RESEARCH SEMINAR IN INTERNATIONAL ECONOMICS

Gerald R. Ford School of Public Policy
The University of Michigan
Ann Arbor, Michigan 48109-3091

Discussion Paper No. 562

Oil Shocks and External Balances

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Abstract: This paper studies the effects of demand and supply shocks in the global crude oil market on several measures of countries' external balance, including the oil trade balance, the non-oil trade balance, the current account and changes in net foreign assets (NFA) during 1975–2004. We explicitly take a multilateral and global perspective. In addition to the United States, the Euro area and Japan, we consider a number of regional aggregates including oil-exporting economies and middle-income oil-importing economies. Our first result is that the effect of oil shocks on the merchandise trade balance and the current account, which depending on the source of the shock can be large, depends critically on the response of the *non-oil* trade balance, and differs systematically between the United States and other oil importing countries. Second, using the Lane-Milesi-Ferretti NFA data set, we document the presence of large and systematic (if not always statistically significant) valuation effects in response to oil shocks, not only for the United States, but also for other oil-importing economies and for oil exporters. Our estimates suggest that increased international financial integration will tend to cushion the effect of oil shocks on NFA positions for major oil exporters and for the United States, but may amplify it for other oil importers.

JEL Codes: F32, F36, O16, O57, Q43

Key Words: Oil prices; External Balances; Oil demand Shocks; Oil supply Shocks; International Financial Integration.

Acknowledgements: Christian de Guzman provided excellent research assistance. The views expressed in this paper are those of the authors and do not necessarily represent those of the IMF or IMF policy.

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1. Introduction

A large literature has investigated the macroeconomic impact of oil-price shocks, focusing in particular on the response of real economic growth and consumer price inflation in oil-importing countries (see Barsky and Kilian (2004) and Hamilton (2005) for recent reviews). A much smaller literature including, for example, Bruno and Sachs (1982), Ostry and Reinhart (1992), and Gavin (1990, 1992) has studied the impact of oil price shocks on external accounts.

This relative neglect of the external channels of the transmission of oil price shocks does not reflect a lack of interest in this question. On the one hand, a common premise in policy discussions is that oil price shocks have large and often harmful effects on external accounts, forcing countries to borrow from abroad to offset adverse terms-of-trade shocks. On the other hand, it is sometimes suggested that there is not enough international risk sharing. In that view, the ensuing imbalances may not be large enough to cushion the domestic impact of oil price shocks effectively. Thus, it is interesting from both a policy and a theoretical point of view to investigate and to quantify the impact of oil price shocks on external balances.

Recent developments in the crude oil market and the emergence of large global external imbalances have reignited the long-standing policy discussion about the role of oil prices in determining external balances (see, e.g., Rebucci and Spatafora 2006). There is renewed interest in the question of how so-called petrodollars will be recycled in the global economy, along with the recognition that the impact of disturbances in the crude oil market on oil-importing economies depends in part on how increased oil-export revenues are recycled through international trade in goods and assets.

Our paper provides the most comprehensive analysis of the effects of oil price shocks on external balances to date. Drawing on new data sets and on methodologies that until recently were not available, we document the dynamic effects of demand and supply shocks in the crude oil market on external balances during 1975–2004. The paper also examines the changing importance of these shocks over time by means of historical decompositions.

Our analysis departs from the existing literature in several dimensions. First, one of the shortcomings of earlier studies has been the very short time span of data available. Our analysis covers a far longer time span and more oil price shock episodes than previous studies.

Second, previous studies of oil shocks tended to focus exclusively on the trade balance and the current account. In this paper we further differentiate between the effects of oil shocks on the oil-trade balance and the non-oil trade balance, highlighting the role of the non-oil trade balance in offsetting oil trade deficits. We also consider the effects of oil shocks on the valuation of net foreign assets (NFA). Valuation effects in the form of capital gains and losses have been documented by Lane and Milesi-Ferretti (2006) and Gourinchas and Rey (2006) for the United States and other countries. We address the complementary question of whether there are systematic valuation effects in response to oil shocks that help financially integrated economies cope with oil trade deficits.

Third, previous studies did not analyze the impact of oil price shocks from a multilateral perspective, but focused on selected oil-importing industrialized economies. While that focus was appropriate in the context of these earlier studies, it leaves many questions unanswered. For example, how do external balances in Japan and Europe respond to such shocks compared to the United States? How do oil exporters respond to higher oil prices? How do middle-income economies in Latin America and East Asia respond to oil price fluctuations? In order to answer these questions our paper explicitly takes a global perspective. In addition to the economies of Japan and of the United States, we consider several regional aggregates including oil-importing middle-income economies, OPEC members and a broader aggregate of oil-exporting economies. This level of disaggregation allows us for the first time to provide a comprehensive analysis of the international transmission of oil price shocks, while also shedding light on the question of how different types of economies and different regions of the world are affected by oil price shocks.

Fourth, our study avoids some of the methodological drawbacks of earlier studies by exploiting recent advances in the measurement of shocks in the oil market (see Kilian 2006c). We not only control for reverse causality from global macroeconomic aggregates to the price of oil, but we also differentiate between different sources of variation in the price of oil. Our analysis illustrates the importance of distinguishing between oil price changes driven by crude oil supply shocks, by changes in the precautionary demand for crude oil and by innovations to the global demand for industrial commodities.

The main results of the analysis are as follows. First, the overall effect of oil shocks on the trade balance, which depending on the source of the shock may be large, depends critically on the response of the *non-oil* trade balance, and differs systematically between the United States and other oil importing countries. In contrast, the responses of middle-income oil-importing economies do not differ systematically from those of the Euro area or Japan.

Second, using the Lane and Milesi-Ferretti (2006) NFA data set, we document the presence of valuation effects in response to oil shocks, not only for the United States, but also for other oil-importing economies and for oil exporters. While in some cases large and systematic, the estimated valuation effects for oil-importing countries are in general difficult to interpret without a fully articulated economic model, since they depend on the cross-ownership of assets among oil-importing economies and on the relative responses of oil-importing countries' currencies and asset prices. Our analysis suggests that capital gains and losses play an important role for net foreign asset dynamics, in particular in response to oil demand shocks, making it necessary to consider the degree of financial integration of a country in predicting the effect of such a shock. Our estimates suggest that increased international financial integration will tend to cushion the effect of oil shocks on NFA positions for major oil exporters and for the United States, but may amplify it for other oil importers.

The remainder of the paper is organized as follows. Section 2 discusses the mechanisms by which oil price fluctuations are expected to drive external balances. We emphasize the limited applicability of frameworks in which oil price shocks are assumed exogenous. Section 3 describes the econometric methodology used in this study. Section 4 discusses the data. Section 5 reports the estimation results. Section 6 summarizes our main findings and outlines some policy conclusions.

2. Theoretical Background

A number of theoretical studies have examined the impact of oil price shocks on external accounts, holding everything else constant.[1] It is common to focus on one of two limiting cases: financial autarky or perfect capital mobility.[2] Under financial autarky, by definition, external current-account imbalances cannot emerge in response to oil price shocks. Under perfect capital mobility, in contrast, the intertemporal approach to the current account, suggests that a temporary

[1] Sen (1994) provides an overview of various channels of transmission. Rebucci and Spatafora (2006) discuss the global transmission of oil-price shocks to macroeconomic and financial variables. Bodenstein, Erceg, Guerrieri (2006) is a recent example of a DSGE model of the effect of oil price shocks on external accounts.

[2] Perfect capital mobility is consistent with financial market incompleteness in the Arrow-Debreu sense, as typically assumed in this literature, because only one financial instrument is traded internationally. Under financial market completeness, external balances that arise in response to oil price shocks have no implications for real allocations.

oil-price shock should be met with no internal adjustment and a purely transitory flow imbalance. Conversely, if the shock is permanent, it should be met with full internal adjustment. Such adjustment, however, may prove costly, especially if undertaken quickly. Thus, to the extent that agents delay or smooth the internal adjustment process, external imbalances may arise even when oil price increases are permanent.

Once set in motion, the adjustment process may work through several channels. For our purposes, it is useful to distinguish the traditional channels of external adjustment labeled the "trade" (or macroeconomic) channel, and the "financial" (or valuation) channel of adjustment.[3] The trade channel works through changes in the quantities and prices of goods exported and imported; the financial channel instead works through changes in external portfolio positions and asset prices.

Focusing first on the trade channel, an oil-price increase (all else equal) lowers real income in oil importing economies, as the terms of trade deteriorate. As real income falls in oil importing countries, firms and households will curtail their expenditures and investment plans. Oil importers' currencies will depreciate, while oil exporters' currencies will appreciate in response to their real income gains. Real output falls at least temporarily in the oil-importing economy. Over time, the initial oil trade deficit will decrease, and the non-oil trade balance increase. Policy responses may further cushion or amplify these effects.

The workings of the financial channel in response to an oil-price increase are more nuanced. The financial channel could either cushion or exacerbate the effect of oil price increases on oil-importing countries' external balances. A decrease in asset prices and dividends in oil-importing countries in response to an oil price increase will affect all asset owners, including residents of oil exporting countries. Conversely, asset prices in oil exporting countries will increase, again affecting all asset owners, including residents of oil importing countries. As a result, capital gains and income flows may blunt the impact of oil-price changes on the current account and on NFA changes. Bond and equity prices and exchange rates typically respond much faster than the prices and quantities of goods (and faster than portfolio positions). In practice, the response will depend on the precise configuration of countries' portfolios, and the extent to which these portfolios can be rebalanced effectively. With certain portfolio

[3] Gourinchas and Rey (2006) analyze the empirical relevance of trade versus financial channels for the United States. Ghironi, Lee, and Rebucci (2006) discuss the theoretical workings of the financial channel.

configurations, the financial consequences of the shock could even completely offset the need for short-term external adjustment. A case in point are the United States, which have mostly fixed income liabilities denominated in own currency, while equity and foreign direct investment holdings are denominated in foreign currency. In other cases, the financial consequences of the shock might require additional external adjustment through the macroeconomic channel. An example are oil importing emerging economies which have mostly fixed income liabilities in foreign currency and much smaller foreign asset positions. In the long run, however, country portfolios will adjust, and the financial channel becomes less important.

While this set of results provides a useful framework for thinking about the effects of an exogenous shift in oil prices, they may be of limited use in practice because (1) they do not allow for endogenous responses of the real price of oil to the global economy, and because (2) they do not distinguish between demand and supply shocks in the crude oil market.

More specifically, theoretical models of the effect of oil price shocks on the economy in general (and on external accounts in particular) have typically been constructed under the premise that one can think of varying the price of crude oil, while holding all other variables in the model constant. In other words, oil prices are treated as exogenous with respect to the global economy (see, e.g., Bodenstein et al. 2006). This premise is not credible (see, e.g., Barsky and Kilian 2002, 2004; Hamilton 2003). There are both good theoretical reasons and strong empirical evidence that global macroeconomic fluctuations influence the price of crude oil (see Kilian 2006a, 2006c). For example, it is widely accepted that a global business cycle expansion (as in recent years) tends to raise the price of oil.[4] The fact that the same economic shocks that drive macroeconomic aggregates (and thus external accounts) also may drive the price of crude oil makes it impossible to separate cause and effect in studying the effect of higher oil prices on external accounts without a structural model of oil prices. This means that the question of how external accounts respond to an increase in the price of oil is not well defined.

Moreover, even if we were to control for reverse causality, existing theoretical models postulate that the effect of an exogenous increase in the price of oil is the same, regardless of which shocks in the oil market are responsible for driving up the price of crude oil. Recent work by Kilian (2006c) has shown that the effects of demand and supply shocks in the crude oil

[4] As noted by Hamilton (2005), “it is clear … that demand increases rather than supply reductions have been the primary factor driving oil prices over the last several years.”

market on U.S. macroeconomic aggregates are qualitatively and quantitatively different, depending on whether the oil price increase is driven by a booming world economy (resulting in high demand for all industrial commodities including crude oil), by a disruption of global crude oil production, or by shifts in precautionary demand for crude oil that reflect increased concerns about the availability of future oil supplies. It is quite natural to expect similar differences in the effect of these shocks on external accounts. In addition, oil price shocks historically have been driven by varying combinations of oil demand and oil supply shocks, so their effect on external aggregates is bound to be different from one episode to the next. In the next section, we outline an empirical methodology that addresses both of these concerns and enables us to shed new light on the transmission of oil price shocks.

