# Accounting for Trade Deficits*

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March 9, 2021

**Abstract**

This paper proposes a decomposition for the total trade deficit of a country by using implications of a dynamic trade model. It is shown that the total trade deficit of a country can be decomposed into changes due to its effective terms of trade, its relative trade costs, and its macroeconomic developments with respect to its export partners. The implications for *bilateral* trade are estimated using both imports and exports data for 188 countries, and the decomposition of *total* trade deficit is achieved for each country. Empirical results show evidence for heterogeneity across countries regarding the decomposition of trade deficits, suggesting alternative policy tools to rebalance trade at the country level. A cross-country investigation further suggests that relative trade costs, followed by relative macroeconomic developments, have contributed the most to the heterogeneity of trade imbalances.

**JEL Classification:** F13, F14

**Key Words:** Trade Deficit; Decomposition; Terms of Trade; Trade Costs

*The author would like to thank Menzie Chinn and two anonymous referees as well as Emine Boz, Walter Steingress, and Midwest International Economics Meetings participants at Vanderbilt University for very helpful comments and suggestions. The usual disclaimer applies.

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# 1 Introduction

Trade deficits (defined as the difference between total imports and total exports) have been experienced by more than 70% of the countries around the globe between 1979-2015.[1] Having a trade deficit is problematic, because it is simply financed by capital flows (from trade-surplus countries) of which sudden stop can be destabilizing not only at the country level but also globally (see Milesi-Ferretti and Razin (2000), Blanchard and Milesi-Ferretti (2009), Catão and Milesi-Ferretti (2014) or Caballero (2016)); moreover, a trade deficit can result in a dynamic Dutch disease (see Caballero and Lorenzoni (2014)). On the other hand, having a trade surplus is also problematic, because a trade surplus may reflect an underlying domestic distortion (see Blanchard and Milesi-Ferretti (2012)) or trade-surplus countries may become targets for protectionist measures by trading partners (see Carney (2017) or Obstfeld (2018)). Accordingly, having a balanced trade (or at least not having an excessive deficit/surplus) as investigated by Dekle, Eaton, and Kortum (2007) is desirable for any open economy, which requires the knowledge of the sources of trade deficit.

This paper investigates the sources of trade deficit by using an international trade approach. In particular, based on the implications of a dynamic trade model that incorporates implicitly additively separable nonhomothetic constant elasticity of substitution (CES) preferences as in studies such as by Hanoch (1975) or Comin, Lashkari, and Mestieri (2015), the trade deficit of any country is decomposed into the effects due to changes in effective terms of trade, relative trade costs, and relative macroeconomic developments. This is achieved in two steps. First, by using the implications of the dynamic trade model, bilateral imports and bilateral exports of 188 countries are estimated. As is standard in the international trade literature, these estimations result in fitted values representing bilateral trade costs, source-time fixed effects and destination-time fixed effects for both bilateral imports and bilateral exports in logs. Second, since the sum of logs is not equal to the log of sums due to Jensen's inequality (i.e., one cannot take the sum of log bilateral trade deficits to obtain log total trade deficit), the fitted values obtained from these estimations are connected to the changes in total trade deficit of each country over time by using the Taylor series of bilateral trade expressions. This innovation results in a decomposition of the level changes in total trade deficit of a country into changes in its effective terms of trade (representing the difference between the weighted average of import prices and the weighted average of export prices), changes in relative trade costs of the country (representing the changes in the weighted av-

[1] This corresponds to 137 out of 188 countries in the sample that is described in the data section. Trade deficit is defined as having a positive average trade deficit during the sampe period.

erage of import trade costs and the weighted average of export trade costs), and relative macroeconomic developments of the country (representing changes in both relative economic activity and relative saving decisions with respect to its export partners). Since cumulative *changes over time* in the level of total trade deficit of any country is equal to its *level* of total trade deficit for any given period, a final decomposition can be achieved for the level of total trade deficit for any country.

The empirical results suggest that each country has different patterns over time regarding the contribution of each component in the decomposition of trade deficits, although relative trade costs followed by relative macroeconomic developments have contributed the most to the magnitude (of the trade deficit) during the sample period, on average across countries. When countries are categorized as Organisation for Economic Co-operation and Development (OECD) versus non-OECD countries, the average OECD country has experienced a trade surplus that is mostly explained by effective terms of trade followed by relative macroeconomic developments, whereas the average non-OECD country has experienced a trade deficit that is mostly explained by relative trade costs followed by relative macroeconomic developments. When subsamples are considered, it is shown that the establishment of the World Trade Organization (WTO) coincides with higher trade deficits for non-OECD countries that are accounted for by relative trade costs and relative macroeconomic developments, although trade surplus of OECD countries and its components have been stable over time.

Regarding country-specific results, for example, the U.S. trade deficit is mostly explained by the positive contributions of relative trade costs followed by those of effective terms of trade. In contrast, the negative Chinese trade deficit (i.e., its trade surplus) is mostly explained by its negative effective terms of trade, despite high and positive contributions of its relative macroeconomic developments. Another interesting country is Japan of which negative trade deficit (i.e., its trade surplus) is mostly explained by its relatively negative macroeconomic developments, followed by its negative relative trade costs.

Since trade imbalance of a country is financed through changes in its net foreign asset position, the international macro literature has investigated the reasons behind current account imbalances from a macroeconomic perspective (e.g., see Gourinchas and Rey (2014) for an excellent survey of the literature). This literature has mostly focused on consumption/saving and investment decisions of economic agents (i.e., intertemporal approach) as in Obstfeld and Rogoff (1995), asymmetries between financial and economic development in advanced and emerging countries as in Caballero, Farhi, and Gourinchas (2008), cross-country differences in the ability to insure away idiosyncratic risk as in Mendoza, Quadrini, and Rios-Rull

(2009) or Angeletos and Panousi (2011), interactions between financial frictions and international trade as in Antras and Caballero (2009), and the market value of claims and liabilities underlying a country's net foreign position as in Lane and Milesi-Ferretti (2001).

This paper contributes to this literature by focusing on how trade-based variables such as source prices or international trade costs interact with macroeconomic developments to explain trade imbalances in a dynamic trade model. Although this trade-based approach is similar to studies such as by Dekle, Eaton, and Kortum (2007), Reyes-Heroles (2016) or Alessandria and Choi (2018), different from them, this paper contributes by providing an estimation-based decomposition that is essential to understand the sources of total trade imbalances for 188 countries. On top of these studies, a cross-country investigation in this paper has further shown that the heterogeneity across countries regarding their total trade deficits is mostly connected to their relative trade costs, followed by relative macroeconomic developments.[2] When the same investigation is achieved for OECD versus non-OECD countries, the heterogeneity across the latter can be attributed more relative trade costs, while this attribution is less for the former.

The rest of the paper is organized as follows. The next section introduces a dynamic trade model that is connected to the decomposition of trade deficits. Section 3 discusses the estimation methodology and the data used. Section 4 depicts the country-specific results. Section 5 depicts summary of results for country groups and achieves a cross-country investigation. Section 6 concludes. Derivations are achieved in the Appendix, whereas country-specific results are given in the Online Appendix.

