsr.umich.edu/cocoon/ICPSR/SERIES/00061.xml. Military spending data are available through 2005. Data are unavailable for Iceland, and we exclude Iceland when estimating the military spending world factor in Section 3.4.

adjustment has the most pronounced impact on Norway's fiscal balances. Norway is also unusual in that its primary balances are more negative than the full balances, presumably because it receives significant revenues from oil exports and its sovereign wealth fund, created in 1990. A glance at the figure reveals that the fiscal balances tend to move together; for example, fiscal situations improve in the late 1990s across countries. We next formally measure the common component in national budget surpluses with the dynamic latent factor model.

3.3. Estimation results for national budget surpluses

For each budget surplus measure, Figure 2 shows the mean as well as the 0.10 and 0.90 quantiles of the posterior distribution for the country loadings on the world budget surplus factor. Except for those of Japan (Norway and Japan), the estimated loadings are always positive for net lending, cyclically adjusted net lending, and the primary balance (cyclically adjusted primary balance).[9] Increases in the world factor thus imply rising budget surpluses for nearly every country. Japan's negative loadings are unsurprising in light of the particular macroeconomic challenges faced by Japan over much of the sample, including the "lost decade" of the 1990s. Norway's negative loading for the cyclically adjusted primary balance likely reflects the large influence that oil exports have on its economy and budget.[10]

Figure 3 displays the mean and 0.10, 0.33, 0.66, and 0.90 quantiles of the posterior distribution for the world factor in each of the four budget surplus measures.[11] Removing interest payments from the budget balances makes relatively little difference to the general patterns in the world factors; compare the world factors for net lending and the primary balance. Figure 3 illustrates significant fluctuations in the world factor for each of the fiscal surpluses: a fall in the early 1980s, a rise to a local maximum in 1989, another downturn to a trough in 1993, a subsequent rise leading to a global maximum in 2000, and a decline thereafter. Overall, Figure 3 illustrates sizable common

[9] We use the mean of the posterior distribution as the point estimate.

[10] The United Kingdom was also an oil exporter for most of the sample, but its oil exports were smaller in absolute value and much less important compared to the size of its economy and government budget.

[11] Observe that the world budget surplus factor is an index, so that a world surplus factor of zero in Figure 3 does not necessarily represent a balanced budget.

variation in national budget surpluses.

Figure 4 illustrates the θ_i^{world} variance decompositions, which measure the extent to which global influences affect national fiscal balances. As in Figure 2, the blue circle corresponds to the mean of the posterior distribution, while the blue bars delineate 0.10 and 0.90 quantiles. On average across the 18 countries, the point estimates indicate that the world factor explains 50 percent of total variance for net lending, 39 percent for cyclically adjusted net lending, 38 percent for the primary balance, and 30 percent for the cyclically adjusted primary balance. The variance decompositions are precisely measured. The difference between the cyclically adjusted and unadjusted measures suggests that the world business cycle explains part of the global influence on deficits, but the variation in the cyclically adjusted measures indicates that there are other important global influences, as well. Likewise, excluding interest payments from the deficit measures, as in the primary balance and the cyclically adjusted primary balance, reduces the variance attributable to the world factor. But the world factor still explains 30 percent of the variance in cyclically adjusted primary balances, on average, across the 18 countries.[12]

To summarize, Figures 2–4 characterize sizable common fluctuations in OECD national budget surpluses, which represent a significant portion of the variability in national budget surpluses. These global influences on fiscal balances extend beyond common business cycle and interest rate effects.

3.4. Estimation results for predetermined variables

To explain the variation in the four measures of fiscal balances, we first compute world factors for national output gaps, dividend-price ratios, unexpected inflation, and military spending, which we treat as nearly predetermined driving variables. We compute the world factors in these variables in the same way that we computed the world factors for the fiscal balances. Figure 5 displays the mean and 0.10 and 0.90 quantiles for each country's loading on the world factor for each of the

[12] As expected, the β_i and θ_i^{world} estimates are positively correlated across countries, with correlation coefficients of 0.46, 0.45, 0.46, and 0.20 for net lending, cyclically adjusted net lending, the primary balance, and the cyclically adjusted primary balance, respectively.

quasi-exogenous variables. The point estimates of the loadings indicate that each variable for each country is positively related to the world factor, with the exception of military spending for Japan.

Figure 6 portrays the estimated world factor for each of the predetermined variables. The world factor for the output gap displays a similar temporal pattern to that in net lending and the primary balance. The 1990s bull market in global equities is clearly evident in the dividend yield world factor (high equity prices and thus low dividend-price ratios), as well as the recent global market "correction." The world factor in unexpected inflation appears to covary with the world output gap factor, in line with an expectations-augmented Phillips curve. The world factor in military spending is fairly steady during the 1980s before starting a long decline around 1989, corresponding to the fall of the Berlin Wall. World factors in output gaps, dividend-price ratios, unexpected inflation, and military spending fluctuate substantially from 1980 to 2008 and are reasonably precisely estimated, except for the military spending factor.[13] The next section formally explains the world fiscal surplus factors with the world factors for the four predetermined variables.

4. Relating predetermined variables to budget surpluses

A priori, we expect that the output gap significantly explains net lending and primary balances, but not the cyclically adjusted versions of those measures. We also conjecture that the dividend-price ratio is negatively related to all fiscal balances through capital gains taxes, because as stock prices exceed fundamental values, government revenues will rise above typical levels. Examination of U.S. capital gains tax receipt data—omitted for brevity—indicates that such receipts can vary by almost 1 percent of GDP within a few years. Unexpected inflation could influence fiscal deficits in either direction. On the one hand, if higher unexpected inflation signals an adverse aggregate supply shock, then one would expect it to reduce fiscal surpluses. Similarly, higher unexpected inflation could increase the cost of financing the short-term portion of the debt. On the other

[13]The world factors typically explain a substantial portion of the variability in national output gaps, price-dividend ratios, unexpected inflation, and military spending, with averages across countries of 0.39, 0.61, 0.28, and 0.52, respectively. For brevity, we do not report the complete results for the variance decompositions, which are available upon request from the authors.

hand, if monetary stimulus produces unexpected inflation, one might expect a larger fiscal surplus. Finally, we expect that defense spending would be negatively related to all fiscal balances. That is, we expect that taxes would not be immediately adjusted for changes in defense spending.