3. Empirical Methodology

Our empirical approach involves two main steps. The first step is to trace fluctuations in the real price of crude oil to the underlying demand and supply shocks in the crude oil market. The second step is to assess empirically the responses of external accounts of selected countries and country groups to the demand and supply shocks in the crude oil market identified in the first step. To the extent that the latter shocks are predetermined with respect to macroeconomic aggregates and external accounts, standard regression methods can be used to estimate the responses of external accounts by country or region and to determine the extent to which historical fluctuations in external accounts were driven by the cumulative effect of specific demand and supply shocks in the crude oil market.

A. Construction of the Demand and Supply Shocks in the Crude Oil Market

Our approach closely follows the identification strategy of Kilian (2006c). We estimate a structural VAR model based on monthly data for the vector time series z_t, consisting of the percent change in global crude oil production, a measure of global real economic activity in industrial commodity markets, and the real price of crude oil.[5] Given the possibility that some

[5] The term real economic activity in this paper is understood to refer to real economic activity that affects industrial commodity markets rather than the usual broader concept of real economic activity underlying world real GDP or industrial output This distinction is necessary because an increase in value added in the service sector, for example, is likely to have a very different effect on global demand for industrial commodities than an increase in manufacturing. The index of global real economic activity in industrial commodity markets is constructed from representative single voyage freight rates collected by Drewry Shipping Consultants Ltd. for various bulk dry

responses may be delayed by more than a year, the VAR model allows for two years' worth of lags. The structural VAR representation of the model is

(1) $$A_0 z_t = \alpha + \sum_{i=1}^{24} A_i z_{t-i} + \varepsilon_t ,$$

where ε_t denotes the vector of serially and mutually uncorrelated structural innovations. The structural innovations are derived by imposing exclusion restrictions on A_0^{-1} in $e_t = A_0^{-1}\varepsilon_t$ .We attribute fluctuations in the real price of oil to three structural shocks: ε_{1t} denotes shocks to the global supply of crude oil (henceforth "oil supply shock"); ε_{2t} captures shocks to the global demand for industrial commodities (including crude oil) that are driven by global real economic activity ("aggregate demand shock"); and ε_{3t} denotes an oil-market specific demand shock. The latter shock is designed to capture shifts in precautionary demand for crude oil that reflect increased concerns about the availability of future oil supplies that are by construction orthogonal to the other shocks ("oil-specific demand shock").[6]

Following Kilian (2006c), we assume that (1) crude oil production will not respond to oil demand shocks within the month, given the costs of adjusting oil production and the uncertainty about the state of the crude oil market; (2) that increases in the real price of oil driven by demand shocks that are specific to the oil market will not lower global real economic activity in industrial commodity markets within the month; and (3) that innovations to the real price of oil that cannot be explained by oil supply shocks or aggregate demand shocks must be demand shocks that are specific to the oil market. These assumptions imply a recursively identified model of the form:

$$e_t \equiv \begin{pmatrix} e_{1t}^{\Delta prod} \\ e_{2t}^{rea} \\ e_{3t}^{rpo} \end{pmatrix} = \begin{bmatrix} a_{11} & 0 & 0 \\ a_{21} & a_{22} & 0 \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \begin{pmatrix} \varepsilon_{1t}^{oil\ \text{supply}\ shock} \\ \varepsilon_{2t}^{aggregate\ demand\ shock} \\ \varepsilon_{3t}^{oil-specific\ demand\ shock} \end{pmatrix}.$$

cargoes such as coal, iron ore, fertilizer, and scrap metal. For a full discussion of the rationale and construction of this index see Kilian (2006c).

[6] While it is beyond reasonable doubt that oil-market specific demand shocks near certain dates in the sample (such as the year 1979 or the outbreak of the Persian Gulf War in 1990) reflect shifts in precautionary demand, in general, oil-market specific demand shocks may also reflect other factors that are orthogonal to oil supply shocks and aggregate demand shocks such as exogenous changes in crude oil inventory policies. Kilian (2006c) shows, however, that inventories seem to have changed in response to changing oil prices rather than the other way around. Thus, it seems reasonable to interpret oil-market specific demand shocks as shifts in precautionary demand for oil driven by fears about the availability of future oil supplies.

The response of the real price of oil to the three structural shocks $\varepsilon_{jt}, j = 1,2,3,$ is reported in Figure 1. There are striking differences depending on the source of the shock. An unanticipated increase in oil-market specific demand (such as an increase in precautionary demand for oil) causes an immediate and persistent increase in the real price of oil; an unanticipated increase in aggregate demand for all industrial commodities causes a delayed, but sustained increase in the real price of oil; and an unanticipated oil supply disruption causes a transitory increase in the real price of oil within the first year.

Using the fitted values of model (1) we can decompose the fluctuations in the real price of oil at each point in time into components representing the cumulative effect of all shocks of a given type up to this date (see Figure 2). The historical decomposition in Figure 2 suggests that major oil price surges typically have been driven by a combination of aggregate demand shocks and precautionary demand shocks, rather than oil supply shocks. For example, the increase in the real price of oil after 2003 was driven entirely by the cumulative effects of positive global demand shocks.

In this paper, we are interested in assessing the effect of these crude oil demand and crude oil supply shocks on external imbalances. Whereas the shocks implied by the VAR model are measured at monthly frequency, international data on external accounts for most countries are available only at annual frequency. Following a similar procedure in Kilian (2006c), we deal with this problem by constructing measures of the annual shocks as averages of the monthly structural innovations for each year:

$$\hat{\zeta}_{jt} = \frac{1}{12}\sum_{i=1}^{12}\hat{\varepsilon}_{j,t,i}, \quad j = 1,...,3,$$

where $\hat{\varepsilon}_{j,t,i}$ refers to the estimated residual for the *j*th structural shock in the *i*th month of the *t*th year of the sample. Although data for z_t are available as far back as 1973, we lose two years worth of observations in estimating the VAR model. Thus, the resulting annual shock series extends back only as far as 1975. Figure 3 plots $\hat{\zeta}_{jt}, j = 1,2,3.$ The pattern of shocks in the late 1970s and in the 1980s in particular is consistent with additional evidence about the genesis of the second oil crisis presented in Barsky and Kilian (2002, 2004).

B. Estimation of the Dynamic Effects

Let y_t denote a stationary macroeconomic aggregate of interest such as the share of the trade balance in GDP. We are interested in estimating the response of y_t to demand and supply shocks in the crude oil market. We treat the shocks $\hat{\zeta}_{jt}$, $j = 1,...,3,$ as predetermined with respect to y_t. Predeterminedness rules out feedback from y_t to the shocks $\hat{\zeta}_{jt}$, $j = 1,...,3,$ within a given year t.[7] This assumption allows us to examine their dynamic effects on the dependent variable based on regressions of the form:

$$y_t = \delta + \sum_{i=0}^{h} \psi_i \hat{\zeta}_{jt-i} + u_t, \quad j = 1,...,3 \qquad (2)$$

where u_t is a potentially serially correlated error, and $\hat{\zeta}_{jt}$ is a serially uncorrelated shock. The parameter h is chosen to coincide with the maximum horizon of the impulse response function to be computed. By definition the impulse response is $dy_{t+1}/d\hat{\zeta}_{j,t}$. Differentiation yields that $dy_t/d\hat{\zeta}_{j,t-i} = \psi_i$. Under stationarity, it follows that $dy_t/d\hat{\zeta}_{j,t-i} = dy_{t+i}/d\hat{\zeta}_{j,t} = \psi_i$.

Regression model (2) allows consistent estimation of the impulse responses under minimal assumptions. In practice, we set the maximum horizon of the impulse responses to five years. Our equation-by-equation approach is built on the premise that the shock series $\hat{\zeta}_{jt}$, $j = 1,...,3,$ are mutually uncorrelated. Whereas the structural VAR residuals $\hat{\varepsilon}_{jt}$, $j = 1,...,3,$ are orthogonal by construction, the annual shocks $\hat{\zeta}_{jt}$, $j = 1,...,3,$ which have been obtained by aggregating over time, need not be orthogonal. Table 1 shows that their contemporaneous correlation ranges between -2 and 11 percent. Although inevitably there will be some omitted variable bias, these correlations are so low that not much is lost by treating the shocks as orthogonal and estimating a separate equation for each shock.

We also investigated some alternative regression approaches. One alternative approach would have been to estimate model (2) including current and lagged values of all shocks. Given the very short sample of external balances available and given the need to include five lags for

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[7] In contrast, strict exogeneity imposes in addition Granger non-causality from y_t to $\hat{\zeta}_{jt}$. For further discussion see Cooley and LeRoy (1985). Pre-determinedness and strict exogeneity in our regression framework correspond to the notion of weak and strong exogeneity, respectively, in the parlance of Engle, Hendry and Richard (1983).

each shock, that approach is not practically feasible. Yet another approach would have been to fit a recursively identified VAR model to $\left(\hat{\zeta}_{1t}\ \hat{\zeta}_{2t}\ \hat{\zeta}_{3t}\ y_t\right)'$ with a sufficiently high lag order. That more restrictive regression approach is practically feasible, but many of the response estimates are strongly counterintuitive and the estimation results are highly sensitive to the lag structure, suggesting that the model structure is rejected by the data or – more likely – that there is a serious overfitting problem. A third alternative would have been to add lagged dependent variables as regressors in the model (2). The latter specification would have required strict exogeneity of $\hat{\zeta}_{jt}$ with respect to y_t, which is not a viable assumption in our context (see Kilian 2006a,b,c). For these reasons, we report results based on the parsimonious equation-by-equation approach based on model (2).

4. Data

In the empirical analysis we consider seven different measures of external balance. The specific measures of external balance used are:

- Change in Net Foreign Assets ≡ Current Account + Capital Gains
  - Current Account ≡ Merchandise Trade Balance + Service Trade Balance + Income Balance
    - Merchandise Trade Balance ≡ Oil Trade Balance + Non-Oil Merchandise Trade Balance
      - Oil Trade Balance
      - Non-Oil Merchandise Trade Balance
  - Capital Gains on Gross Foreign Assets and Liabilities.

In what follows, the *trade balance* should be understood to refer to the merchandise trade balance. The trade balance does not include trade in services because of data availability and concerns about the poor quality of trade data on services. We also exclude the income balance which is usually computed as the difference between the current account and trade balance. The reason is that the income balance is difficult to interpret without further knowledge of the asset position of a country, and that it cannot be measured accurately. For example, the income balance cannot be separated from transfer payments, even when data on trade in services are available. A more detailed description of these aggregates is provided in the Data Appendix. The NFA data are from Lane & Milesi-Ferretti (2006). All other data (including the trade balance, current account, and GDP data) are from the IMF's *World Economic Outlook* database.

Our analysis focuses on the following countries and country groupings:

1. Oil exporters
   - Major oil exporters
     - OPEC
   - Canada and UK

2. High-income oil-importing economies
   - United States
   - Euro Area
   - Japan

3. Middle-income oil-importing economies
   - Middle-income economies
     - Latin America
     - Emerging Asia

A list of the countries included in each group is provided in the Appendix. All external accounts are expressed in current dollars. As is conventional, all external accounts are normalized by nominal GDP for the empirical analysis. Shares in GDP for the groups are not computed by averaging shares across countries, but by adding external accounts across countries and normalizing them by the sum of GDP in current dollars of the same countries. This procedure has the advantage of netting out intra-group imbalances.

A country is classified as a *major oil exporter* if its average share of fuel exports in total exports over the sample period (1970-2005) is at least 20 percent.[8] OPEC is a subset of the set of major oil exporters. In addition, we treat Canada and the U.K. as a separate group because these countries are likely to behave differently from both oil-importing advanced economies and from major oil exporters. Both countries have diversified export structures with fuel shares of less than 20 percent, but their oil exports are large in absolute value during the sample period. In contrast, the oil export share of Norway is high enough for the country to qualify as a major oil exporter.

Middle-income economies are classified as developing countries that lie above the median of the PPP-weighted GDP per capita of the sample of all developing economies excluding China and India. We do not report results for low-income countries given the poor quality of these countries' external accounts data. We also exclude China and India. The Chinese

[8] Fuel exports include petroleum products, natural gas and coal. The list of OPEC countries excludes Iraq because of NFA data availability.

economy underwent major structural changes during the sample period, making it difficult to interpret the responses. We do not include results for India, because India, given its size and position in the income distribution, is not representative of either low or middle income economies. The United States, Japan, and the Euro Area are examined individually.