## 2 Economic Environment

We would like to obtain an expression for the level of total trade deficits by introducing a dynamic trade model, where consumers in each country maximize their utility based on their consumption given as follows:

$$U_{nt} = E_0 \sum_{t=0}^{\infty} \beta^t \frac{(C_{nt})^{1-\sigma}}{1-\sigma} \tag{1}$$

[2]By focusing on bilateral trade balances (rather than total trade balances as in this paper), Felbermayr and Yotov (2019) have shown by using a trade approach that *bilateral* trade balances across countries can mostly be attributed to country-specific variables (corresponding to macroeconomic developments at the bilataral level in this paper).

where, for country $n$ at time $t$, $U_{nt}$ is the utility of consumers, $E_0$ is the expectation operator, $\beta$ is the discount factor, and $C_{nt}$ is an overall consumption index. Utility is maximized with respect to the following budget constraint:

$$\underbrace{P_{nt}C_{nt}}_{\text{Expenditure}} + \underbrace{E_t\left\{Q_{t+1,t}B_{nt+1}\right\} - B_{nt}}_{\text{Net Saving}} = \underbrace{P_{nnt}Y_{nt}}_{\text{Income}} \tag{2}$$

where $P_{nt}$ is the price of $C_{nt}$, $Q_{t+1,t}$ is the stochastic discount factor for one-period ahead nominal pay-offs that is common across countries under the assumption of complete securities markets, $B_{nt+1}$ is the nominal pay-off in period $t+1$ of an international portfolio held at the end of period $t$, $P_{nnt}$ is the price of home products, and $Y_{nt}$ is the endowment of home products.[3] Utility maximization in country $n$ results in the following stochastic Euler equation:

$$\beta R_t E_t\left\{\left(\frac{C_{nt+1}}{C_{nt}}\right)^{-\sigma}\frac{P_{nt}}{P_{nt+1}}\right\} = 1 \tag{3}$$

where $R_t = \frac{1}{E_t\{Q_{t+1,t}\}}$ is the gross return (interest rate) on a riskless one-period discount bond paying off one unit of domestic currency in $t+1$ that is common across countries due to complete securities markets.

Following the functional form in studies such as by Hanoch (1975) or Comin, Lashkari, and Mestieri (2015), the consumption index of $C_{nt}$ is further given by implicitly additively separable nonhomothetic constant elasticity of substitution (CES) preferences:

$$C_{nt} = \underbrace{\left(C_{nt}\right)^{\frac{\varphi_n^H}{\theta}}\left(C_{nnt}\right)^{\frac{\theta-1}{\theta}}\left(1-\alpha\right)^{\frac{1}{\theta}}}_{\text{Due to Consumption of Home Products}} + \underbrace{\left(C_{nt}\right)^{\frac{\varphi_n^F}{\theta}}\sum_{i\neq n}\left(C_{nit}\right)^{\frac{\theta-1}{\theta}}\left(\alpha\right)^{\frac{1}{\theta}}}_{\text{Due to Consumption of Foreign Products}} \tag{4}$$

where, for country $n$ at time $t$, $C_{nit}$ represents products imported from country $i$ (representing consumption of home products when $i=n$), $\varphi_n^H$ governs income elasticity of demand for home products, $\varphi_n^F$ governs income elasticity of demand for foreign products, $\theta$ is the elasticity of substitution across products of different countries, and $\alpha$ is (inversely) related to the degree of home bias in preferences as in studies such as by Gali and Monacelli (2005). The optimization across products of source countries results in the following demand function in country $n$ for

[3] It is important to emphasize that the rest of the investigation is not affected by the assumption of an endowment economy. In particular, when the endowment economy is replaced with an economy having a production side, it can be shown that one can obtain the very same decomposition given in Equation 9, where production-side details would be captured by macroeconomic developments.

products imported from country $i$ at time $t$:

$$C_{nit} = \alpha \left( \frac{P_{nit}}{P_{nt}} \right)^{-\theta} (C_{nt})^{\varphi_n^F} \tag{5}$$

and the following demand function for home products:

$$C_{nnt} = (1-\alpha) \left( \frac{P_{nnt}}{P_{nt}} \right)^{-\theta} (C_{nt})^{\varphi_n^H} \tag{6}$$

where $P_{nit}$ and $P_{nnt}$ are prices of $C_{nit}$ and $C_{nnt}$ satisfying:

$$P_{nt} = \left( (C_{nt})^{\varphi_n^H - 1} (P_{nnt})^{1-\theta} (1-\alpha) + (C_{nt})^{\varphi_n^F - 1} \sum_{i \neq n} (P_{nit})^{1-\theta} \alpha \right)^{\frac{1}{1-\theta}} \tag{7}$$

In a special case in which $\varphi_n^H = \varphi_n^F = 1$, the last three equations reduce to expressions that are implied by conventional CES preferences with unitary income elasticity. However, when $\varphi_n^H \neq \varphi_n^F \neq 1$, consumers distinguish between their demand for home versus foreign products following a change in their overall consumption $C_{nt}$ (i.e., elasticity of foreign-goods consumption imported from country $i$ with respect to $C_{nt}$ is $\frac{\partial C_{nit}}{\partial C_{nt}} \frac{C_{nt}}{C_{nit}} = \varphi_n^F$, while elasticity of home-goods consumption with respect to $C_{nt}$ is $\frac{\partial C_{nnt}}{\partial C_{nt}} \frac{C_{nt}}{C_{nnt}} = \varphi_n^H$).[4]

## 2.1 Implications for Bilateral Trade

In terms of log expenditures, Equation 5 representing imports of country $n$ from country $i$ can be rewritten as follows:

$$\log (P_{nit} C_{nit}) = (1-\theta) \log P_{iit} + (1-\theta) \log \tau_{nit} + \log Z_{nt} + \log \alpha \tag{8}$$

where iceberg trade costs $\tau_{nit} > 1$ satisfying $P_{nit} = \tau_{nit} P_{iit}$ have been used, with $P_{iit}$ representing source prices, and $Z_{nt} = (P_{nt})^{\theta} (C_{nt})^{\varphi_n^F}$ is a measure of economic activity (that would reduce to the value of nominal consumption in a special case of unitary elasticities, $\theta = \varphi_n^F = 1$). In terms of future percentage changes, this expression can be rewritten as

[4] Although $\varphi_n^H$ and $\varphi_n^F$ can take values different from 1, it is implied by Engel aggregation that their weighted average is equal to 1, where weights are home and foreign expenditure shares, respectively.

follows:

$$\underbrace{\Delta \log \left(P_{nit+1} C_{nit+1}\right)}_{\text{Trade Data}} = \underbrace{(1-\theta)\, E_t \left\{\Delta \log P_{iit+1}\right\}}_{\text{Source Prices}} + \underbrace{(1-\theta)\, E_t \left\{\Delta \log \tau_{nit+1}\right\}}_{\text{Bilateral Trade Costs}} \tag{9}$$

$$+ \underbrace{E_t \left\{\Delta \log \left(Z_{nt+1}\right)\right\}}_{\text{Macroeconomic Developments}} + \underbrace{v_{nit+1,t}}_{\text{Residuals}}$$

where $\Delta$ represents time difference, and $v_{nit+1,t} = \Delta \log \left(P_{nit+1} C_{nit+1}\right) - E_t \left\{\Delta \log \left(P_{nit+1} C_{nit+1}\right)\right\}$ is the full-information rational expectations error and is thus uncorrelated with any information dated $t$ or earlier.[5] Using Equation 3, macroeconomic developments represented by $E_t \left\{\Delta \log \left(Z_{nt+1}\right)\right\}$ in this expression can alternatively be written as follows:

$$\underbrace{E_t \left\{\Delta \log \left(Z_{nt+1}\right)\right\}}_{\text{Macroeconomic Developments}} = \underbrace{\theta \log \left(\beta R_t\right)}_{\text{Saving Decision}} + \underbrace{\left(\varphi_n^F - \sigma\theta\right) E_t \left\{\Delta \log \left(C_{nt+1}\right)\right\}}_{\text{Changes in Real Consumption}} \tag{10}$$

where they depend on the saving decision of individuals as in studies such as by Obstfeld and Rogoff (1995) together with future expected changes in real consumption (that would effectively be eliminated in a special case of unitary elasticities, $\theta = \varphi_n^F = \sigma = 1$).[6]

In terms of the literature, Equation 9 is in line with Allen, Arkolakis, and Takahashi (2018) who have shown that several international trade models such as by Anderson (1979), Anderson and Van Wincoop (2003), Eaton and Kortum (2002), Dekle, Eaton, and Kortum (2008), Caliendo and Parro (2015), Krugman (1980), Melitz (2003), Arkolakis, Demidova, Klenow, and Rodriguez-Clare (2008), di Giovanni and Levchenko (2009), and Bernard, Eaton, Jensen, and Kortum (2003) imply the very same *universal* gravity equation, where bilateral trade between any two countries depend on source prices, bilateral trade iceberg costs, and a measure of economic activity at the destination country. However, different from this literature, Equation 9 is dynamic, and thus, its right hand side represents future expected percentage changes in variables.