To explore determinants of budget balances, we regress the world fiscal surplus factors on world factors for the output gaps, dividend-price ratios, unexpected inflation, and military spending. We perform the regressions both individually and jointly. The bivariate regression model takes the form:

$$f_t^{surplus} = a + b_j f_t^j + e_t^{surplus}, \tag{11}$$

where $f_t^{surplus}$ is the world factor for the fiscal surplus at time t and f_t^j is the world factor for one of the four explanatory variables, indexed by j—output gaps, dividend-price ratios, unexpected inflation, and military spending. The multiple regression is as follows:

$$f_t^{surplus} = a + \sum_{j=1}^{4} b_j f_t^j + e_t^{surplus}. \tag{12}$$

We estimate (11) and (12) using OLS, accounting for autocorrelation with Newey and West (1987) standard errors.

We present the regressions results with two caveats. First, the factors on both the left- and right-hand-side of the regressions are generated variables. The error in the left-hand-side variables (i.e., the world budget surplus factors) will decrease the apparent amount of predictability in the relations, causing the estimated R^2 to understate the R^2 that is theoretically expected, in the absence of measurement error, because the estimated total sum of squares will exceed the total sum of squares without measurement error. Likewise, the error in the predetermined variables on the right-hand-side will attenuate their estimated coefficients toward zero and thus inflate their p-values. Therefore, the error in the factor estimation will cause our regressions to present a conservative picture of the relation between the fiscal surpluses and predetermined variables.

Second, we view the right-hand-side variables in (11) and (12) as nearly predetermined. Strictly speaking, these variables are endogenous, meaning that the coefficients will be subject to simultaneity bias. We believe that the explanatory variables are largely predetermined, however, and

unlikely to react strongly to contemporaneous fiscal balances. Therefore, we do not believe that simultaneity bias will strongly influence our results.[14]

Table 2 presents the bivariate and multiple regression results for all four fiscal surplus measures. The sample is 1980–2008, except for regressions including military spending, for which the sample is 1980–2005. Given that including military spending reduces the sample length, we estimate multiple regression models with and without this variable.

In the bivariate regressions, the output gap factor is positive and significant at the 1 percent level for net lending and the primary balance, with substantial R^2 statistics of 45 and 48 percent, respectively. That is, international business cycle fluctuations are significantly associated with cyclically unadjusted fiscal surpluses, presumably through the familiar tax and spending channels. Surprisingly, however, the output gap factor is also significant at the 5 percent level for the cyclically adjusted surpluses, with still sizable R^2 statistics of 20 and 15 percent, respectively. The OECD's cyclical adjustments do not completely capture international business cycle effects on budgets.

Consistent with the idea that higher equity prices increase capital gains tax revenues, the dividend-price ratio factor is significantly negatively related to the primary balance and cyclically adjusted primary balance factors in the bivariate regressions. The R^2 statistics are sizable, 24 and 44 percent for the primary balance and cyclically adjusted primary balance, respectively. Our results indicate that global bull (bear) equity markets significantly raise (decrease) the primary balance in industrialized countries. The dividend-price ratio factor is not significantly related to the net lending or cyclically adjusted net lending factor, although the relationship is nearly significant at the 10 percent level for the cyclically adjusted net lending factor. The dividend-price factor explains more of the variability in primary balances than in the non-primary surpluses. A systematic relationship between global equity valuations and interest rates could create this difference.

The unexpected inflation factor significantly explains each fiscal surplus factor in the bivariate regressions. As noted in Section 3.4, the unexpected inflation factor is positively correlated with

[14]Our exercise is similar in spirit to Crucini et al. (2008) in the context of explaining the G-7 business cycle. They first estimate a world factor in G-7 real output growth rates, which they then explain using world factors in G-7 measures of productivity, fiscal policy, monetary policy, oil prices, and terms of trade.

the output gap factor, so that the significantly positive coefficients on the unexpected inflation factor likely capture similar business cycle effects.

The military spending factor is significant at the 1 percent level in the bivariate regression model for each fiscal surplus factor. The R^2 statistics are substantial, ranging from 38 to 57 percent. The estimated negative coefficients point to a global peace dividend: Decreases in military spending across countries lead to improved fiscal balances across countries.

In the multiple regressions, the output gap factor remains significant at the 1 percent level for the two cyclically unadjusted fiscal surplus factors and significant at the 5 percent level for the cyclically adjusted primary balance. This confirms the evidence that the cyclical adjustments do not completely capture international business cycle effects. The dividend-price ratio factor is significantly related to the primary balance and cyclically adjusted primary balance factors at the 1 percent level but is not significant for net lending or its cyclically adjusted counterpart. Unexpected inflation coefficients are negative and no longer significant in any of the multiple regressions, probably because it is strongly correlated with the output gap factor. The military spending factor significantly explains all of the fiscal surplus factors at conventional levels, with the exception of the primary balance factor. The R^2 statistics in the fifth column of Table 2 show that world factors in the four predetermined variables collectively explain much of the variability in the surplus factors, especially for the cyclically unadjusted and adjusted primary balance factors, where the R^2 statistics are both nearly 80 percent.[15]

When we exclude the military spending factor in the multiple regression models and use a 1980–2008 sample, the output gap and dividend-price ratio factors are both significant at least at the 10 percent level for each of the four surplus factors. The unexpected inflation factor remains insignificant at conventional levels in each of the four regressions. The R^2 statistics continue to be substantial in the final column of Table 2, ranging from 34 to 70 percent.

In summary, Table 3 indicates that the output gap, price-dividend ratio, and military spending

[15]To get a sense of the appropriateness of the quasi-exogeneity assumption, we also computed instrumental variable estimates of the multiple regression model coefficients with lagged values of the nearly predetermined variables serving as instruments. The inferences are similar to those obtained from Table 2, so that endogeneity bias does not appear to be important.

world factors substantially determine fluctuations in fiscal surplus world factors. Unexpected inflation also has predictive value when considered by itself but not in conjunction with the other variables. Global expansions, bullish equity markets, and military spending reductions improve fiscal balances across industrialized countries.[16]

5. Idiosyncratic components

Our method of investigating international influences on fiscal balances permits us to isolate the effect of domestic events on fiscal balances. That is, we can examine the common and idiosyncratic components of budget surpluses to determine the effect of domestic events or policies. Figure 7 displays common and idiosyncratic components for selected countries' net lending.[17]

The top left panel of Figure 7 shows demeaned U.S. net lending and its two components, the common component—the product of the world factor and its loading—and the U.S. idiosyncratic component. Demeaned net lending is the sum of the common and idiosyncratic components, of course. The figure illustrates that both global and idiosyncratic components contributed to the major movements in U.S. net lending over the sample. For example, both components contributed to the increase in deficits in the early 1980s and the movement from substantial deficits to surplus in the 1990s. The substantial deterioration in the U.S. fiscal balance in 2001 was mostly due to the U.S. idiosyncratic component, however. That is, U.S. factors—such as the 2001 tax cuts, the September 11th attacks, and the wars in Afghanistan and Iraq—bore the lion's share of the blame for the decline in the fiscal situation during that period.