5. Results

We estimate regression model (2) for each of the 54 dependent variables defined in section 4. Regression model (2) treats the oil shocks $\hat{\zeta}_{jt}$, $j = 1,...,3,$ as predetermined with respect to the dependent variable. The realism of this assumption may be judged by focusing on the example of the United States. Clearly, the United States is the economy for which this assumption is most likely to be invalid, given the overall size of the U.S. economy and its disproportionate contribution to the world economy. As Table 2 shows, nevertheless, innovations to the U.S. dependent variables are not very highly correlated with demand and supply shocks in the crude oil market at the annual frequency, with the exception of the oil trade balance, which is highly negatively correlated with oil-specific demand shocks for the obvious reason that oil-specific demand shocks raise the price of oil immediately causing the oil trade balance to deteriorate on impact (see Figure 1). These low correlations are important because they dispel concerns that positive innovations to domestic real economic activity (reflected in a deterioration of the current account as a share of GDP) may drive aggregate demand innovations in global commodity markets or innovations to the supply of crude oil. If there were such causal link within the year, one would expect to see a large, positive correlation in columns 1 and 2 of Table 2.

5.1. Impulse responses

Figures 4-12 show the estimated impulse responses of each measure of external balance by type of shock. All responses have been normalized such that a given shock will imply an increase in the real price of oil. The results shown are expressed as a share of GDP. The one-standard error and two-standard error bands for the impulse responses based on model (2) are constructed using a block bootstrap method that allows for serially correlated error terms (see Berkowitz, Birgean and Kilian 1999).

5.1.1. Oil exporters

We begin the analysis with the oil exporters. The natural starting point in analyzing the effects of demand and supply shocks in the crude oil market is the oil trade balance. We would expect negative supply shocks or positive demand shocks in the crude oil market to improve the oil trade balance of oil exporters, to the extent that such shocks increase the price of oil. Indeed, the point estimates in column 1 of Figure 4 indicate that oil exporters' oil trade balances persistently improve in response to such shocks, although that increase is not always statistically significant. Much stronger and more significant responses are obtained for the subset of OPEC countries in Figure 5. The temporary nature of the response is consistent with the view that the quantity of oil exports falls over time, as demand for crude oil falls. For Canada and the U.K., the responses in Figure 6 are not only much smaller (consistent with the lesser importance of crude oil exports for those countries), but largely statistically insignificant with the exception of the response to an oil supply disruption.

We find evidence of a deterioration of oil exporters' non-oil trade balance in response to favorable shocks in the crude oil market from the oil exporters' point of view (in column 2), consistent with the view that an increase in oil prices and hence wealth is associated with increased demand for (and reduced supply of) non-oil tradable goods. The magnitude and timing of this response, however, differs depending on the type of shock, reflecting their uneven impact on the real price of oil (see Figure 1). For oil exporters in general (and OPEC countries in particular) demand shocks result in a significant deterioration of the non-oil trade balance in the medium run, whereas the response to oil supply disruptions is largely insignificant (see Figures 4 and 5). In contrast, the responses of the non-oil trade balance of Canada and the U.K. in Figure 6 resemble more the responses of advanced oil-importing economies (see section 5.1.2). Overall, shocks in the crude oil market that raise the real price of oil tend to improve the trade balance of oil exporters (in column 3) and their current account (in column 4), although the responses are not always significant.

As discussed in section 2, the trade effects of demand and supply shocks in the crude oil market may be cushioned not only by the non-oil trade balance, but also by capital gains. Although capital gains may be inferred from comparing the responses of the current account and of changes in NFA, we compute separate responses for capital gains.[9] This facilitates the construction of confidence intervals for the response of capital gains. Column 5 of Figures 4 and

[9] NFA data for oil exporters may not capture all capital gains. See Lane and Milesi-Ferretti (2006) for a discussion of the NFA data of these countries.

5 suggests that oil-supply disruptions cause a significant capital loss in oil-exporting economies, whereas the responses induced by demand shocks tend to be statistically insignificant. In the case of an oil supply shock, the capital loss offsets the improvement in the current account and renders the change-in-NFA response statistically insignificant (see last column). This result is consistent with the view that foreign-denominated assets held by oil exporters depreciate as a result of oil-supply disruptions. In the case of oil-specific demand increase, the same explanation applies, but the capital gain responses are estimated less precisely. Given the small magnitude of the capital losses, there is an accumulation of NFA, but the response is smaller than it otherwise would be. Capital losses in response to oil supply disruptions play a much less important role for Canada and the U.K. in Figure 6.

5.1.2. High-Income Oil-Importing Economies

Figures 7–9 focus on advanced oil-importing economies, namely the United States, Japan, and the Euro area.

Oil trade balance

As expected, all types of oil shocks impact the oil-trade balance of advanced oil-importing economies negatively and often persistently; yet there are some important differences across shocks. An oil-specific demand increase (such as an increase in precautionary demand for crude oil) causes an immediate, persistent and highly significant oil trade deficit (see column 1), consistent with the response of the price of oil in Figure 1. As a share of GDP this effect is relatively small for the United States, but much more pronounced for other advanced economies such as Japan or the Euro area. This result is expected given the higher dependence on imported oil in the Euro area and in Japan. A positive aggregate demand shock in global commodity markets also causes an oil trade deficit, but with a delay, consistent with the delayed response of the price of oil to such shocks. The response remains significant after three to four years. Again the U.S. response is smaller than the estimates for other advanced economies. An oil supply disruption is associated with a negative response of the oil trade balance in all advanced economies, but that effect is less long-lasting and less precisely estimated. The larger and more statistically significant estimated responses to oil demand shocks are consistent with the responses of the real price of oil to these shocks in Figure 1.

Non-oil trade balance

Figures 7–9 show that the non-oil trade balance tends to improve in response to oil shocks that raise the price of oil, although some responses are estimated imprecisely (see column 2). Nevertheless, there are important differences depending on whether the shock is to demand or to supply, as well as across countries. For example, whereas for the Euro area there is some evidence of a significant non-oil trade surplus in response to an adverse oil supply shock, the corresponding responses for the U.S. and for Japan are statistically insignificant. This result is consistent with evidence that oil exporters' propensity to spend oil revenues is skewed toward European goods (see Rebucci and Spatafora 2006).

In contrast, for the U.S., but not for other advanced oil-importing economies, an unanticipated increase in aggregate demand is associated with a delayed, but significant surplus in non-oil trade. Finally, in both the U.S. and Japan, and to a lesser extent in the Euro area, the non-oil trade balance increases significantly in response to oil-specific demand shocks, although typically the response involves some delay. This delay is consistent with a slow downward adjustment of expenditures in oil-importing economies as well as a slow upward adjustment of expenditures in oil-exporting economies in response to the sharp increase in oil prices triggered by an oil-specific demand increase.[10]

Trade balance

Overall, the previous findings suggest that adverse shocks in the crude oil market tend to worsen the oil trade balance of advanced-economy oil importers, but that the non-oil trade balance often improves in response. Column 3 of Figures 7–9 illustrates that the net effect on the trade balance differs across countries. For example, a positive aggregate demand shock causes an initial trade deficit in the United States, followed by a significant trade surplus after three years. There also is some evidence of a surplus in response to increases in oil-specific demand. In all other advanced economies, oil-specific demand increases cause an immediate, persistent and highly statistically significant trade deficit, whereas aggregate demand expansions cause a temporary trade deficit with a delay of about two years. These results confirm that there are systematic differences between the United States and other economies.

[10] The estimated responses for the U.S. non-oil trade balance are consistent with estimates of the effect of the same oil shocks on U.S. real GDP reported in Kilian (2006c). As the price of oil rises and real GDP falls, the non-oil trade balance moves into surplus.

Capital gains

International financial integration (as measured by the size of gross foreign asset positions) may affect the transmission of oil shocks to the extent that it creates the potential for valuation effects, which can magnify or (at least partially) offset movements in the current account. Valuation effects manifest themselves in capital gains or capital losses. The extent of these gains and losses will depend in general on how the ownership of assets is distributed across countries. They also may depend on the extent to which the U.S. dollar depreciates against the currencies of other oil-importing economies, given the unique structure of the U.S. portfolio.

Column 6 of Figures 7-9 assesses this channel of transmission. In interpreting these results, it is important to keep in mind the limitations of the NFA data set (see Lane and Milesi-Ferretti 2006). With that caveat in mind, the data suggest a clear pattern of valuation effects, in particular in response to aggregate demand shocks. Specifically, the United States experience significant short-run capital gains, followed by equally significant capital losses in years 3 and 4. The response of capital gains in the Euro area and in Japan is roughly the mirror image of the U.S. response. For the United States, for the Euro area and for Japan, there is a small negative, but statistically insignificant response of capital gains to oil supply disruptions, consistent with these shocks' small impact on the price of oil (see Figure 1). Finally, a precautionary oil-demand increase causes an initial capital loss, followed by a significant capital gain in years 3 and 4. While the similarities are not as pronounced as for the aggregate demand shock, the U.S. response again is the rough mirror image of the response for the Euro area and for Japan.

This analysis suggests that valuation effects can be important. For the United States and for oil exporting economies, valuation effects tend to dampen the impact of oil shocks. For the Euro area and Japan, in contrast, valuation effects in some cases magnify the impact of oil shocks. Thus, international financial integration may amplify or cushion the effect of oil shocks, depending on the context.

Current account and change in NFA

As a result of the non-oil trade balance responses and capital gain responses, the impact of shocks that raise the price of crude oil on the current account and on the change in NFA may not as negative as the textbook explanations would suggest. For example, the U.S. NFA position does not change significantly in response to an oil supply shock. It actually improves with some delay in response to oil-market specific demand increases. There also is some evidence of a temporary improvement in the U.S. NFA position in response to positive aggregate demand shocks, but the corresponding improvement in the current account is preceded by a deficit.

In contrast, for other advanced oil-importing economies, the same oil shocks tend to cause a current account deficit and a reduction in NFA in most cases, although the declines are not always statistically significant. This asymmetry in how the same oil shocks affect the United States and other advanced oil-importing countries has not been documented previously.

5.1.3. Middle-Income Oil-Importing Economies

Figure 10 highlights the role of the non-oil trade balance in the transmission of oil shocks in middle-income economies. Whereas the oil trade balance systematically falls in response to shocks that raise the price of oil (the response to oil supply disruptions and oil-specific demand increases being highly significant, and that to aggregate demand shocks being marginally significant), the non-oil trade balance may improve or deteriorate depending on the shock. The response of the non-oil trade balance to an oil supply disruption is negative, although not precisely estimated. In contrast, the response to a positive aggregate demand shock is positive and statistically significant, and the response to an oil-specific demand shock is not statistically different from zero.

The effect on the overall trade balance depends on the relative magnitude of the responses of the oil- and non-oil trade balance. For example, an aggregate demand shock that raises the real price of oil will result in a marginally significant improvement of the trade balance on impact, whereas oil supply disruptions and increases in precautionary demand are causing a significant deterioration of the overall trade balance. As in the case of advanced oil-importing economies, the response of the non-oil trade balance to oil demand shocks partially offsets that of the oil-trade balance.

Figure 10 also illustrates the importance of valuation effects for middle-income countries. There is evidence of a statistically significant capital loss after the second year in response to a positive aggregate demand shock and of a significant capital gain in years 3 and 4. The estimated response is qualitatively similar to the estimates for the Euro area and for Japan, but more statistically significant, and almost exactly the mirror image of the U.S. response. The responses of capital gains to the other two oil shocks are largely statistically insignificant.

The current account deteriorates significantly in response to oil supply disruptions and in response to an increase in oil-specific demand. In the case of the oil supply disruption, this decline is driven mainly by the trade balance; in the case of the oil-specific demand shock it is driven by the trade balance and exacerbated by the net effect of income payments, transfers and the trade balance in services. In contrast, the current account response to a positive aggregate demand shock is significantly positive on impact, but subsequently turns significantly negative, reflecting the evolution of the trade balance.

The net foreign asset position deteriorates in all cases and in some cases significantly so. The timing of that decline appears to be driven primarily by the valuation effect, as opposed to the current account. Thus, capital gains are a potentially important channel in the transmission of oil shocks not only for the United States and other advanced economies, but for middle-income economies as well.

5.1.4. Latin America vs. Emerging Asia

The estimates for the aggregate of middle-income oil-importing economies mask interesting contrasts between Latin America and Emerging Asia.[11] This comparison is particularly interesting, as Emerging Asia is comprised of economies that are typically more open than Latin American economies. Figures 11 and 12 show a negative response of the oil trade balance to all three shocks for both groups of countries. The response of the non-oil trade balance to oil supply disruptions is more negative on impact in Latin America. The response of the non-oil trade balance to oil-demand shocks is less pronounced for Latin America. The decline in the non-oil trade balance in year 3 in Emerging Asia is consistent with the decline of U.S. real GDP in response to an aggregate demand increase, to which export-oriented East Asian economies are more susceptible. Similarly, an oil-specific demand increase causes an immediate reduction in U.S. real growth and hence a more significant overall trade deficit for Emerging Asia in Figure 11 than for Latin America in Figure 12.[12] The response of the overall trade balance reflects this pattern. The overall current account deteriorates more in Emerging Asia, owing to the non-oil trade balance. One interpretation is that Latin America's limited access to international capital markets has discouraged borrowing in response to oil demand shocks.