[5] Since future prices are endogenous variables that can change with shocks that occur unexpectedly over time, the corresponding unexpected changes are captured by $v_{nit+1,t}$'s.

[6] It is important to emphasize that Equation 10 holds independent of having an endowment or a production economy. In particular, having a production side in an alternative model would only put more structure (in equilibrium) on future expected changes in real consumption.

## 2.2 Implications for Trade Deficits

Using the model introduced so far, as shown in details in the Appendix, an expression can be found for the total trade deficit of country $n$ as a percentage of its Gross Domestic Product (GDP) as follows:

$$\underbrace{100\times\frac{\sum_{t=1979}^{e}\Delta D_{nt+1}}{GDP_{ne}}}_{\text{Cumulative Trade Deficit}}=\underbrace{100\times\frac{\sum_{t=1979}^{e}(1-\theta)\begin{pmatrix}M_{nt}\sum_{i\neq n}\omega_{nit}E_t\{\Delta\log P_{iit+1}\}\\-X_{nt}E_t\{\Delta\log P_{nnt+1}\}\end{pmatrix}}{GDP_{ne}}}_{\text{Cumulative Changes due to Effective Terms of Trade as \% of GDP}} \tag{11}$$

$$+\underbrace{100\times\frac{\sum_{t=1979}^{e}(1-\theta)\begin{pmatrix}M_{nt}\sum_{i\neq n}\omega_{nit}E_t\{\Delta\log\tau_{nit+1}\}\\-X_{nt}\sum_{i\neq n}\lambda_{int}E_t\{\Delta\log\tau_{int+1}\}\end{pmatrix}}{GDP_{ne}}}_{\text{Cumulative Changes due to Relative Trade Costs as \% of GDP}}$$

$$+\underbrace{100\times\frac{\sum_{t=1979}^{e}\begin{pmatrix}M_{nt}E_t\{\Delta\log Z_{nt+1}\}\\-X_{nt}\sum_{i\neq n}\lambda_{int}E_t\{\Delta\log Z_{it+1}\}\end{pmatrix}}{GDP_{ne}}}_{\text{Cumulative Changes due to Macroeconomic Developments as \% of GDP}}$$

$$+\underbrace{100\times\frac{\sum_{t=1979}^{e}\begin{pmatrix}M_{nt}\sum_{i\neq n}\omega_{nit}\left(v_{nit+1,t}+o\left(\|f_{nit}^2\|\right)\right)\\-X_{nt}\sum_{i\neq n}\lambda_{int}\left(v_{int+1,t}+o\left(\|f_{int}^2\|\right)\right)\end{pmatrix}}{GDP_{ne}}}_{\text{Cumulative Changes due to Residuals}}$$

where $D_{nt}$ represents the difference between the *levels* of total imports and total exports of country $n$ at time $t$, satisfying $D_{nt}=M_{nt}-X_{nt}$ with $M_{nt}=\sum_{i\neq n}P_{nit}C_{nit}$ representing total imports and $X_{nt}=\sum_{i\neq n}P_{int}C_{int}$ representing total exports of country $n$ at time $t$. The share of imports in country $n$ coming from source country $i$ at time $t$ is given by $\omega_{nit}=\frac{P_{nit}C_{nit}}{M_{nt}}$ as it satisfies $\sum_{i\neq n}\omega_{nit}=1$, whereas the share of exports in country $n$ sent to destination country $i$ at time $t$ is given by $\lambda_{int}=\frac{P_{int}C_{int}}{X_{nt}}$ as it satisfies $\sum_{i\neq n}\lambda_{int}=1$. Finally, $o\left(\|f_{nit}^2\|\right)$'s represent terms that are equal to or higher than second order due to using Taylor series of $\Delta\log\left(x_{t+1}\right)=\frac{\Delta x_{t+1}}{x_t}+o\left(\|f^2\|\right)$ as the sum of logs is not equal to the log of sums according to Jensen's inequality.

The left hand side of Equation 11 represents the cumulative trade deficits (in levels) of country $n$ at period $e$ measured starting from the year 1979. The starting date of 1979 has been chosen not only to have more countries with positive trade observations in the sample but also due to the fact that the trade openness and thus the trade deficits of most countries have been virtually around zero at that time. The latter is important for technical reasons, because our measure of cumulative changes in trade deficit ($\sum_{t=1979}^{e} \Delta D_{nt+1}$) would be exactly equal to the level of trade deficit ($D_{nt+1}$) when the initial trade deficit (in 1979) is set equal to zero as we proceed in this paper.[7] Finally, $GDP_{ne}$ represents GDP of country $n$ at any time $e$.

As is evident in Equation 11, the *level* of trade deficit (measured by the cumulative changes in trade deficit) of country $n$ can be decomposed into components as a percentage of its GDP. The first component, the cumulative change in effective terms of trade, represents the difference between the weighted average of import prices and the weighted average of export prices, both measured at the source country; it can be connected to policies such as structural reforms to adjust export prices (as in Chinn and Ito (2007), Alfaro, Kalemli-Ozcan, and Volosovych (2008), Cheung, Furceri, and Rusticelli (2013) or Culiuc and Kyobe (2017)) or foreign exchange intervention (as in Bayoumi, Gagnon, and Saborowski (2015), Blanchard, Adler, and Filho (2015), or Carney (2017)). The second component measures the effects due to the relative trade costs of the country, defined as the changes in the weighted average of import trade costs and the weighted average of export trade costs; it can be connected to the standard trade policies such as changes in tariffs/duties or investment in transportation technology (as in Barattieri (2014), Obstfeld (2016), Reyes-Heroles (2016), Alessandria and Choi (2018), Eichengreen (2018), or Boz, Li, and Zhang (2019)). The third component compares the relative macroeconomic developments of the country with respect to its export partners; it can be connected to macroeconomic policies as in IMF (2018).

[7] The investigation based on countries of which initial trade deficit in 1979 was not around zero still captures the changes in their trade deficit starting from 1979, although the decomposition of cumulative changes *before* 1979 cannot be achieved. According to the data described below, out of 188 countries, the following countries have experienced trade deficits or surpluses more than 10% of their GDP as of 1979: Belize, Benin, Bermuda, Brunei Darussalam, Burkina Faso, Cabo Verde, Congo, Republic of, Costa Rica, Dominica, Egypt, Fiji, Gabon, Gambia, The, Greenland, Guinea-Bissau, Indonesia, Israel, Jordan, Malawi, Malaysia, Mali, Malta, Morocco, Nicaragua, Nigeria, Pakistan, Portugal, Saint Vincent and the Grenadines, Saudi Arabia, Seychelles, Singapore, Sri Lanka, Tanzania, Togo, Trinidad and Tobago, United Arab Emirates.