The upper right panel of Figure 7 portrays the idiosyncratic components for a pair of highly indebted European countries, Belgium and Greece. The idiosyncratic components were quite dif-

[16] We also estimated fixed-effects panel regression models with national fiscal surpluses serving as regressands and national output gaps, price-dividend ratios, unexpected inflation, and military spending serving as regressors. (The complete results are not reported for brevity and are available upon request from the authors.) The national output gap and military spending are significant determinants of national net lending and cyclically adjusted net lending, while the national output gap, dividend-price ratio, and military spending are significantly related to the national primary balance and cyclically adjusted primary balance. Of course, panel estimation does not explicitly identify world factors in national budget surpluses and their determinants—the focus of this paper—but it does appear to pick up aspects of the links that we document in Table 2.

[17] The complete set of common and idiosyncratic components are available upon request from the authors.

ferent in these two countries during the 1980s. Both countries, however, faced pressure in the 1990s to reduce their debt and deficits to levels required by the Maastricht Treaty for entry into the European Economic and Monetary Union on January 1, 1999. This regional influence is clearly evident during the 1990s for these countries' idiosyncratic components.

The lower left panel of Figure 7 shows the common and idiosyncratic components for Sweden and highlights the important role played by the Swedish banking crisis of 1990–1994. During the late 1980s, the idiosyncratic component contributed to a marked improvement in Sweden's fiscal surplus. With the advent of the banking crisis, however, Sweden was forced to spend relatively large sums recapitalizing its banking systems, resulting in a sharp decrease in the idiosyncratic component during the early 1990s. The common component also decreased in the early 1990s, so that the early 1990s are characterized by a steep decline in overall Swedish net lending. As expected, the resolution of the banking crisis led to a sizable increase in the idiosyncratic component during the late 1990s.

Finally, the lower right panel of Figure 7 illustrates the importance of the oil market for Norway. In addition to the Norwegian idiosyncratic component, the figure shows the value of Norwegian oil exports as a share of GDP. The two variables clearly move together, indicating that oil revenues are especially important for improving the fiscal situation in Norway. Observe, however, that oil revenues moved up while the idiosyncratic component moved down around 1990. This likely reflects the influence of the Scandinavian banking crisis, which affected Norway and appeared to start earlier than the Swedish crisis (Vale, 2004). The increase in oil revenues during this time helped to cushion the negative budgetary impulse of the banking crisis.

In summary, decomposing net lending into common and idiosyncratic components allows us to more easily evaluate the effects of domestic events and policies on a country's fiscal situation.

6. Conclusion

The emergence of the prospect of unprecedented deficits in the United States has rekindled interest in the causes of such imbalances and the question of responsibility for them. Properly

addressing these imbalances requires understanding their sources and influences, including international influences.

While researchers, such as Roubini and Sachs (1989), have examined how political polarization might affect deficits, and others, such as Lane (2003), have evaluated the cyclicality of deficits, there has been no significant previous work on internationally driven comovements in deficits. This paper identifies substantial international comovements in four budget surplus measures for 18 OECD countries for 1980–2008 with a dynamic latent factor model. Depending on the measure of the fiscal surplus, the world factor explains between 30 and 50 percent of surplus variability, on average, across countries. The world factor explains 37 percent of the variation in U.S. net lending, for example.

World factors in national output gaps, dividend-price ratios, and military spending usually significantly explain variation in the four world fiscal surplus factors. Surprisingly, the output gap factor significantly explains not only the net lending and primary balance factors, but the cyclically adjusted versions of those measures. This indicates that the OECD cyclical adjustments do not completely remove the contribution of the international business cycle on fiscal balances. The importance of the world dividend-price ratio factor highlights the role of global equity market conditions in affecting fiscal balances, while the significance of the military spending factor points to an international peace dividend in the 1990s.

Our results show that international business cycle, equity market, and military spending trends create common fluctuations in national budget surpluses. The discovery of a significant global factor in international budget deficits suggests avenues for future research. What global political economy incentives influence fiscal balances? Do individual governments respond optimally to these international shocks? Can individual country characteristics explain varying sensitivities of national fiscal balances to international influences? Our findings highlight the relevance of such questions.

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Table 1
Summary statistics for annual budget surpluses, 18 OECD countries, 1980–2008

Country	Mean	Standard deviation	Minimum	Maximum	Mean	Standard deviation	Minimum	Maximum
	Net lending as a share of GDP				Cyclically adjusted net lending as a share of potential GDP			
Australia	−0.015	0.026	−0.055	0.020	−0.014	0.024	−0.050	0.020
Austria	−0.028	0.014	−0.059	−0.002	−0.025	0.012	−0.053	−0.008
Belgium	−0.054	0.048	−0.160	0.004	−0.050	0.043	−0.157	0.003
Canada	−0.032	0.040	−0.091	0.029	−0.030	0.035	−0.085	0.021
Denmark	−0.083	0.039	−0.108	0.051	−0.007	0.032	−0.090	0.054
Finland	0.018	0.041	−0.083	0.069	0.024	0.026	−0.031	0.061
France	−0.030	0.013	−0.064	−0.001	−0.029	0.012	−0.059	−0.008
Greece	−0.071	0.031	−0.140	−0.023	−0.071	0.032	−0.141	−0.024
Iceland	−0.005	0.030	−0.047	0.063	−0.006	0.025	−0.044	0.051
Ireland	−0.034	0.054	−0.133	0.047	−0.033	0.052	−0.141	0.031
Italy	−0.072	0.040	−0.124	−0.009	−0.068	0.041	−0.123	−0.005
Japan	−0.035	0.034	−0.112	0.021	−0.035	0.031	−0.109	0.011
Netherlands	−0.029	0.026	−0.092	0.020	−0.026	0.022	−0.080	0.012
Norway	0.070	0.059	−0.019	0.200	−0.010	0.023	−0.060	0.233
Spain	−0.032	0.027	−0.073	0.022	−0.026	0.024	−0.068	0.020
Sweden	−0.014	0.044	−0.112	0.037	−0.013	0.033	−0.076	0.032
United Kingdom	−0.029	0.025	−0.080	0.037	−0.028	0.020	−0.070	0.010
United States	−0.033	0.020	−0.058	0.016	−0.031	0.018	−0.053	0.009
Average	−0.024	0.034	−0.089	0.033	−0.027	0.028	−0.083	0.018
	Primary balance as a share of GDP				Cyclically adjusted primary balance as a share of potential GDP			
Australia	0.011	0.019	−0.023	0.039	0.012	0.016	−0.013	0.039
Austria	−0.003	0.014	−0.026	0.025	0.000	0.011	−0.020	0.018
Belgium	0.022	0.039	−0.088	0.065	0.025	0.036	−0.085	0.066
Canada	−0.001	0.036	−0.064	0.060	0.002	0.033	−0.054	0.059
Denmark	0.024	0.037	−0.074	0.095	0.025	0.030	−0.057	0.080
Finland	0.015	0.040	−0.087	0.079	0.020	0.025	−0.035	0.071
France	−0.008	0.011	−0.037	0.011	−0.007	0.010	−0.033	0.009
Greece	−0.009	0.032	−0.061	0.038	−0.010	0.034	−0.067	0.043
Iceland	−0.002	0.026	−0.040	0.056	−0.003	0.022	−0.042	0.044
Ireland	0.001	0.040	−0.075	0.056	0.001	0.041	−0.092	0.043
Italy	0.000	0.034	−0.067	0.058	0.003	0.036	−0.071	0.068
Japan	−0.021	0.034	−0.097	0.033	−0.021	0.032	−0.094	0.027
Netherlands	0.005	0.022	−0.048	0.049	0.008	0.019	−0.037	0.033
Norway	0.023	0.038	−0.052	0.082	−0.070	0.045	−0.136	−0.005
Spain	−0.009	0.028	−0.063	0.033	−0.003	0.023	−0.042	0.032
Sweden	−0.011	0.044	−0.116	0.147	−0.010	0.034	−0.084	0.034
United Kingdom	−0.002	0.025	−0.056	0.060	−0.002	0.021	−0.046	0.034
United States	−0.006	0.020	−0.032	0.041	−0.004	0.019	−0.030	0.035
Average	0.002	0.030	−0.061	0.052	−0.002	0.027	−0.058	0.041