There is little evidence of significant capital gains or losses in response to oil shocks in

[11] The aggregates for Latin America and Emerging Asia that we study below have been constructed excluding all oil exporters in these regions.
[12] See Kilian (2006c) for further details on the response of U.S. macroeconomic aggregates.

Latin America, consistent with Latin America's currencies depreciating less than the U.S. dollar because of limited exchange-rate flexibility during much of our sample period. For Emerging Asia there is a marginally significant capital loss after two years, followed by a statistically significant and large capital gain after three years in response to positive aggregate demand shocks, not unlike the responses found for advanced oil-importing countries. There are no significant responses to other shocks.

5.1.5. Summary

Our analysis allows some generalizations about the typical response of oil importers and oil exporters to oil shocks. First, while any shock in the crude oil market that raises the price of crude oil will push a typical oil importers' oil trade balance into deficit, the timing and the magnitude of the response of the oil trade balance depends on the source of the shock. A positive aggregate demand shock, for example, tends to generate an oil trade deficit with some delay. In contrast, shocks to the precautionary demand for oil and shocks to supply tend to cause an immediate oil trade deficit, the former being more sustained and larger than the latter. Second, these same shocks also tend to be associated with a non-oil trade surplus that partially offsets the oil trade deficit, giving rise to an overall trade deficit (with some delay in the case of aggregate demand shocks and immediately upon impact for positive precautionary oil demand and negative oil supply shocks). Third, the extent to which the resulting trade and current account deficits translate into a deterioration of the NFA position depends on the response of capital gains. Oil demand shocks may also cause large and systematic (if not always statistically significant) valuation effects. Increased international financial integration thus may help cushion the impact of future disturbances in global crude oil markets for oil importers whose assets are widely held abroad (as in the case of the United States), while potentially amplifying it in other cases.

The overall response of the typical oil exporter is the mirror image of the typical oil importer. Positive precautionary oil demand shocks and negative oil supply shocks produce an immediate oil trade surplus, whereas positive aggregate demand shocks cause an oil trade surplus with some delay. The surplus in the oil-trade balance is associated with a non-oil trade deficit. On balance, trade and current account balances of oil exporters improve. The NFA increase in response to aggregate demand and oil-specific demand shocks is dampened to the extent that oil exporters experience capital losses. In response to oil supply disruptions, in particular, capital losses tend to render the positive response of NFA changes insignificant.

5.2. Historical Decompositions

Impulse responses are estimates of the average effect of a one-time shock on the dependent variable. Since more than one oil shock occurs at any given point in time, and since the composition of innovations to the real price of oil evolves over time, impulse response estimates do not tell us how much of the evolution of the external accounts must be attributed to oil shocks. Historical decompositions of the fluctuations in external accounts shed light on the cumulative effect of each oil shock on a given external account. They can be constructed by simulating the path of the dependent variable from the fitted regression model (2) under the counterfactual assumption that a given demand or supply shock in the oil market is zero throughout the sample. The difference between this counterfactual path of the dependent variable and its actual path is a measure of the cumulative effect of the shock in question.

We computed the cumulative effect of all three oil shocks combined as well as the cumulative effects by shock. Two results are particularly interesting. First, as Figure 13 shows, the model tracks reasonably well major shifts in external accounts such as the rapid NFA accumulation by OPEC after 1999 and the growing US current account deficit since the late 1990s. Second, the relative importance of individual demand and supply shocks may change drastically from one episode to the next. Figure 14 focuses on the current accounts of the United States and of OPEC. For example, the OPEC current account deficit of 1998 is associated with the temporary drop in oil-specific demand following the Asian crisis of 1997, when oil prices reached an all-time low in recent history. In contrast, both the current account deficit of 1991/92 and the current account surplus since 2002 were driven primarily by global aggregate demand shocks. Figure 14 also shows that the deterioration of the U.S. current account since 2000 appears to be driven primarily by global aggregate demand shocks.

6. Conclusions

This paper provided a comprehensive analysis of the effects of oil shocks on external balances covering a wide range of countries. Our analysis explicitly recognized that oil price changes do not take place in isolation, but may be driven by some of the same macroeconomic forces that determine external balances, as illustrated by the recent surge in oil prices driven by strong global demand for crude oil (see Hamilton 2005). We also distinguished between oil price changes driven by crude oil supply shocks, oil price changes driven by shocks to global aggregate demand for industrial commodities, and oil price changes driven by oil-market specific demand shocks such as shocks to the precautionary demand for oil. This distinction between different types of shocks is crucial. As emphasized in the paper, crude oil-price increases (all else equal) will affect external balances of oil importers differently depending on whether they reflect increased demand for oil or decreased supply of oil. This result is consistent with evidence that these shocks have qualitatively and quantitatively different effects on the real price of oil.

Our key findings are: (1) Non-oil trade balances play a central role in the international transmission of oil shocks. The response of the non-oil trade balance may offset oil trade deficits and helps explain striking differences between the response of the United States and that of other oil-importing economies. (2) There also is some evidence of valuation effects of oil shocks with capital gains and losses offsetting or amplifying trade imbalances. The importance of valuation effects has been documented for the U.S. based on overall changes in balance of payments data by Gourinchas and Rey (2006); our results complement this literature by focusing on the response of external balances to specific shocks. We find evidence of valuation effects in response to oil shocks not only for the U.S., but more generally for other advanced and middle income economies and for oil exporters. We showed that valuation effects may either cushion or amplify the response of the current account to oil shocks, depending on the context. (3) In general, the nature of the transmission of oil price increases is highly dependent on the cause of the oil price increase. If the real price of oil increases due to strong global demand for industrial commodities, for example, the implied responses of external accounts are quite different from the responses to an oil supply disruption or to an increase in precautionary demand for crude oil reflecting concerns about future oil supply shortfalls.

Our analysis showed that international financial integration plays two distinct roles in the transmission of oil shocks. First, it allows risk sharing between oil exporters and oil importers. Ownership of oil assets by residents of oil-importing countries provides some insurance against oil price increases and helps diversify the risks associated with oil shocks. In turn, ownership of foreign assets by oil producers provides some insurance against falling oil prices for oil-exporting economies. Second, international financial integration affects how the burden of adjustment is distributed among oil-importing economies. The United States in particular was shown to be in a unique and privileged position in that its NFA position may improve in response to oil shocks, when other oil-importing economies may potentially experience NFA losses in response to the same shocks.

Our results have important implications for the economic modeling of oil price shocks in macroeconomic models of external accounts. First, our results illustrate the importance of controlling for reverse causality and of distinguishing between oil price changes driven by different types of shocks. Second, they highlight the importance of incorporating trade in assets in theoretical models of oil price shocks. Our findings suggest that theoretical models that ignore this channel of transmission will not be consistent with the data. This conclusion is in sharp contrast to the current generation of dynamic general equilibrium models of external accounts that treat oil prices as exogenous.

Our analysis also has implications for the recent policy debate about growing external imbalances. For example, the widening imbalance in the U.S. current account can be explained to a large extent by the cumulative effect of demand and supply shocks in the crude oil market. In particular, the data suggest that global aggregate demand shocks have played a significant role in recent years in the emergence of these imbalances.

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Data Appendix

A. Variable List

Description	Calculation	Units/Scale	Variable name	Source
Gross domestic product, current prices, U.S. dollars		Billions of US dollars	gdp	IMF World Economic Outlook
Net external position		Millions of US dollars	nfa	Lane/Milesi-Ferreti
Net foreign assets as a share of GDP	(nfa /1000) / gdp) * 100	Percent of GDP	nfa_gdp	Lane/Milesi-Ferreti, IMF World Economic Outlook
Current account balance		Billions of US dollars	ca	IMF World Economic Outlook
Current account balance as a share of GDP	(ca /gdp) * 100	Percent of GDP	ca_gdp	IMF World Economic Outlook
Trade balance for goods		Billions of US dollars	tb	IMF World Economic Outlook
Trade balance as a share of GDP	(tb /gdp) * 100	Percent of GDP	tb_gdp	IMF World Economic Outlook
Oil trade balance		Billions of US dollars	tbo	IMF World Economic Outlook
Oil trade balance as a share of GDP	(tbo/gdpd) * 100	Percent of GDP	tbo_gdp	IMF World Economic Outlook
Non-oil trade balance	tb-tbo	Billions of US dollars	tbno	IMF World Economic Outlook
Non-oil trade balance as a share of GDP		Percent of GDP	tbno_gdp	IMF World Economic Outlook
Change in NFA over the previous year	$nfa_{t} - nfa_{t-1}$	Millions of US dollars	dnfa	Lane/Milesi-Ferreti
Change in NFA as a share of GDP	((dnfa/1000) / gdp) * 100	Percent of GDP	dnfa_gdp	Lane/Milesi-Ferreti, IMF World Economic Outlook
Capital gains as defined by the difference between the change in NFA and the current account balance	(dnfa/1000) – ca	Billions of US dollars	capgain	Lane/Milesi-Ferreti, IMF World Economic Outlook
Capital gains as a share of GDP defined by the difference between the change in NFA and the current account balance divided by GDP	(capgain/gdp) * 100	Percent of GDP	capgain_ gdp	Lane/Milesi-Ferreti, IMF World Economic Outlook

B. Country groupings:

Fuel exporters (26):	Algeria, Angola, Azerbaijan, Bahrain, Brunei, Congo (Rep. of), Ecuador, Gabon, Indonesia, Iran, Kazakhstan, Kuwait, Libya, Mexico, Nigeria, Norway, Oman, Qatar, Russia, Saudi Arabia, Syria, Trinidad and Tobago, Turkmenistan, United Arab Emirates, Venezuela, Yemen.
OPEC (10):	Algeria, Indonesia, Iran, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates, Venezuela.
Canada and UK	
United States	
Japan	
Euro Area (12):	Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain.
Middle-Income Economies (46):	Albania, Argentina, Belarus, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Chile, Colombia, Costa Rica, Croatia, Czech Republic, Dominican Republic, Equatorial Guinea, Estonia, Fiji, Hong Kong, Hungary, Jordan, Korea, Latvia, Lebanon, Lithuania, Macedonia, Malaysia, Malta, Mauritius, Namibia, Panama, Paraguay, Peru, Philippines, Poland, Romania, Singapore, Slovak Republic, Slovenia, South Africa, Swaziland, Taiwan, Thailand, Tunisia, Turkey, Ukraine, Uruguay, Yugoslavia.
Emerging Asia (7):	Hong Kong, Korea, Malaysia, Philippines, Singapore, Taiwan, Thailand.
Latin America (10):	Argentina, Brazil, Chile, Colombia, Costa Rica, El Salvador, Panama, Paraguay, Peru, Uruguay.