# 3 Estimation Methodology and Data

The decomposition given in Equation 11 requires knowledge of future expected changes in source prices represented by $(1-\theta)\,E_t\{\Delta\log P_{iit+1}\}$'s that are source-country and time specific, future expected changes in bilateral trade costs represented by $(1-\theta)\,E_t\{\Delta\log\tau_{nit+1}\}$'s that are source- and destination-country and time specific, future expected changes in macroeconomic developments represented by $E_t\{\Delta\log(Z_{nt+1})\}$'s that are destination-country and time specific, and future expected changes in residuals represented by $v_{nit+1,t}$ for all $n,i,t$ for both imports and exports; these are estimated by using the implications of the model for bilateral imports and bilateral exports. The remaining required information (for the decomposition in Equation 11) on total imports of $M_{nt}$'s, total exports of $X_{nt}$'s, import shares of $\omega_{nit}$'s and export shares $\lambda_{int}$'s are directly obtained from the data.[8]

Based on this background, regarding bilateral imports, we estimate Equation 9 as a panel by using data on bilateral imports according to the following expression for country $n$:

$$\underbrace{\Delta\log(P_{nit+1}C_{nit+1})}_{\text{Bilateral Import Data}}=\underbrace{(1-\theta)\,E_t\{\Delta\log P_{iit+1}\}}_{\text{Source-Time Fixed Effects}}+\underbrace{(1-\theta)\,E_t\{\Delta\log\tau_{nit+1}\}}_{\text{Bilateral Trade Costs}} \tag{12}$$

$$+\underbrace{E_t\{\Delta\log(Z_{nt+1})\}}_{\text{Destination-Time Fixed Effects}}+\underbrace{v_{nit+1,t}}_{\text{Residuals}}$$

where the corresponding fitted values are effectively used in the decomposition of trade deficits given in Equation 11.

Similarly, regarding bilateral exports, we estimate Equation 8 as a panel by using data on bilateral exports according to the following expression for country $n$:

$$\underbrace{\Delta\log(P_{int+1}C_{int+1})}_{\text{Bilateral Export Data}}=\underbrace{(1-\theta)\,E_t\{\Delta\log P_{nnt+1}\}}_{\text{Source-Time Fixed Effects}}+\underbrace{(1-\theta)\,E_t\{\Delta\log\tau_{int+1}\}}_{\text{Bilateral Trade Costs}} \tag{13}$$

$$+\underbrace{E_t\{\Delta\log(Z_{it+1})\}}_{\text{Destination-Time Fixed Effects}}+\underbrace{v_{int+1,t}}_{\text{Residuals}}$$

where, again, the corresponding fitted values are effectively used in the decomposition of trade deficits given in Equation 11.

[8] Information on $o\left(\left\|f_{nit}^2\right\|\right)$'s is also required, which can be obtained by using $\Delta\log(x_{t+1})=\frac{\Delta x_{t+1}}{x_t}+o\left(\left\|f^2\right\|\right)$ as discussed above.

In both estimations, percentage changes in trade costs are represented by dyadic fixed effects (that capture any importer-specific, exporter-specific, or importer-exporter-specific percentage changes in trade costs by construction), together with dummies for common currency and free trade agreements (that are time-varying by construction) interacting with dyadic fixed effects.[9] The latter interactions result in capturing the effects of having a common currency or a free trade agreement for each country pair individually (e.g., they can distinguish between the effects of The North American Free Trade Agreement between the U.S. and Canada versus those of The European Free Trade Association between Norway and Switzerland). Source-time fixed effects capture the effects of future expected percentage changes in source-specific prices, while destination-time fixed effects capture the effects of future expected percentage changes in destination-specific macroeconomic developments.[10]

Trade data are obtained from the International Monetary Fund's Direction of Trade Statistics (DOTS) for bilateral imports $P_{nit}C_{nit}$'s, bilateral exports $P_{int}C_{int}$'s, total imports $M_{nt}$'s, and total exports $X_{nt}$'s for the years between 1979-2015. Estimation results, as well as $M_{nt}$'s and $X_{nt}$'s, are further combined with shares of imports given by $\omega_{nit}$'s and shares of exports given by $\lambda_{int}$'s, both obtained from the same data set, to achieve the decomposition of total trade deficits in Equation 11. The gravity variables are obtained from the economic geography database of CEPII (Centre d'Etudes Prospectives et d'informations Internationales) for the very same time period. The combination of the two data sets results in having data for 188 countries in estimations.

It is important to emphasize that we estimate bilateral imports and bilateral exports in two separate estimations. This is not only to make sure that we match the total trade deficit of each country through our trade deficit expression (of Equation 11) but also to capture the inconsistency between partner country data as indicated by DOTS documentation (i.e., imports from country $i$ to country $j$ may not be equal to exports from country $j$ to country $i$). One reason for the latter inconsistency is the time of recording, which may be different for the source country (recorded when the shipment leaves) and the destination country (recorded when the shipment arrives). Since shipment takes time, these recordings can fall into two different recording periods (e.g., source recording may represent the current year, while destination recording may represent the following year). Another reason is the

[9] Considering these time-varying gravity variables, together with time-varying import and export shares, results in having time-varying contribution of trade costs in Equation 11.

[10] For sure, alternative model details (e.g., see Olivero and Yotov (2012) where capital accumulation is considered) would result in alternative structural interpretation of these fixed effects, although the estimated fixed effects would remain the same across alternative model specifications. Accordingly, the interpretation of the results in this paper should be considered based on the ingredients of the model introduced.

way that imports and exports are valued; e.g., apart from imports being measured as cost, insurance, and freight (CIF), and exports are measured as free on board (FOB), alternative currency conversions or anti-evasion procedures can lead into having inconsistencies between partner country data. Having alternative coverage practices is another reason, where certain confidential items such as for military or government may or may not be recorded by source or destination countries. By having alternative regressions for bilateral imports and bilateral exports, our empirical strategy captures all of these details by construction.

# 4 Empirical Results for Individual Countries

## 4.1 Results for the Full Sample

The methodology introduced above provides results for all 188 countries in our data set, although we focus on the U.S. and its four major trade partners, namely China, Canada, Mexico and Japan, in this section. The results for other countries are given in the Online Appendix. The decomposition of the trade deficit for these countries are given in Figure 1 over the sample period, while the averages (across years) for alternative periods are given for the same countries in Table 1.

We start with investigating the U.S., where trade deficit has been about 3% of its GDP on average between 1980-2015 according to Table 1. The majority of the U.S. trade deficit can be attributed to relative trade costs, followed by effective terms of trade, while relative macroeconomic developments have mostly worked toward balancing trade. The contribution of relative trade costs to the U.S. trade deficit has gradually increased over time, where effective terms of trade has almost always contributed positively to the U.S. trade deficit, while the negative contribution of relative macroeconomic developments has been in the picture except for early 2000s.

In contrast, China has experienced a trade surplus (i.e., negative trade deficit) of about 2% of its GDP on average between 1980-2015, for which negative effective terms of trade have contributed the most, followed by negative relative trade costs. Although relative macroeconomic developments have been positive in China, their magnitude has not been enough to have trade deficits. Starting from late 1990s, China has started experiencing positive relative macroeconomic developments dominated by negative effective terms of trade, which has resulted in a trade surplus. Compared to the U.S. that has experienced positive and dominant relative trade costs almost at all times, China's relative trade costs have always contributed negatively, suggesting heterogeneity of contributing components across countries.

Different from the U.S. that has experienced a trade deficit and China that has experienced a trade surplus between 1980-2015, Canada and Mexico have experienced relatively balanced trade measures during the same period. However, the components responsible for Canada versus Mexico are highly different. In particular, Canada's relatively balanced trade can be attributed to positive effective terms of trade and positive relative macroeconomic developments compensated by negative relative trade costs, whereas relatively balanced trade of Mexico can be attributed to positive relative trade costs and positive relative macroeconomic developments compensated by negative effective terms of trade. Contribution of trade costs has always been negative for Canada, while it has always been positive for Mexico. Canada's effective terms of trade have turned from positive to negative in 2000s, whereas those of Mexico have always been negative.

One interesting comparison can be achieved between Mexico and Japan. In particular, as opposed to Mexico, Japan's relative macroeconomic developments have contributed negatively, while its effective terms of trade have contributed positively almost always. Nevertheless, on average between 1980-2015, Japan has experienced a trade surplus, where positive contribution of effective terms of trade has been dominated by negative contributions of relative macroeconomic developments and relative trade costs.