Note: “Average” is the average across all of the countries.

Table 2
OLS estimation results, bivariate and multiple regression models, 1980–2008

	Bivariate regression		Multiple regression		Multiple regression, excluding military spending	
Regressor	Coefficient (t-statistic)	R^2	Coefficient (t-statistic)	R^2	Coefficient (t-statistic)	R^2
A. Regressand = Net lending, world factor						
Output gap, world factor	0.93 (3.54)	45%	0.75 (2.90)	71%	0.97 (3.25)	52%
Dividend-price ratio, world factor	−0.62 (−1.29)	9%	−0.27 (−1.16)		−0.58 (−1.72)	
Unexpected inflation, world factor	2.35 (3.20)	19%	−0.40 (−0.61)		−0.38 (−0.58)	
Military spending, world factor	−2.22 (−5.49)	42%	−1.54 (−3.78)			
B. Regressand = Cyclically adjusted net lending, world factor						
Output gap, world factor	0.54 (2.01)	20%	0.32 (1.23)	61%	0.55 (1.82)	34%
Dividend-price ratio, world factor	−0.70 (−1.63)	15%	−0.35 (−1.42)		−0.68 (−1.89)	
Unexpected inflation, world factor	1.61 (2.22)	12%	−0.22 (−0.33)		−0.21 (−0.30)	
Military spending, world factor	−2.16 (−6.03)	55%	−1.62 (−4.21)			
C. Regressand = Primary balance, world factor						
Output gap, world factor	0.82 (4.44)	48%	0.79 (4.43)	79%	0.88 (4.76)	70%
Dividend-price ratio, world factor	−0.84 (−2.18)	24%	−0.98 (−5.41)		−0.84 (−3.14)	
Unexpected inflation, world factor	2.11 (2.78)	22%	−0.42 (−0.81)		−0.61 (−1.18)	
Military spending, world factor	−1.87 (−3.71)	38%	−0.38 (−1.23)			
D. Regressand = Cyclically adjusted primary balance, world factor						
Output gap, world factor	0.36 (2.01)	15%	0.29 (2.11)	78%	0.39 (2.52)	58%
Dividend-price ratio, world factor	−0.89 (−2.87)	44%	−0.95 (−6.00)		−0.91 (−3.39)	
Unexpected inflation, world factor	1.21 (1.71)	12%	−0.25 (−0.62)		−0.40 (−0.89)	
Military spending, world factor	−1.80 (−4.82)	57%	−0.62 (−2.34)			

Notes: t-statistics are based on Newey-West standard errors. The sample is 1980–2005 for regression models that include military spending, world factor as a regressor.