Table 1: Correlations of Demand and Supply Shocks in Crude Oil Market Aggregated to Annual Frequency 1975-2004

	Oil Supply Shock	Aggregate Demand Shock	Oil-Specific Demand Shock
Oil Supply Shock	1	-0.02	0.11
Aggregate Demand Shock	-	1	-0.08
Oil-Specific Demand Shock	-	-	1

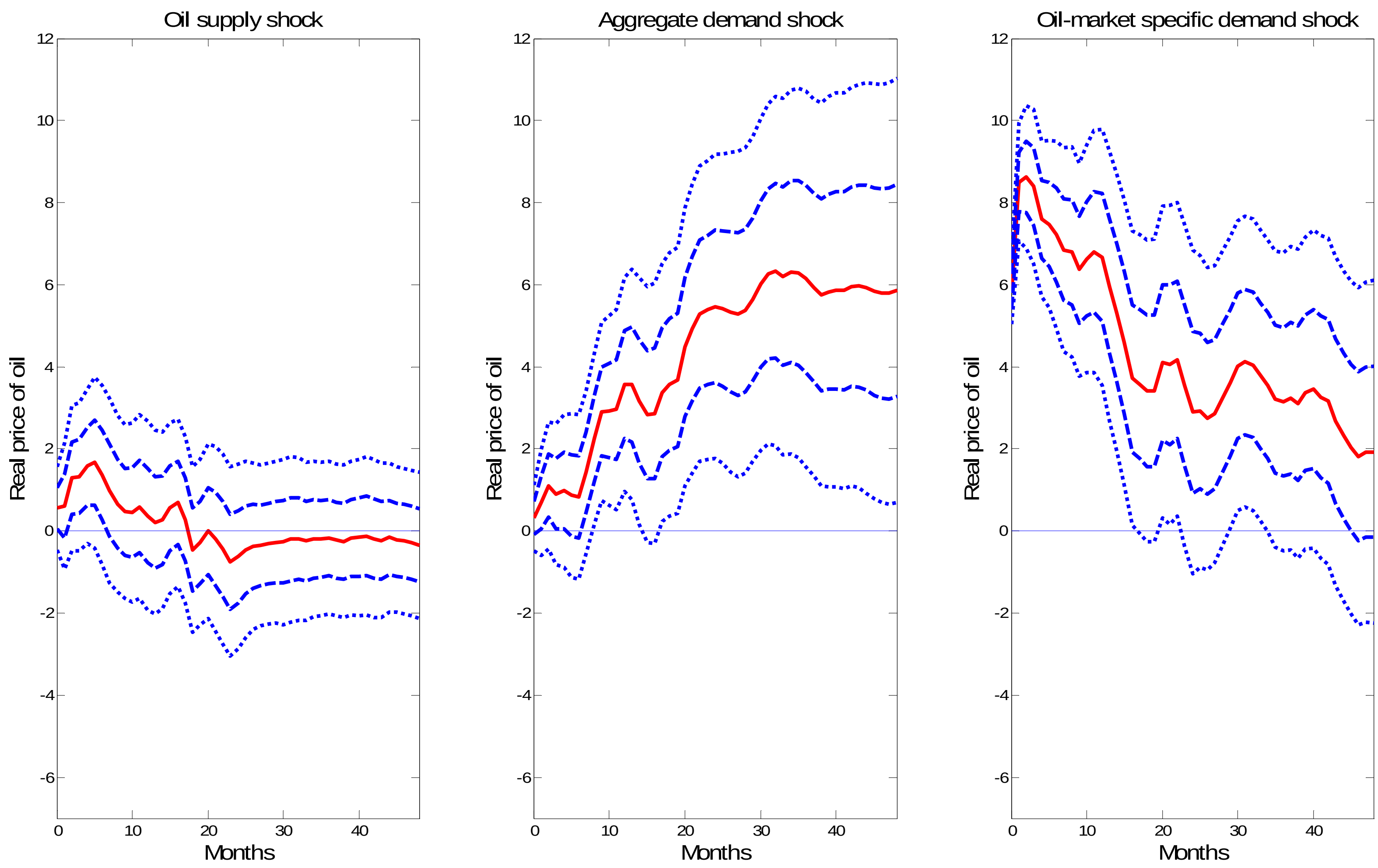
NOTES: The oil shocks are obtained from model (1) as described in the text.

Table 2: Correlations of the Innovations of External Balances (as a Percent Share of GDP) with Oil Shocks United States

Share in GDP	Oil Supply	Aggregate Demand	Oil-Specific Demand
Change in NFA	0.06	-0.08	0.13
Current Account	0.03	-0.13	-0.19
Trade Balance	-0.04	0.04	-0.10
Oil Trade Balance	0.01	-0.31	-0.49
Non-Oil Trade Balance	-0.15	0.19	0.27
Income Balance	0.20	-0.05	0.18
Capital Gain	-0.17	0.15	0.18

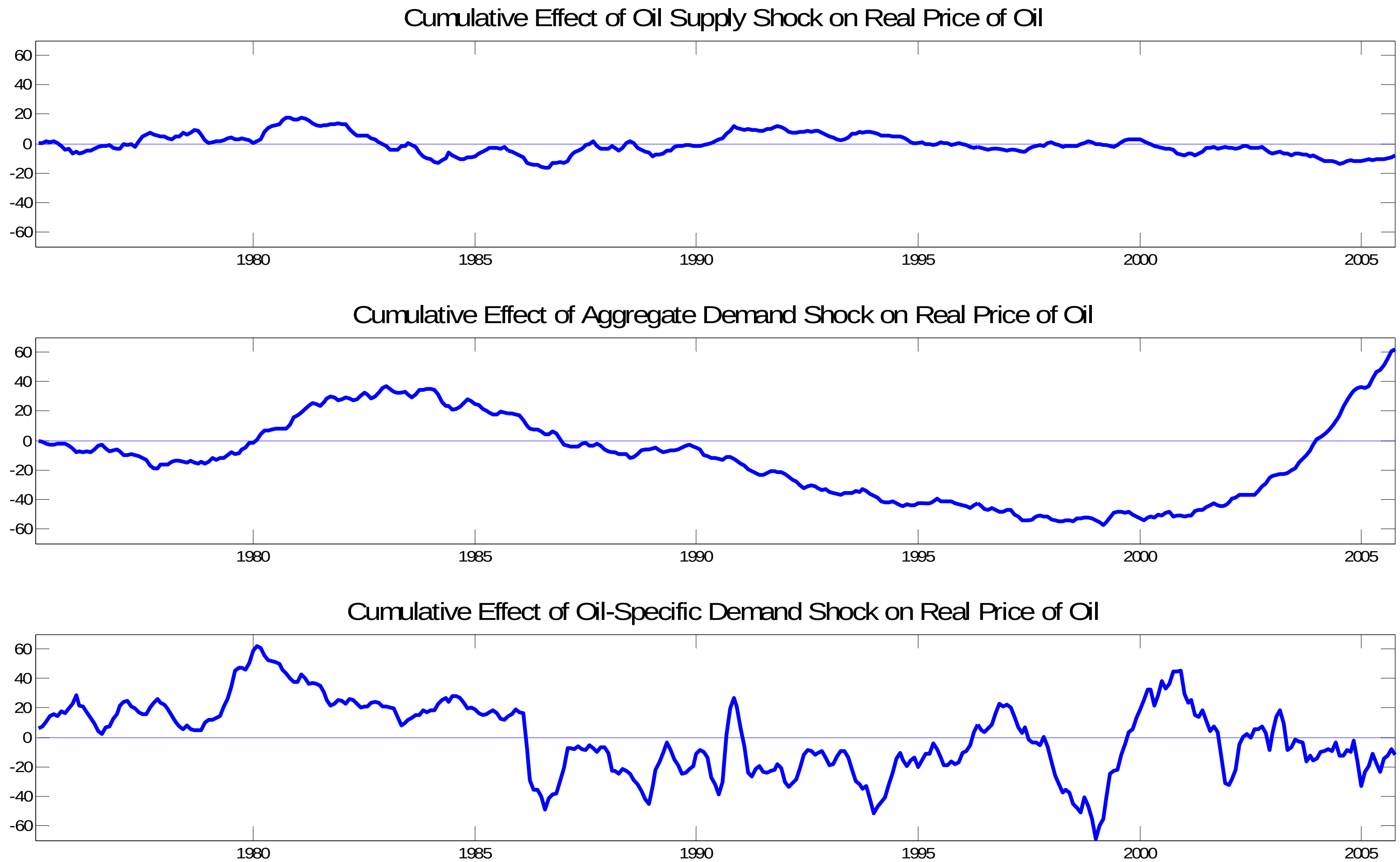
NOTES: The innovations are estimated as the residuals of AR(2) models for each of the external balance measures. The oil shocks are obtained from model (1) as described in the text.

Figure 1: Responses to One-Standard Deviation Structural Shocks
OLS Point Estimates with One and Two-Standard Error Bands



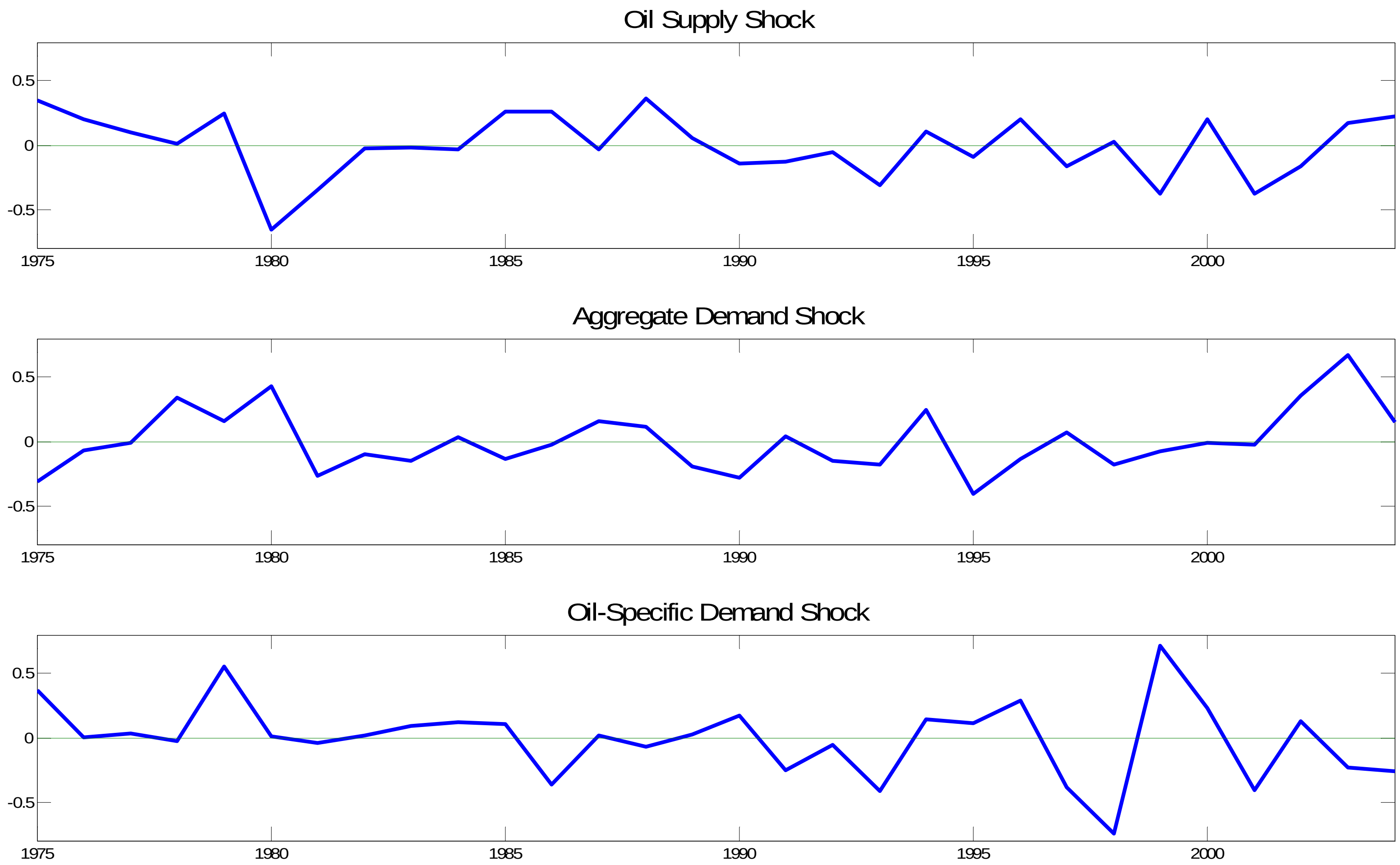
NOTES: Estimates based on restricted VAR(24) system described in text The confidence intervals were constructed using a recursive-design wild bootstrap (see Gonçalves and Kilian 2004).

Figure 2: Historical Decomposition of Real Price of Oil
1975.2-2005.9



NOTES: See Figure 1.

Figure 3: Annual Averages of the Shocks that Determine the Real Price of Oil
Estimates for 1975-2004



NOTES: Annual averages of the structural shocks underlying the responses in Figure 1.