The average decomposition of trade imbalances during the sample period is given for all 188 countries in the Online Appendix Table A.1, where similar country-specific investigations can be achieved. Country-specific decompositions over time are provided as figures in the Online Appendix as well.

## 4.2 Results for Subsamples

The results for subsamples of the U.S. and its four major trade partners representing periods before and after the establishment of WTO in 1995 are summarized as averages across years in Table 1. Since the main function of WTO is to ensure through global rules that trade flows as smoothly, predictably and freely as possible, investigating these subsamples provides insights about how the establishment of WTO might have changed the decomposition of trade deficits across countries.

As is evident, increases in both the U.S. trade deficit and the trade surplus (i.e., negative trade deficit) of China after WTO can be attributed to changes in their effective terms of trade and relative trade costs, suggesting that opposite changes in trade balances of these countries coincide with WTO.

Trade deficit of Canada has been mostly stable between subsamples, since higher contribution of relative macroeconomic developments after WTO has been compensated by lower contributions of effective terms of trade and trade costs. Trade surplus of Mexico before WTO has turned into trade surplus after WTO, since lower contribution of effective terms of trade has not been enough to compensate for higher contributions of relative trade costs and relative macroeconomic developments. Since the establishment of WTO also coincides with the North American Free Trade Agreement (NAFTA), it is suggested that trade deficits of countries can be affected by alternative factors following freer trade.

Finally, Japan has experienced trade surpluses in both subsamples as the significant higher contribution of effective terms of trade has been compensated by lower contributions of relative trade costs and relative macroeconomic developments after WTO.

# 5 Empirical Results for Country Groups

## 5.1 Results for the Full Sample

After showing that countries have distinct decompositions of their trade deficits, we continue with providing results for country groups by distinguishing between all countries, OECD countries, non-OECD countries, and world regions. Although we have the results for all 188 countries in our data set (as given in the Online Appendix), to control for outliers and thus have a healthy summary, we ignore countries that have trade deficit or surplus measures corresponding to more than 50% of their GDP at any year during the sample period. The decomposition of the cumulative trade deficit for these country groups are given in Figure 2 over the sample period, while the corresponding averages are given in Table 2.

The average country has experienced a trade deficit of about 4% of its GDP, for which relative trade costs have contributed the most, followed by relative macroeconomic developments. When countries are split as OECD versus non-OECD countries, the average of the former has experienced a trade surplus of about 1% of its GDP, whereas the average of the latter has experienced a trade deficit of about 6% of its GDP. Trade deficit of the average non-OECD country can mostly be attributed to relative trade costs and relative macroeconomic developments, whereas trade surplus of the average OECD country can be attributed to negative effective terms of trade and negative relative macroeconomic developments.

Regarding world regions (based on World Bank country classifications), South Asian and Sub-Saharan African countries have experienced higher trade deficits that are mostly accounted for by relative macroeconomic developments for the former and relative trade

costs for the latter. In contrast, European and Central Asian countries have experienced lower trade deficits that can be attributed to their effective terms of trade.

As shown in Figure 2, over time, the average country has experienced a trade deficit almost always during the sample period, with positive contributions of relative trade costs at all times, together with positive contributions of relative macroeconomic developments starting from late 1990s. The average OECD country has experienced a trade surplus almost at all times, where effective terms of trade have started pushing toward a trade deficit starting after the 2008 recession. In contrast, the average non-OECD country has experienced a trade deficit at all times, with positive contributions of relative trade costs at all times and relative macroeconomic developments starting from late 1990s. Similar comparisons can be achieved for world regions.

## 5.2 Results for Subsamples

The results for subsamples of country groups representing periods before and after WTO are summarized as averages across years in Table 3. The establishment of WTO coincides with higher trade deficits for non-OECD countries that is accounted for by relative trade costs and relative macroeconomic developments, although trade surplus of OECD countries and its components have been stable over time.

Regarding world regions, South Asian and Sub-Saharan African countries have experienced the highest increase in their trade deficits that can be mostly explained by relative macroeconomic developments for the former and relative trade costs for the latter. It is implied that the establishment of WTO coincides with heterogenous changes across country groups regarding the components of their trade deficits.

## 5.3 Cross-Country Investigation

Although results on individual countries or country groups that have been depicted so far provide useful information for country-specific or group-specific policies, we would like to investigate in this section whether there are any systematic patterns across countries regarding the decomposition of their trade deficits. Similar to studies such as by Lane and Milesi-Ferretti (2002), this is achieved by showing the individual explanatory power of each component for the trade deficit. To control for outliers, we again ignore countries that have trade deficit or surplus measures corresponding to more than 50% of their GDP at any year during the sample period.

The results representing all countries are given in Figure 3, where it is evident that relative trade costs are correlated the most with trade deficits, followed by relative macroeconomic developments. The correlation between country-specific trade deficits and effective terms of trade as well as preferences/residuals, is almost none. Across OECD countries, as shown in Figure 4, there is weak evidence for the correlation between trade deficits and relative trade costs, together with relative macroeconomic developments, whereas the correlation between trade deficits and relative trade costs is much stronger for non-OECD countries in Figure 5. Overall, both the average (across countries) magnitude of trade imbalances and the cross-country heterogeneity can mostly be attributed to relative trade costs of countries over time.

# 6 Concluding Remarks and Policy Implications

Based on implications of a dynamic trade model that incorporates implicitly additively separable nonhomothetic CES preferences, this paper has shown that the total trade deficit of a country can be decomposed into changes due to effective terms of trade, relative trade costs, and relative macroeconomic developments. Using bilateral imports and bilateral exports data, estimations have been achieved for 188 countries.

Country-specific results have shown that each country has different patterns over time regarding the contribution of each component in the decomposition of total trade deficits. For example, the U.S. trade deficit is mostly explained by the positive contributions of relative trade costs followed by those of effective terms of trade, whereas the negative Chinese trade deficit (i.e., its trade surplus) is mostly explained by its negative effective terms of trade, despite high and positive contributions of its relative macroeconomic developments.

On average across countries, relative trade costs followed by relative macroeconomic developments have contributed the most to the magnitude (of the trade deficit) during the sample period. While the average OECD country has experienced a trade surplus that is mostly explained by effective terms of trade followed by relative macroeconomic developments, the average non-OECD country has experienced a trade deficit that is mostly explained by relative trade costs followed by relative macroeconomic developments. When subsamples are considered, it has been shown that the establishment of WTO coincides with higher trade deficits for non-OECD countries that are accounted for by relative trade costs and relative macroeconomic developments, although trade surplus of OECD countries and its components have been stable over time. A cross-country investigation has further shown that

the heterogeneity across countries regarding their trade deficits is mostly connected to their relative trade costs (followed by relative macroeconomic developments), also reflecting the heterogeneity across non-OECD countries.

The three components obtained by the decomposition introduced in this paper can further be connected to certain policy tools suggested by the existing literature. First, effective terms of trade of a country can be affected by structural reforms to adjust export prices (implied by Chinn and Ito (2007), Alfaro, Kalemli-Ozcan, and Volosovych (2008), Cheung, Furceri, and Rusticelli (2013) or Culiuc and Kyobe (2017)) or by an exchange rate policy (see Bayoumi, Gagnon, and Saborowski (2015), Blanchard, Adler, and Filho (2015), or Carney (2017)). Hence, for a given exchange rate, since a country cannot affect the source prices of its imports (that are determined at the source country), its trade deficit caused by its effective terms of trade can be rebalanced by policies that can reduce its export prices. Such policies may include increasing productivity through product and labor market reforms (as in Cacciatore, Duval, Fiori, and Ghironi (2016a) or Cacciatore, Duval, Fiori, and Ghironi (2016b)), reducing market frictions by improving competitiveness (as in Chen, Milesi-Ferretti, and Tressel (2013)), for example, by enhancing schooling/training, broadening the skill base of the labor force, immigration policies, or reforming wage bargaining mechanisms. Similarly, trade surplus of a country caused by its effective terms of trade can be rebalanced by removing export subsidies (if any) that can alternatively be utilized, for example, as investment projects by the government. Alternatively, trade deficit (surplus) of a country caused by its effective terms of trade can also be rebalanced by the depreciation (appreciation) of its currency, for example, by a foreign exchange intervention or by abandoning currency manipulations (if any).[11]

Second, relative trade costs a country can be connected to its bilateral protectionist policies or its composition of trading partners (that can be determined by bilateral/multilateral trade agreements) as in studies such as by Barattieri (2014), Obstfeld (2016), Reyes-Heroles (2016), Alessandria and Choi (2018), Eichengreen (2018) or Boz, Li, and Zhang (2019). Therefore, if trade deficit of a country is due to its relative trade costs, it can be balanced, for example, by negotiating with export partners for lower tariffs/duties, or trade surplus of a country can be rebalanced, for example, by reducing its own tariffs/duties applied to its imports.