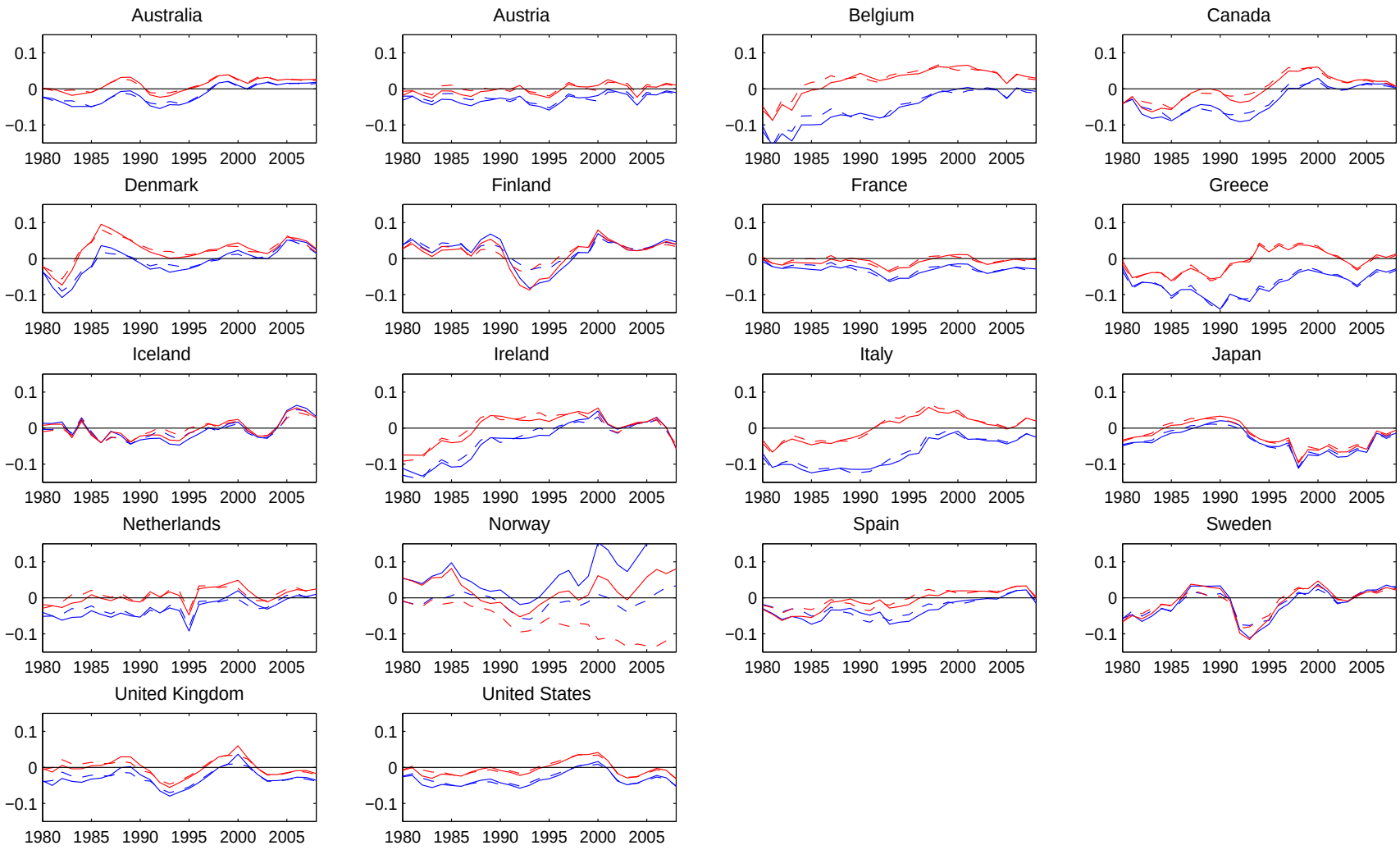

Fig. 1. Annual budget surpluses, 18 OECD countries, 1980–2008. Solid blue line is net lending as a share of GDP; dashed blue line is cyclically adjusted net lending as a share of potential GDP; solid red line is primary balance as a share of GDP; dashed red line is cyclically adjusted primary balance as a share of potential GDP.

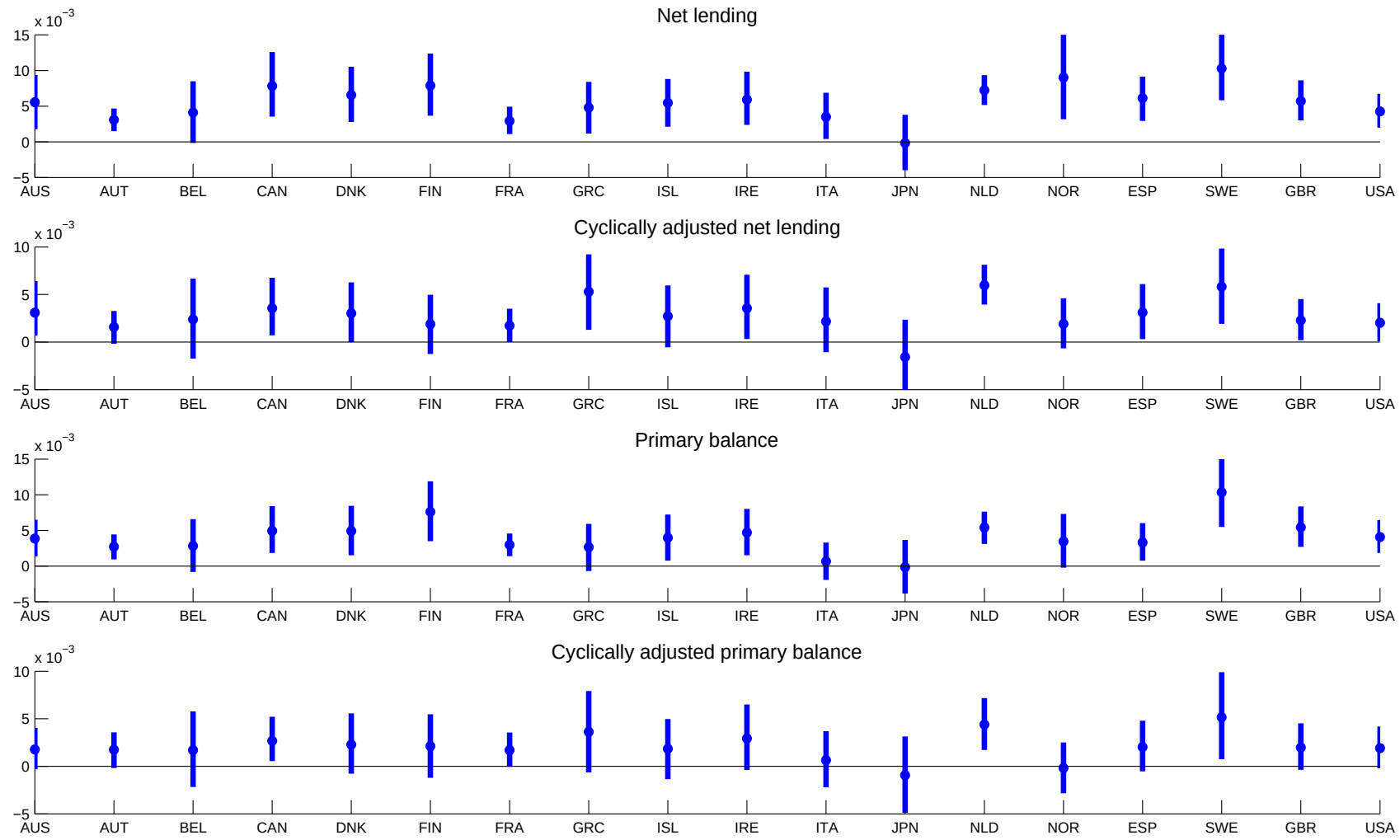

Fig. 2. Loadings on the world factor for budget surpluses, 1980–2008. Circle indicates the mean and vertical bars delineate 0.10 and 0.90 quantiles for the posterior distribution.