Figure 4: Dynamic Responses of External Accounts as a Share of GDP
Oil Exporters

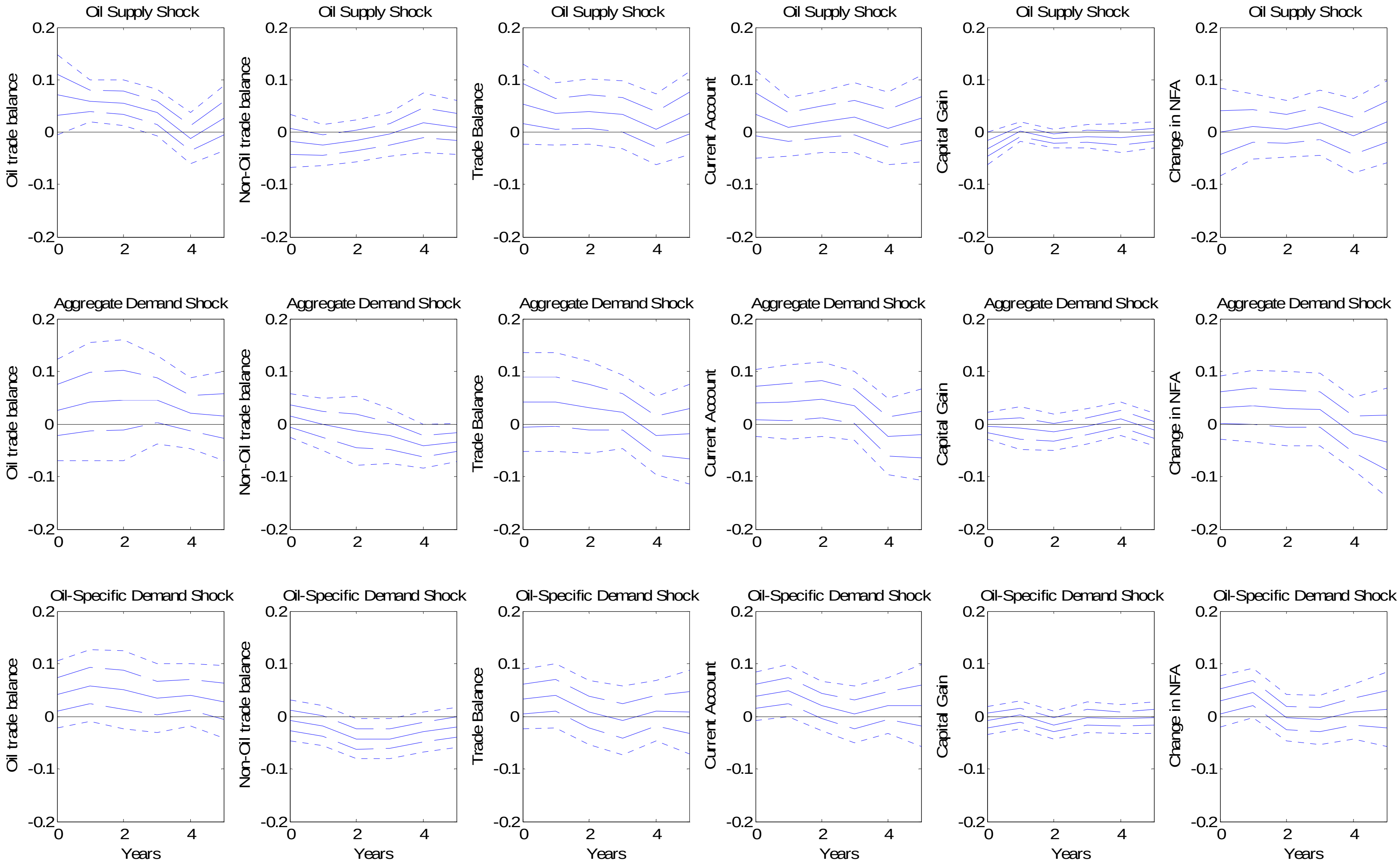


Figure 5: Dynamic Responses of External Accounts as a Share of GDP
OPEC

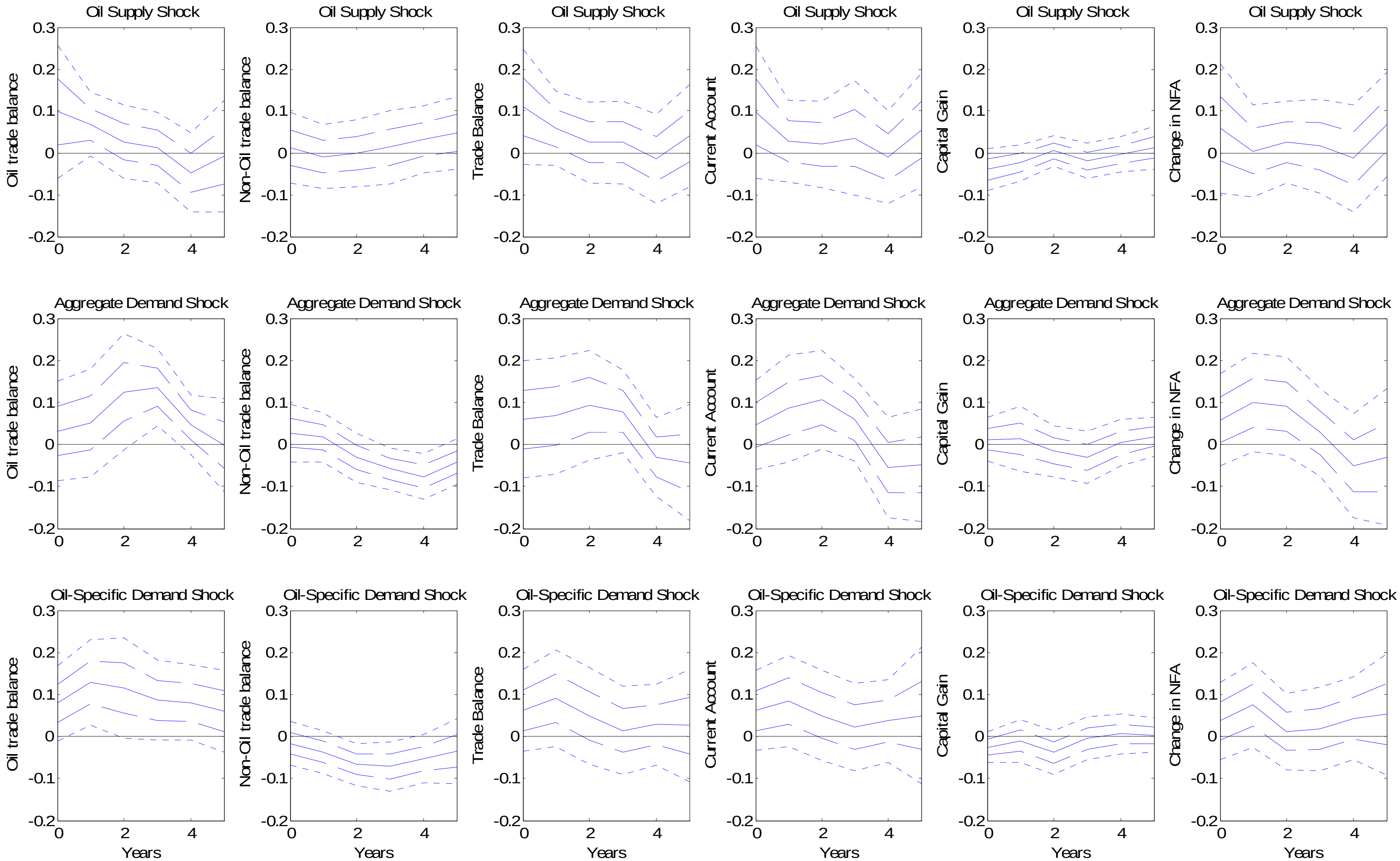


Figure 6: Dynamic Responses of External Accounts as a Share of GDP
Canada and UK

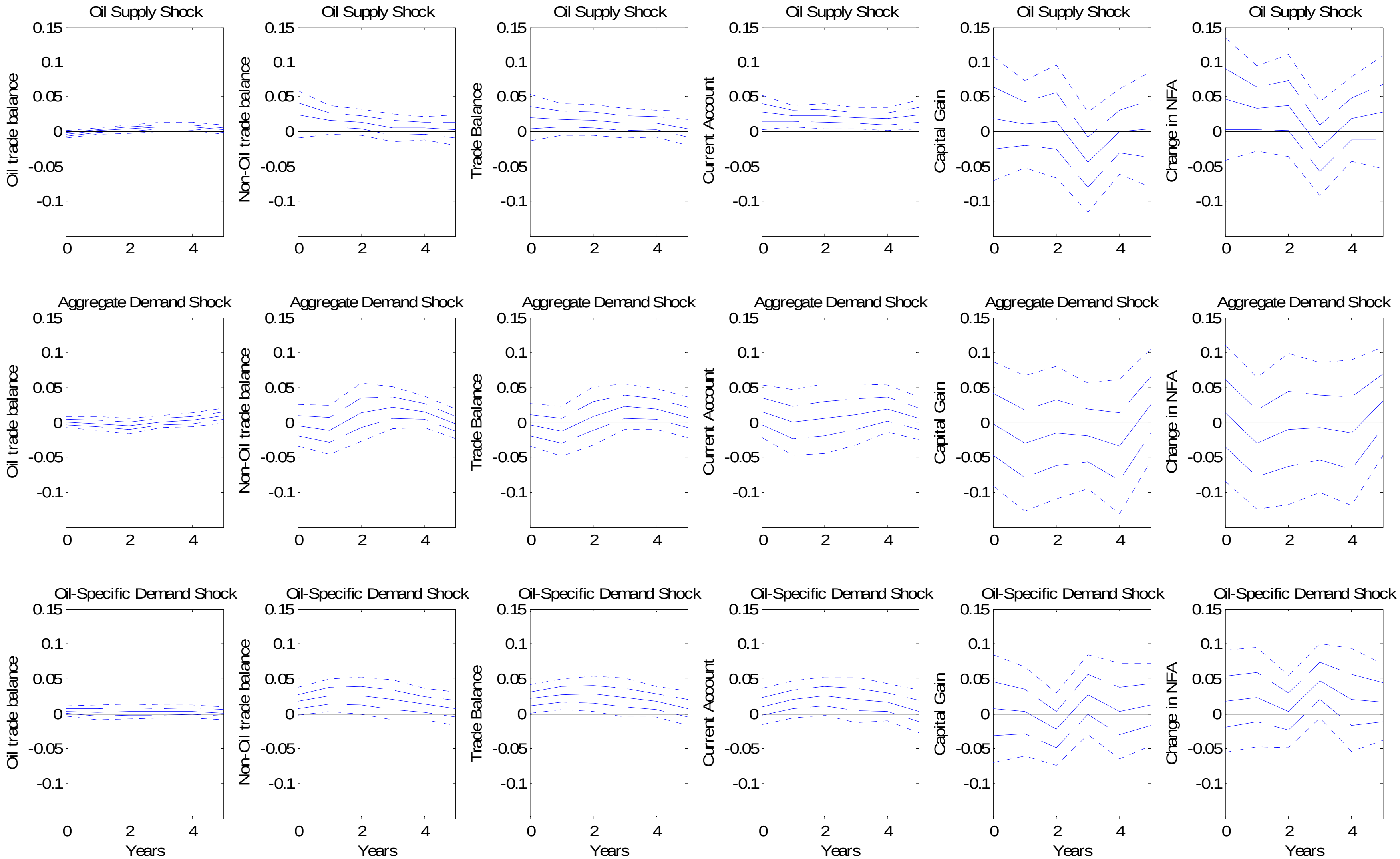


Figure 7: Dynamic Responses of External Accounts as a Share of GDP
United States

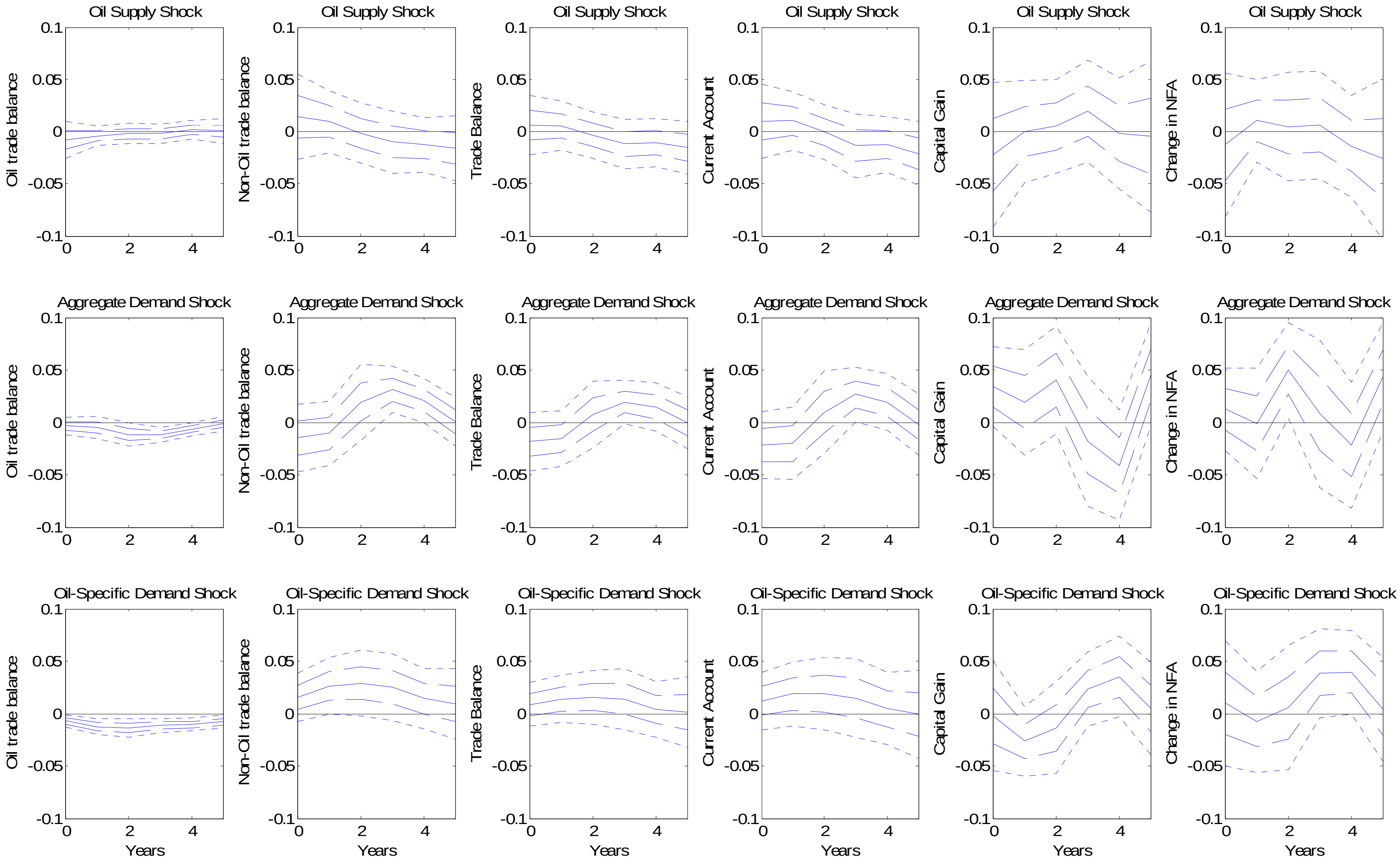