Third, if trade imbalance of a country is due to its macroeconomic developments capturing its relative economic activity as well as its relative saving decision with respect to

[11] See Ricci, Milesi-Ferretti, and Lee (2013) who provide strong evidence for the relationship between terms of trade and real exchange rate.

its export partners, macroeconomic policies can be used for rebalancing (see IMF (2018)). For example, trade deficit of a country can be rebalanced by fiscal consolidation or monetary/credit tightening, while trade surplus of a country can be rebalanced by expansionary fiscal stance or policies to foster domestic credit growth. Overall, understanding the source of trade imbalances is the key to optimal policy for rebalancing, and the decomposition achieved in this paper has provided insights through an international trade approach in a dynamic framework.

# 7 Appendix

## 7.1 Derivation of Trade Deficits

Since the sum of logs is not equal to the log of sums due to Jensen's inequality, when Equation 8 is estimated (as is standard in the literature), one cannot take the sum of log bilateral trade deficits (implied by Equation 8) to obtain an expression for total trade deficit. Accordingly, in order to connect the total trade deficit of a country to the components of its log bilateral trade, we consider an alternative approach of using Taylor series for log bilateral trade expressions. To do so, total trade deficit of country $n$ at time $t$ can be written as follows:

$$\underbrace{D_{nt}}_{\text{Trade Deficit}} = \underbrace{M_{nt}}_{\text{Total Imports}} - \underbrace{X_{nt}}_{\text{Total Exports}} \tag{14}$$

where $M_{nt} = \sum_{i \neq n} P_{nit} C_{nit}$ represents total imports, and $X_{nt} = \sum_{i \neq n} P_{int} C_{int}$ represents total exports of country $n$. By using Taylor series of $\Delta \log (x_{t+1}) = \frac{\Delta x_{t+1}}{x_t} + o\left(\|f^2\|\right)$ for the left hand side of Equation 9, where $o\left(\|f^2\|\right)$ represents terms that are equal to or higher than $2^{nd}$ order, it can be rewritten as follows:

$$\begin{aligned} \frac{\Delta \left(P_{nit+1} C_{nit+1}\right)}{P_{nit} C_{nit}} &= (1-\theta)\, E_t \left\{\Delta \log P_{iit+1}\right\} + (1-\theta)\, E_t \left\{\Delta \log \tau_{nit+1}\right\} \\ &\quad + E_t \left\{\Delta \log \left(Z_{nt+1}\right)\right\} + v_{nit+1,t} + o\left(\left\|f_{nit}^2\right\|\right) \end{aligned} \tag{15}$$

Defining $\omega_{nit} = \frac{P_{nit} C_{nit}}{M_{nt}}$ in country $n$ as the share of imports coming from source country $i$ at time $t$ that satisfies $\sum_{i \neq n} \omega_{nit} = 1$, an expression (in levels) can be found for future changes in total imports of country $n$ after multiplying both sides of Equation 15 by $\omega_{nit}$ and using

$M_{nt} = \sum_{i \neq n} P_{nit} C_{nit}$ as follows:

$$\begin{aligned} \Delta M_{nt+1} = (1-\theta) M_{nt} \sum_{i \neq n} \omega_{nit} E_t \left\{ \Delta \log P_{iit+1} \right\} + (1-\theta) M_{nt} \sum_{i \neq n} \omega_{nit} E_t \left\{ \Delta \log \tau_{nit+1} \right\} \\ + M_{nt} E_t \left\{ \Delta \log Z_{nt+1} \right\} + M_{nt} \sum_{i \neq n} \omega_{nit} \left( v_{nit+1,t} + o\left( \left\| f_{nit}^2 \right\| \right) \right) \end{aligned} \tag{16}$$

Similarly, after defining $\lambda_{int} = \frac{P_{int} C_{int}}{X_{nt}}$ in country $n$ as the share of exports sent to destination country $i$ at time $t$ that satisfies $\sum_{i \neq n} \lambda_{int} = 1$, an expression (in levels) can be found for future changes in total exports of country $n$ by using $X_{nt} = \sum_{i \neq n} P_{int} C_{int}$ as follows:

$$\begin{aligned} \Delta X_{nt+1} = (1-\theta) X_{nt} E_t \left\{ \Delta \log P_{nnt+1} \right\} + (1-\theta) X_{nt} \sum_{i \neq n} \lambda_{int} E_t \left\{ \Delta \log \tau_{int+1} \right\} \\ + X_{nt} \sum_{i \neq n} \lambda_{int} E_t \left\{ \Delta \log Z_{it+1} \right\} + X_{nt} \sum_{i \neq n} \lambda_{int} \left( v_{int+1,t} + o\left( \left\| f_{int}^2 \right\| \right) \right) \end{aligned} \tag{17}$$

Combining Equations 14, 16 and 17 results in the following decomposition for changes in trade deficit of country $n$ in levels:

$$\begin{aligned} \underbrace{\Delta D_{nt+1}}_{\text{Changes in Trade Deficit}} &= \underbrace{(1-\theta) M_{nt} \sum_{i \neq n} \omega_{nit} E_t \left\{ \Delta \log P_{iit+1} \right\} - (1-\theta) X_{nt} E_t \left\{ \Delta \log P_{nnt+1} \right\}}_{\text{Changes due to Effective Terms of Trade}} \\ &+ \underbrace{(1-\theta) M_{nt} \sum_{i \neq n} \omega_{nit} E_t \left\{ \Delta \log \tau_{nit+1} \right\} - (1-\theta) X_{nt} \sum_{i \neq n} \lambda_{int} E_t \left\{ \Delta \log \tau_{int+1} \right\}}_{\text{Changes due to Relative Trade Costs}} \\ &+ \underbrace{M_{nt} E_t \left\{ \Delta \log Z_{nt+1} \right\} - X_{nt} \sum_{i \neq n} \lambda_{int} E_t \left\{ \Delta \log Z_{it+1} \right\}}_{\text{Changes due to Relative Macroeconomic Developments}} \\ &+ \underbrace{\left( M_{nt} \sum_{i \neq n} \omega_{nit} \left( v_{nit+1,t} + o\left( \left\| f_{nit}^2 \right\| \right) \right) - X_{nt} \sum_{i \neq n} \lambda_{int} \left( v_{int+1,t} + o\left( \left\| f_{int}^2 \right\| \right) \right) \right)}_{\text{Changes due to Residuals}} \end{aligned} \tag{18}$$