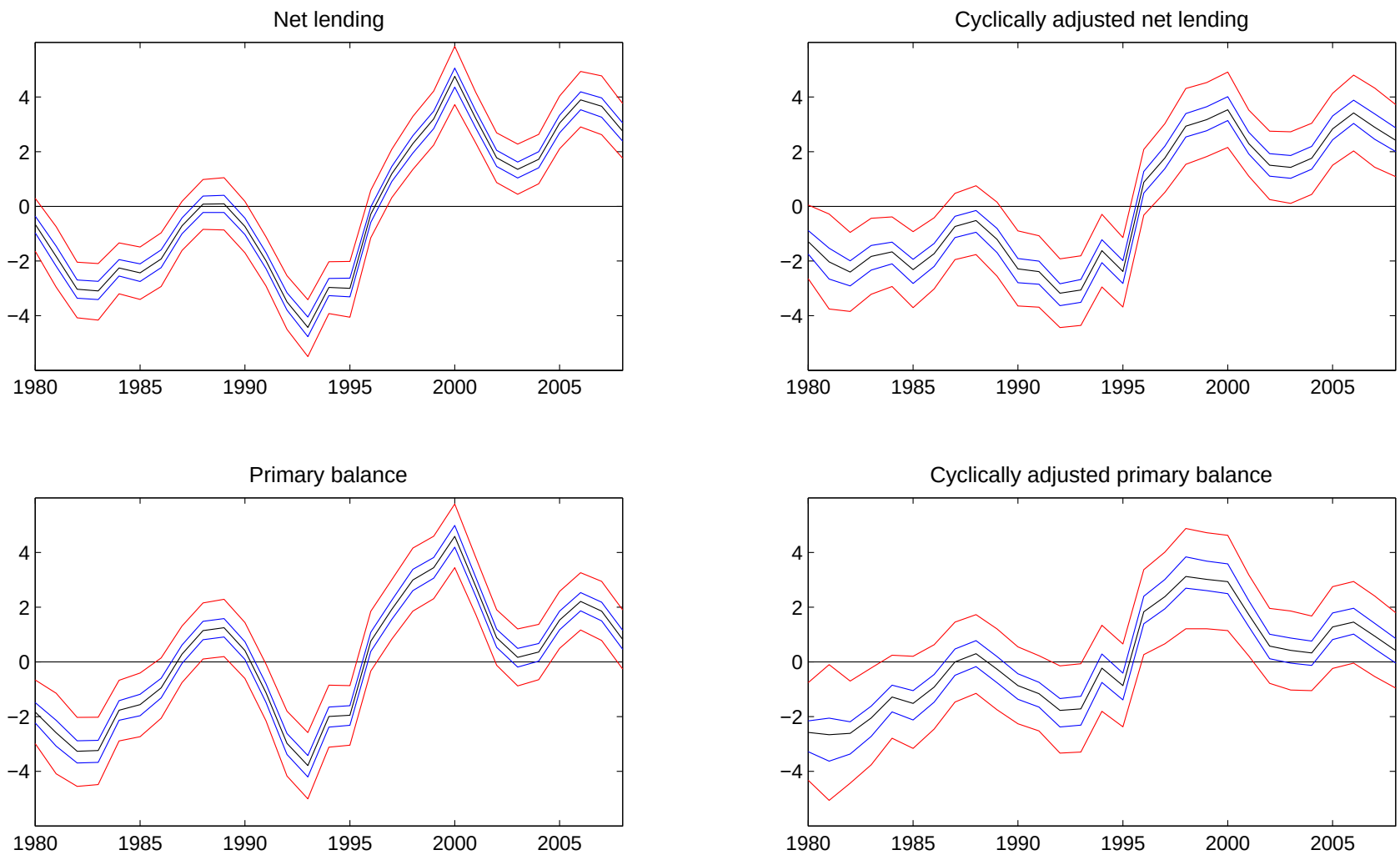

Fig. 3. World factors for budget surpluses, 1980–2008. Black line delineates the mean of the posterior distribution. Blue (red) lines delineate the 0.33 and 0.66 (0.10 and 0.90) quantiles for the posterior distribution.