Figure 8: Dynamic Responses of External Accounts as a Share of GDP
Euro Area

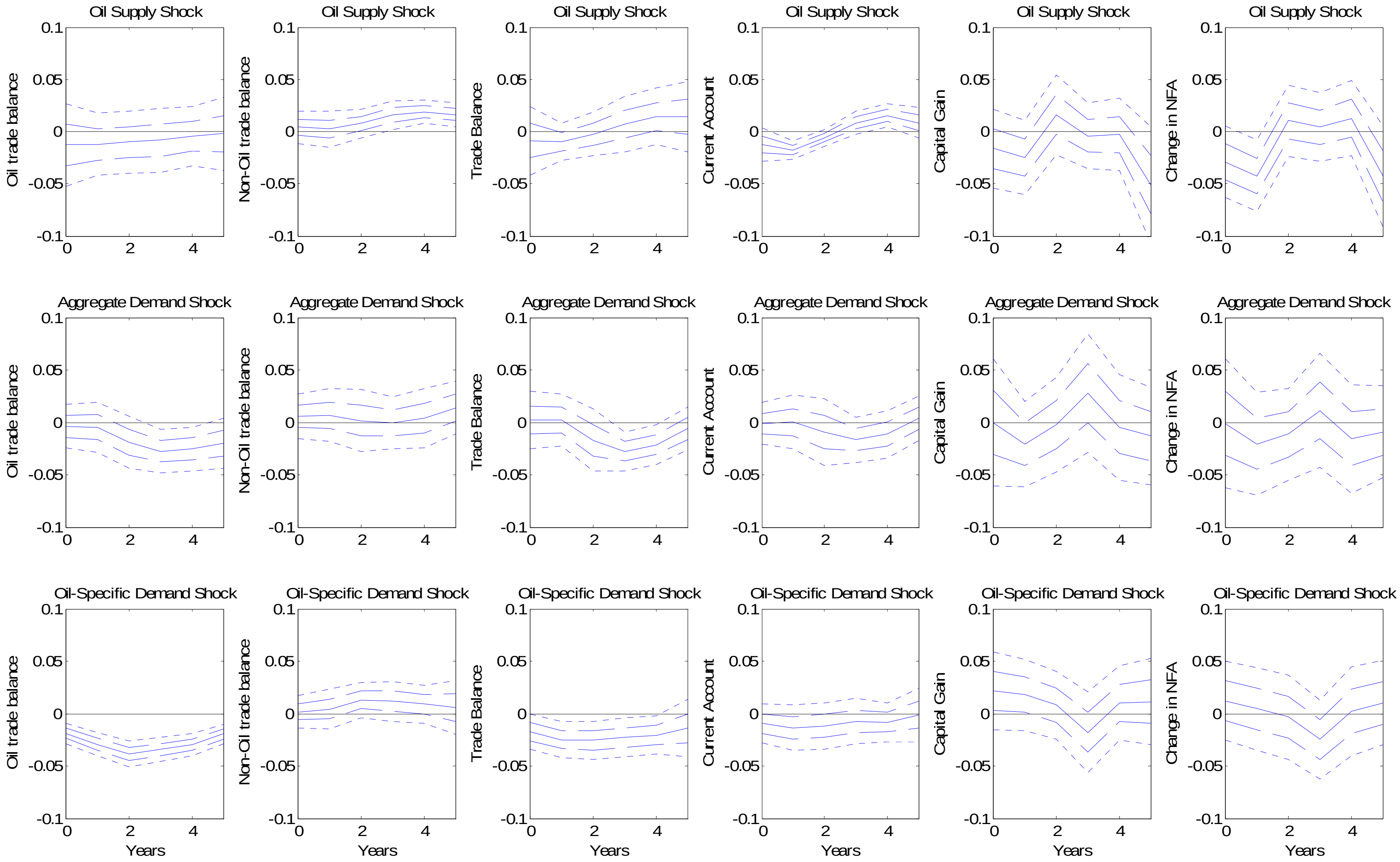


Figure 9: Dynamic Responses of External Accounts as a Share of GDP
Japan

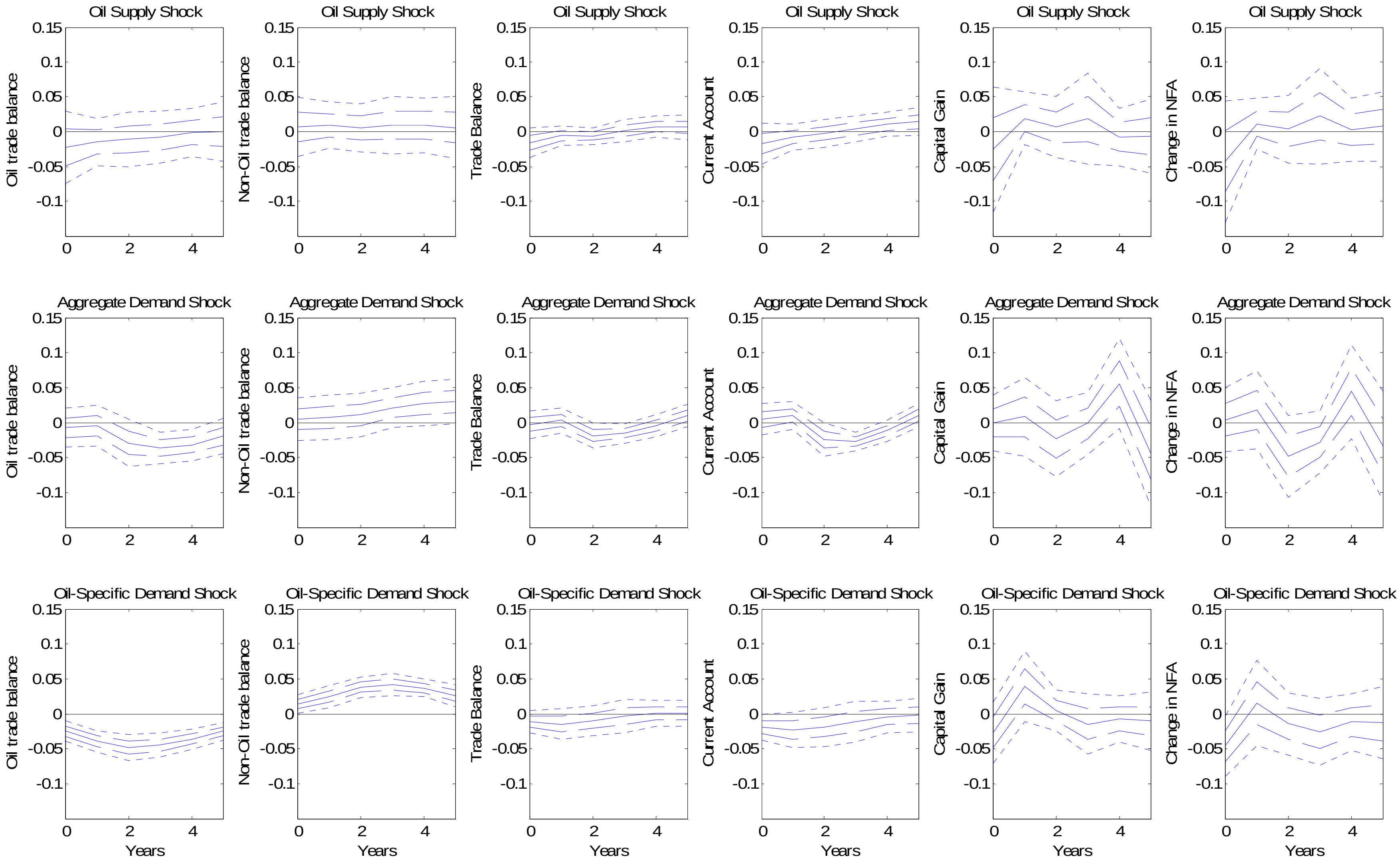


Figure 10: Dynamic Responses of External Accounts as a Share of GDP
Middle-Income Economies

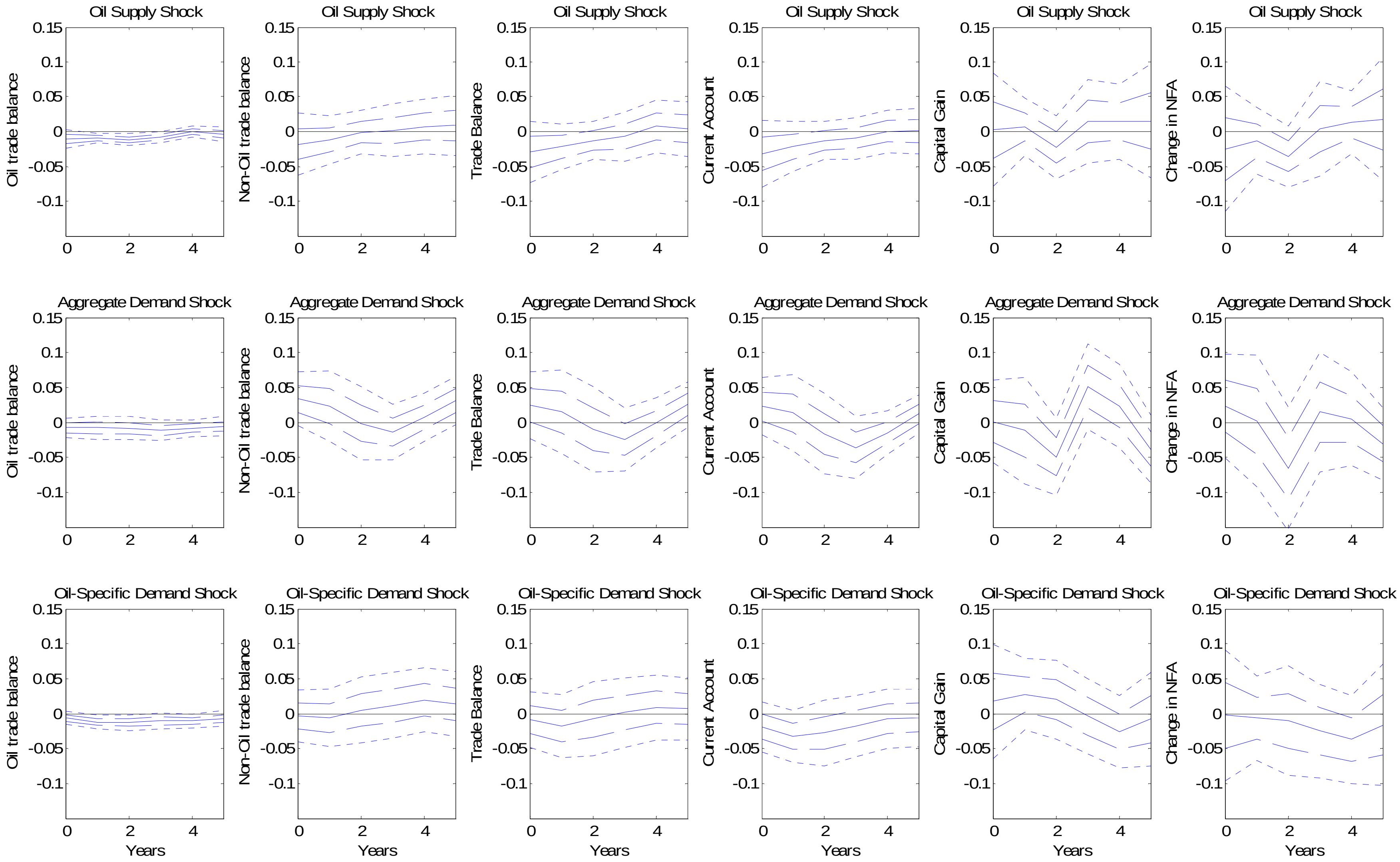


Figure 11: Dynamic Responses of External Accounts as a Share of GDP
Emerging Asia