Since changes in trade deficit are represented by a flow variable ($\Delta D_{nt+1}$), the *cumulative changes* in the trade deficit (as a stock variable that is comparable to the *level* of trade deficit, $D_{nt}$) can be calculated as $\sum_{t=0}^{e} \Delta D_{nt+1}$ for any end period $e > 0$. Hence, the *level* of trade deficit can be decomposed into cumulative changes in terms of trade, cumulative changes in relative trade costs, and cumulative changes in relative economic sizes (and thus macroeconomic developments). In particular, for any end year (each represented by $e$), since countries have different economic sizes, the cumulative decomposition (implied by Equation 18) can be represented as a percentage of GDP according to the following expression:

$$
\begin{aligned}
100 \times \frac{\sum_{t=1979}^{e} \Delta D_{nt+1}}{GDP_{ne}} = & \underbrace{100 \times \frac{\sum_{t=1979}^{e} (1-\theta) \begin{pmatrix} M_{nt} \sum_{i \neq n} \omega_{nit} E_t \{\Delta \log P_{iit+1}\} \\ -X_{nt} E_t \{\Delta \log P_{nnt+1}\} \end{pmatrix}}{GDP_{ne}}}_{\text{Cumulative Changes due to Effective Terms of Trade as \% of GDP}} \\
& + \underbrace{100 \times \frac{\sum_{t=1979}^{e} (1-\theta) \begin{pmatrix} M_{nt} \sum_{i \neq n} \omega_{nit} E_t \{\Delta \log \tau_{nit+1}\} \\ -X_{nt} \sum_{i \neq n} \lambda_{int} E_t \{\Delta \log \tau_{int+1}\} \end{pmatrix}}{GDP_{ne}}}_{\text{Cumulative Changes due to Relative Trade Costs as \% of GDP}} \\
& + \underbrace{100 \times \frac{\sum_{t=1979}^{e} \begin{pmatrix} M_{nt} E_t \{\Delta \log Z_{nt+1}\} \\ -X_{nt} \sum_{i \neq n} \lambda_{int} E_t \{\Delta \log Z_{it+1}\} \end{pmatrix}}{GDP_{ne}}}_{\text{Cumulative Changes due to Macroeconomic Developments as \% of GDP}} \\
& + \underbrace{100 \times \frac{\sum_{t=1979}^{e} \begin{pmatrix} M_{nt} \sum_{i \neq n} \omega_{nit} \left(v_{nit+1,t} + o\left(\|f_{nit}^2\|\right)\right) \\ -X_{nt} \sum_{i \neq n} \lambda_{int} \left(v_{int+1,t} + o\left(\|f_{int}^2\|\right)\right) \end{pmatrix}}{GDP_{ne}}}_{\text{Cumulative Changes due to Residuals}}
\end{aligned}
\tag{19}
$$

where the starting date has been set to $t = 1979$, and $GDP_{ne}$ represents GDP of country $n$ at time $e$.

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| Table 1 - Decomposition of Trade Deficits: Five Countries | | | | | |
|---|---|---|---|---|---|
| | TD | ToT | TC | MD | Res. |
| Period: 1980-2015 | | | | | |
| United States | 2.957 | 1.793 | 3.484 | −1.646 | −0.673 |
| China | −2.124 | −11.470 | −2.450 | 7.240 | 4.557 |
| Canada | −0.671 | 2.471 | −4.904 | 6.381 | −4.620 |
| Mexico | 0.354 | −10.174 | 6.505 | 9.115 | −5.091 |
| Japan | −1.725 | 6.005 | −2.203 | −5.447 | −0.080 |
| Period: 1980-1994 | | | | | |
| United States | 1.384 | 0.712 | 0.949 | −1.398 | 1.120 |
| China | 0.001 | −2.805 | −1.281 | −0.893 | 4.981 |
| Canada | −0.568 | 4.380 | −2.122 | 2.305 | −5.131 |
| Mexico | −1.775 | −4.487 | 1.178 | 4.638 | −3.104 |
| Japan | −2.537 | −0.768 | −0.996 | −1.667 | 0.894 |
| Period: 1995-2015 | | | | | |
| United States | 4.081 | 2.564 | 5.294 | −1.823 | −1.954 |
| China | −3.642 | −17.660 | −3.286 | 13.049 | 4.254 |
| Canada | −0.745 | 1.107 | −6.890 | 9.293 | −4.254 |
| Mexico | 1.876 | −14.236 | 10.310 | 12.312 | −6.510 |
| Japan | −1.145 | 10.842 | −3.065 | −8.147 | −0.776 |

Notes: TD stands for trade deficit, ToT stands for relative terms of trade, TC stands for relative trade costs, MD stands for relative macro developments and Res. stands for residuals. Values are in percentage of GDP representing averages during the corresponding time period.

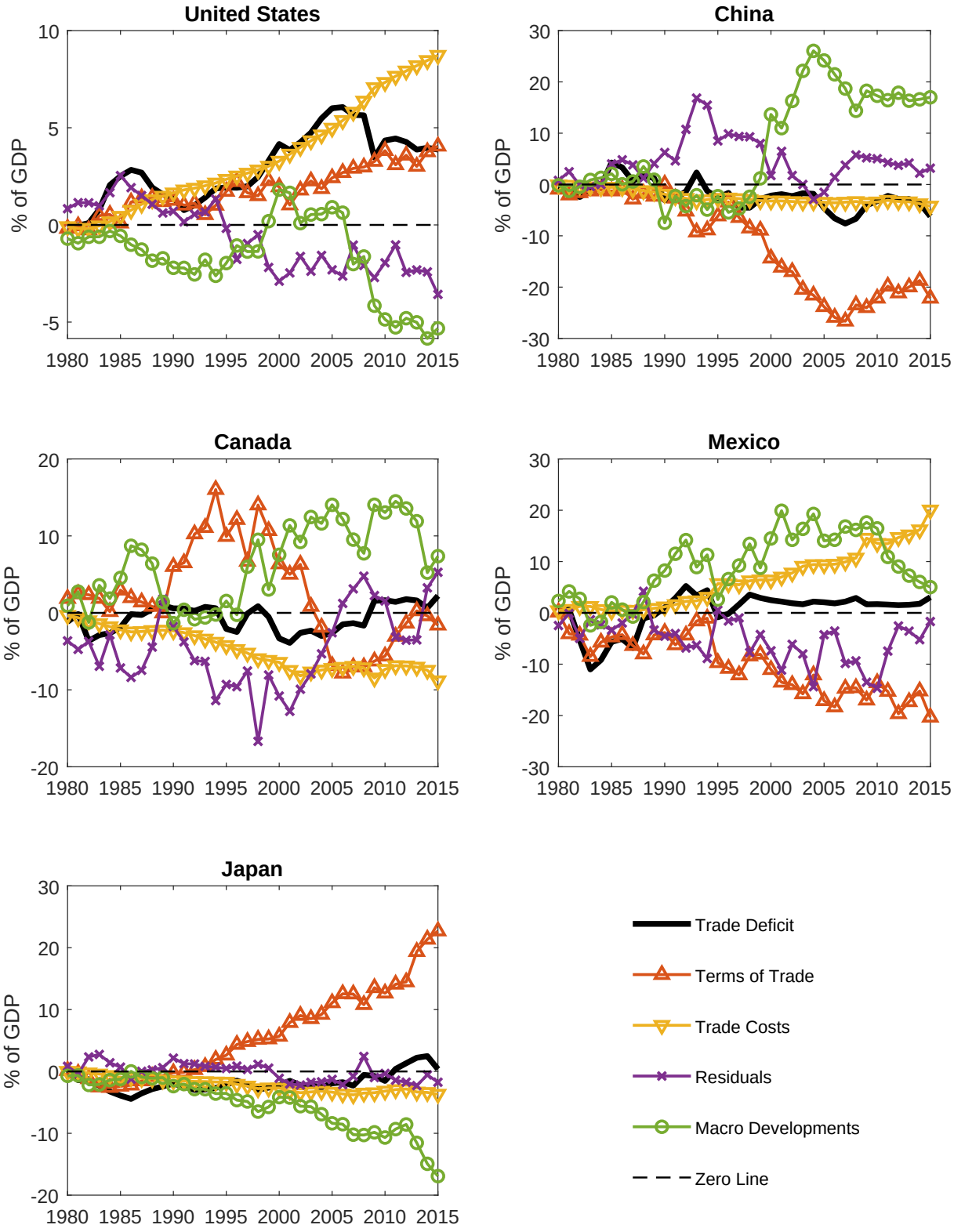
| Table 2 - Decomposition of Trade Deficits: Country Groups | | | | | |
|---|---|---|---|---|---|
| | TD | ToT | TC | MD | Res. |
| Period: 1980-2015 | | | | | |
| All Countries | 3.924 | −0.757 | 2.551 | 2.074 | 0.057 |
| Non-OECD | 6.280 | −0.411 | 3.613 | 3.385 | −0.307 |
| OECD | −0.962 | −1.477 | 0.349 | −0.646 | 0.811 |
| East Asia & Pacific | 1.953 | −2.688 | 1.856 | 3.742 | −0.957 |
| Europe & Central Asia | 1.071 | −0.621 | 0.632 | 1.340 | −0.280 |
| Latin America & Caribbean | 4.886 | −2.537 | 3.923 | 3.626 | −0.127 |
| Middle East & North Africa | 3.757 | −0.126 | 4.069 | 3.845 | −4.031 |
| North America | 1.143 | 2.132 | −0.710 | 2.368 | −2.646 |
| South Asia | 8.393 | 1.040 | 1.257 | 3.978 | 2.118 |
| Sub-Saharan Africa | 7.395 | 0.689 | 4.782 | −0.180 | 2.104 |