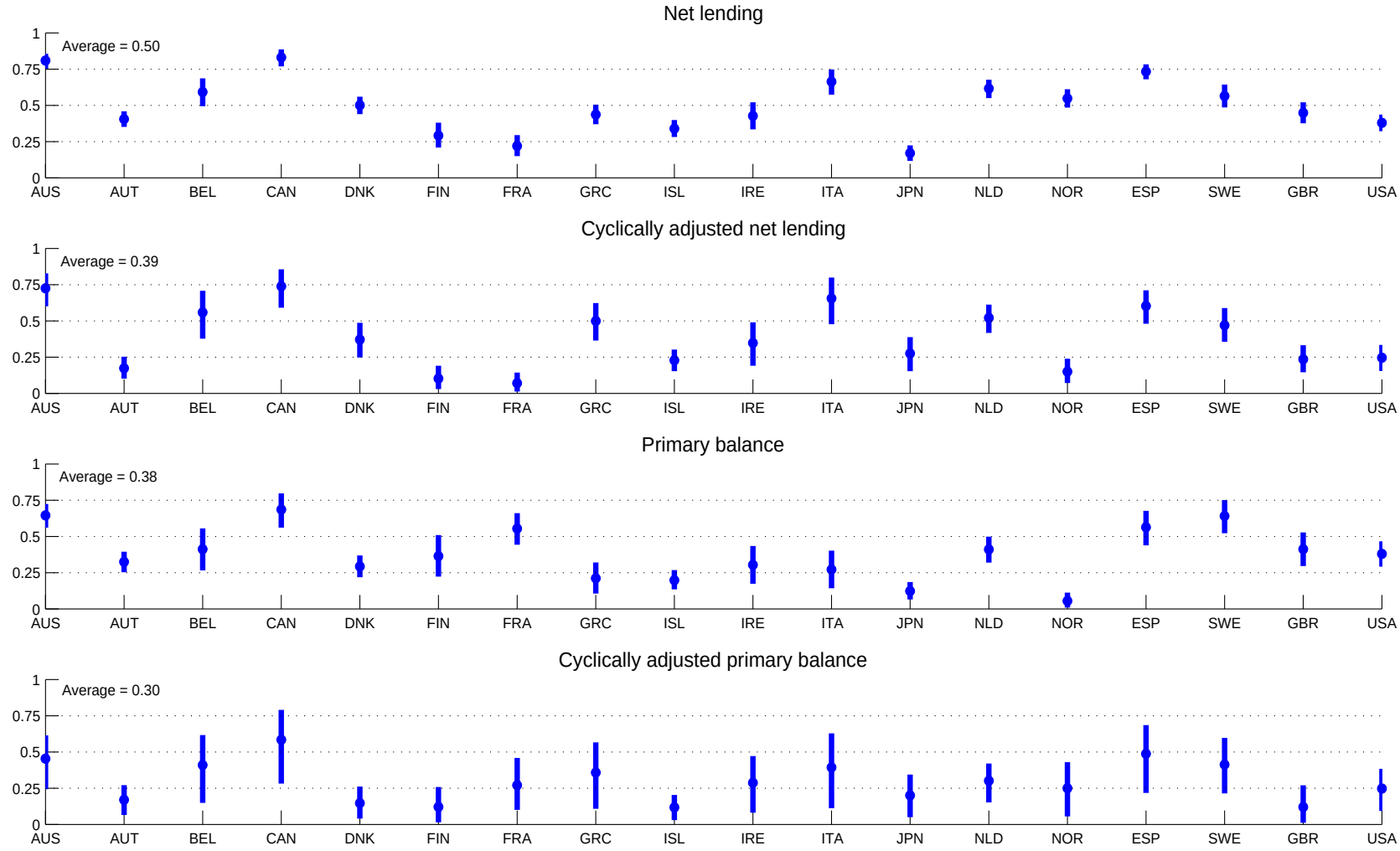

Fig. 4. θ_i^{world} variance decompositions for budget surpluses, 1980–2008. Circle indicates the mean and vertical bars delineate 0.10 and 0.90 quantiles for the posterior distribution. "Average" is the average of the posterior means across all of the countries.

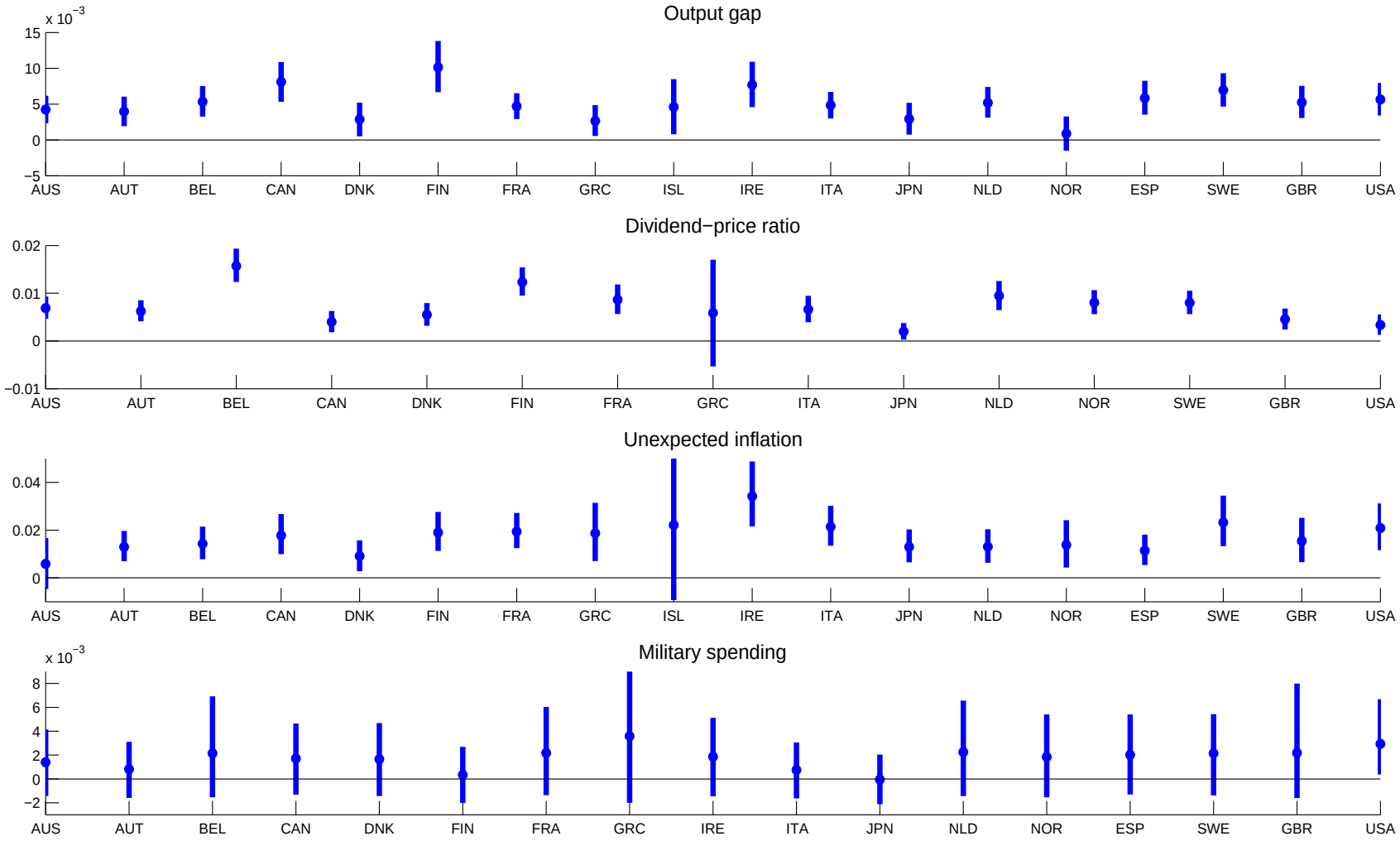

Fig. 5. Loadings on the world factor for predetermined variables, 1980–2008. Circle indicates the mean and vertical bars delineate 0.10 and 0.90 quantiles for the posterior distribution. Estimated loadings for military spending are based on data for 1980–2005.