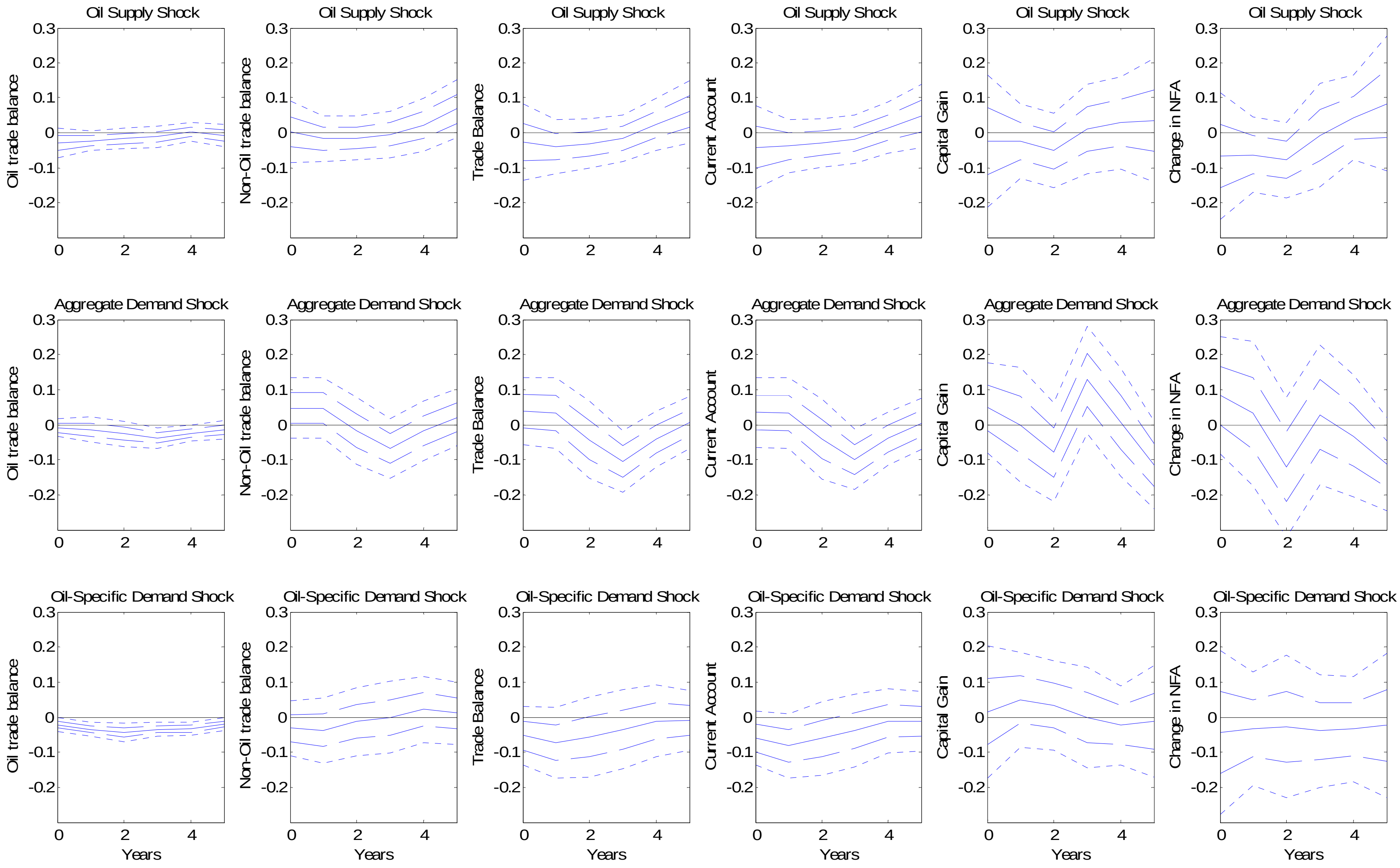


Figure 12: Dynamic Responses of External Accounts as a Share of GDP
Latin America

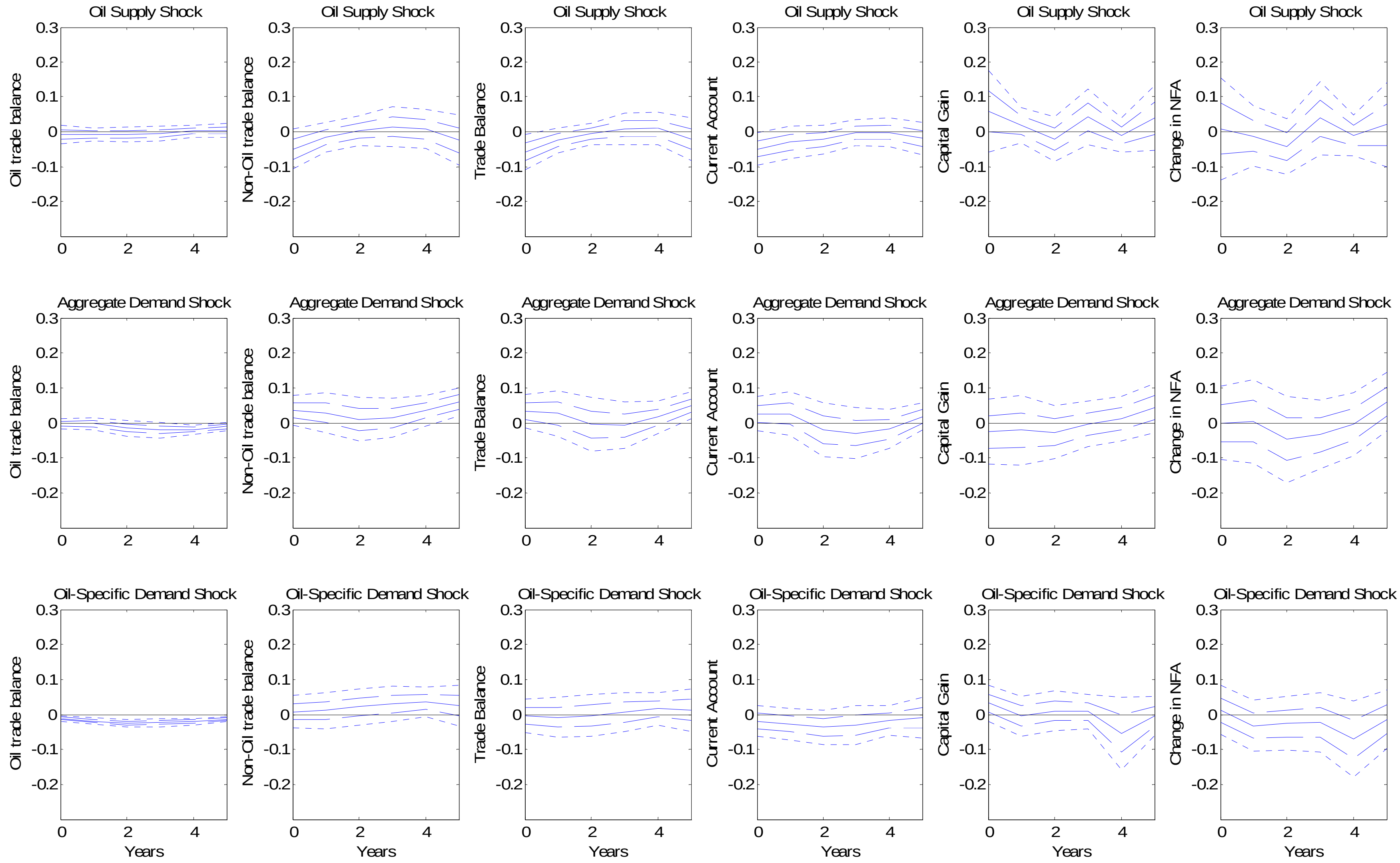


Figure 13: Historical Decompositions of Selected External Accounts as a Share of GDP

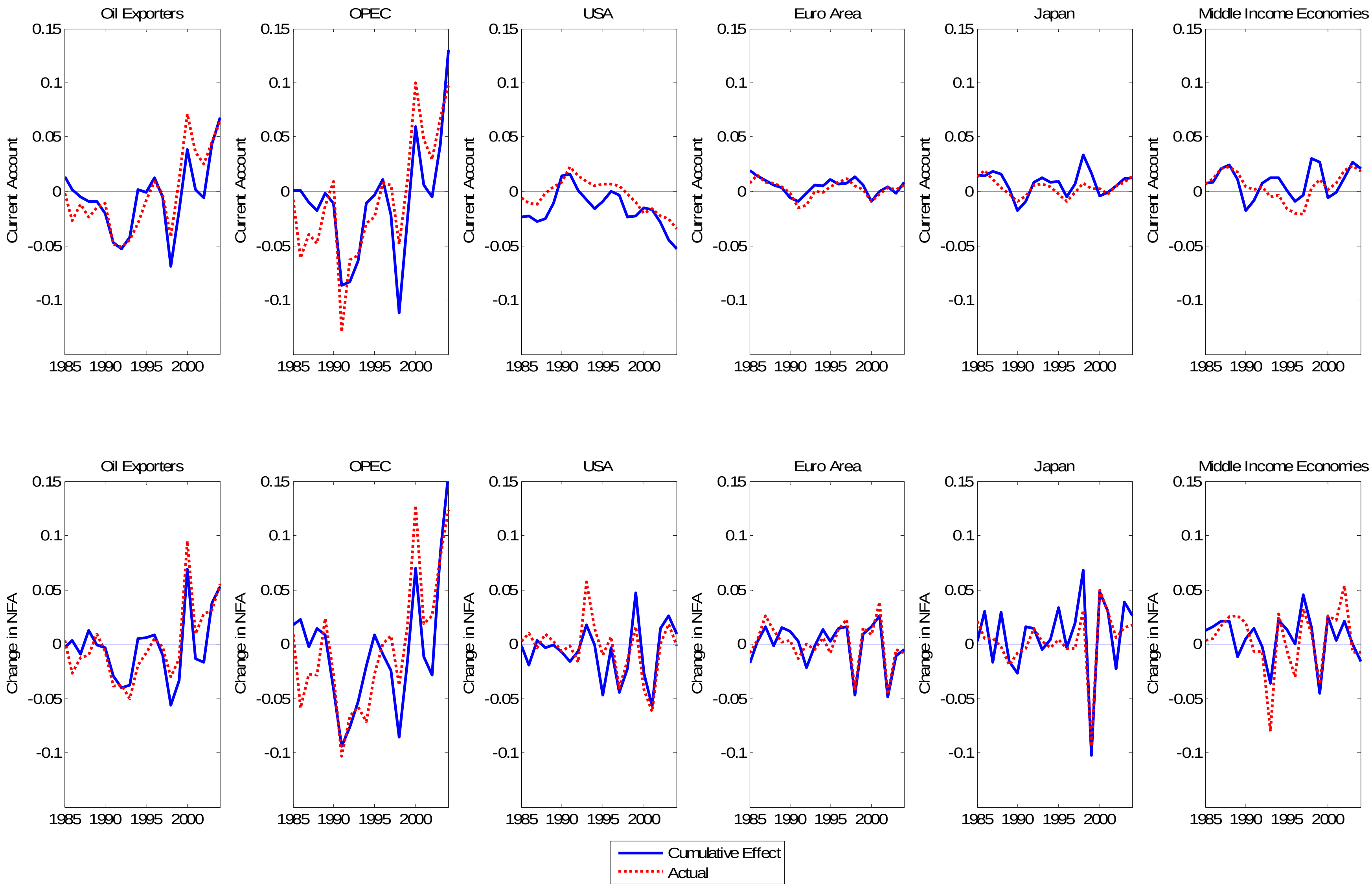


Figure 14: Historical Decompositions of the Current Account as a Share of GDP