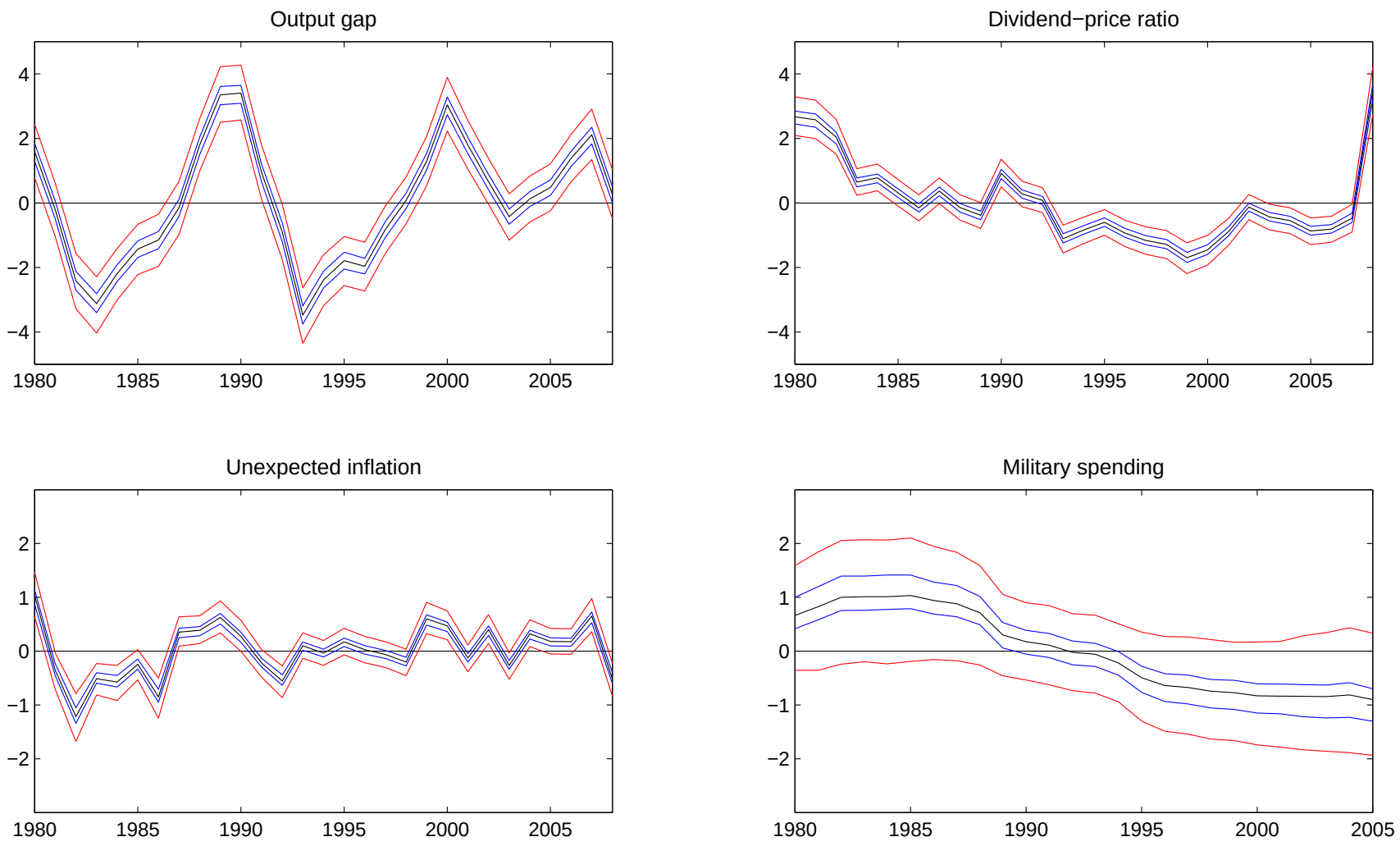

Fig. 6. World factors for predetermined variables, 1980–2008. Black line delineates the mean of the posterior distribution. Blue (red) lines delineate the 0.33 and 0.66 (0.10 and 0.90) quantiles for the posterior distribution. The world factor for military spending is estimated for 1980–2005.

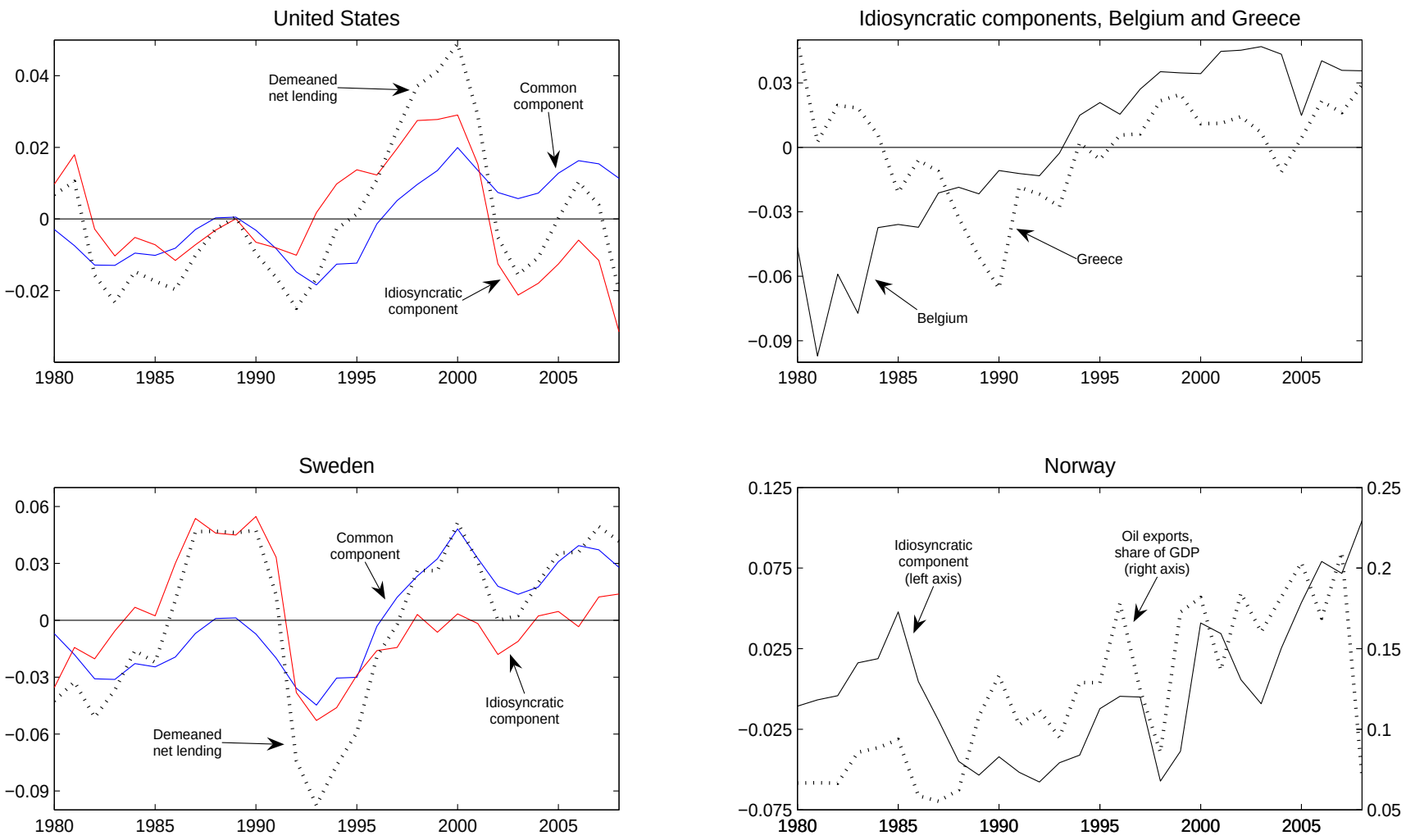

Fig. 7. Common and idiosyncratic components for demeaned net lending, 1980–2008, selected countries.