Notes: TD stands for trade deficit, ToT stands for relative terms of trade, TC stands for relative trade costs, MD stands for relative macroeconomic developments and Res. stands for residuals. Values are in percentage of GDP representing averages during the corresponding time period.

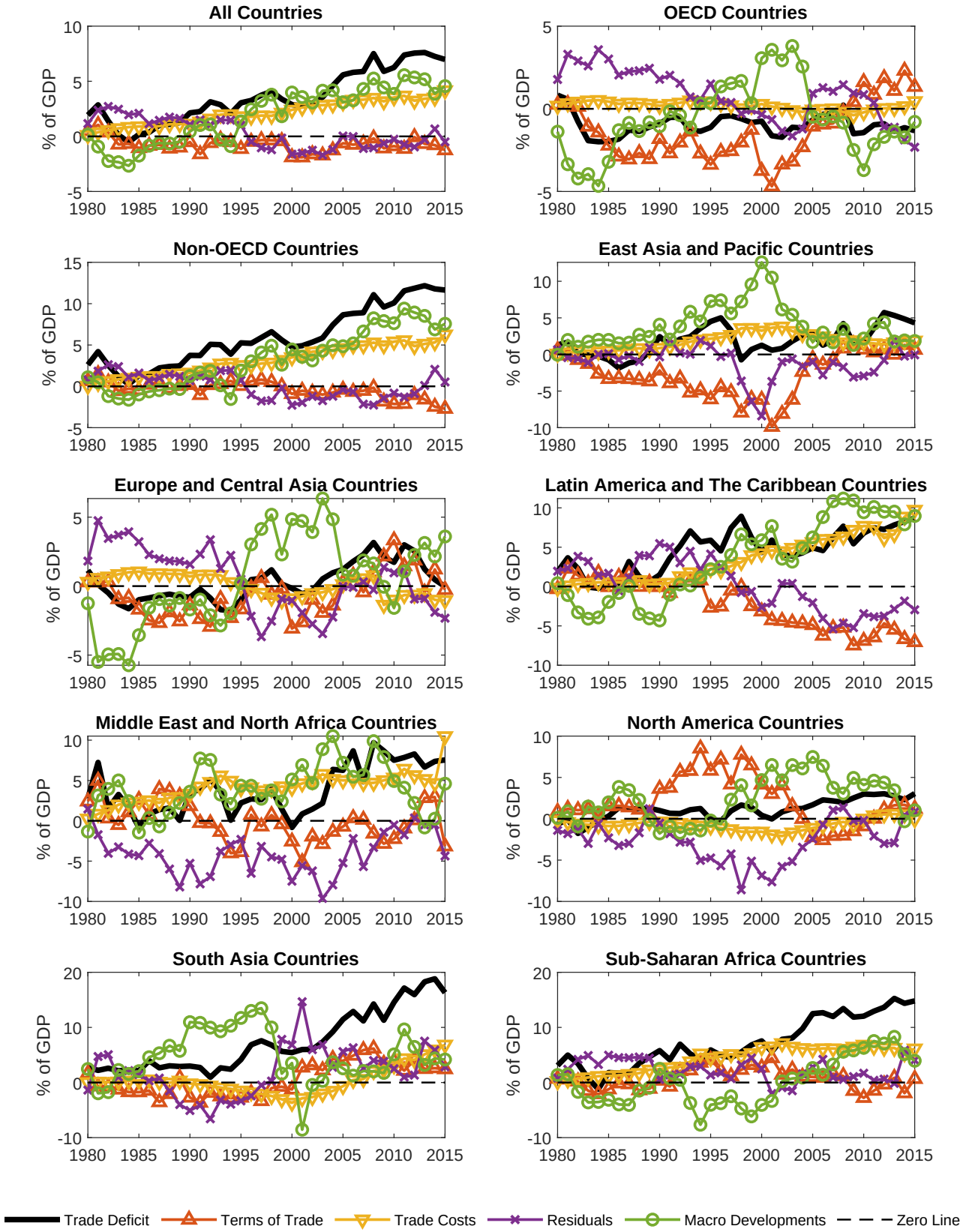
| Table 3 - Decomposition of Trade Deficits: Subsamples of Country Groups | | | | | |
|---|---|---|---|---|---|
| | TD | ToT | TC | MD | Res. |
| Period: 1980-1994 | | | | | |
| All Countries | 1.479 | −0.417 | 0.946 | −0.581 | 1.532 |
| Non-OECD | 2.718 | 0.416 | 1.253 | −0.232 | 1.281 |
| OECD | −0.998 | −2.084 | 0.333 | −1.280 | 2.033 |
| East Asia & Pacific | 0.712 | −2.672 | 0.864 | 2.326 | 0.193 |
| Europe & Central Asia | −0.278 | −1.001 | 0.502 | −1.712 | 1.934 |
| Latin America & Caribbean | 2.415 | 0.658 | 0.624 | −1.731 | 2.865 |
| Middle East & North Africa | 2.171 | 0.988 | 2.869 | 2.456 | −4.142 |
| North America | 0.408 | 2.546 | −0.586 | 0.453 | −2.005 |
| South Asia | 2.484 | −0.907 | 0.041 | 4.132 | −0.782 |
| Sub-Saharan Africa | 3.326 | 0.030 | 1.884 | −1.850 | 3.262 |
| Period: 1995-2015 | | | | | |
| All Countries | 5.240 | −0.918 | 3.219 | 3.629 | −0.690 |
| Non-OECD | 8.267 | −0.829 | 4.733 | 5.331 | −0.968 |
| OECD | −0.926 | −1.099 | 0.135 | 0.162 | −0.124 |
| East Asia & Pacific | 2.581 | −2.836 | 2.457 | 4.748 | −1.788 |
| Europe & Central Asia | 1.247 | −0.181 | 0.217 | 2.335 | −1.125 |
| Latin America & Caribbean | 6.195 | −4.444 | 5.478 | 7.092 | −1.931 |
| Middle East & North Africa | 4.921 | −0.998 | 4.964 | 4.875 | −3.920 |
| North America | 1.668 | 1.836 | −0.798 | 3.735 | −3.104 |
| South Asia | 11.879 | 2.424 | 1.686 | 3.783 | 3.986 |
| Sub-Saharan Africa | 10.077 | 1.094 | 6.188 | 1.268 | 1.526 |

Notes: TD stands for trade deficit, ToT stands for relative terms of trade, TC stands for relative trade costs, MD stands for relative macroeconomic developments and Res. stands for residuals. Values are in percentage of GDP representing averages during the corresponding time period.

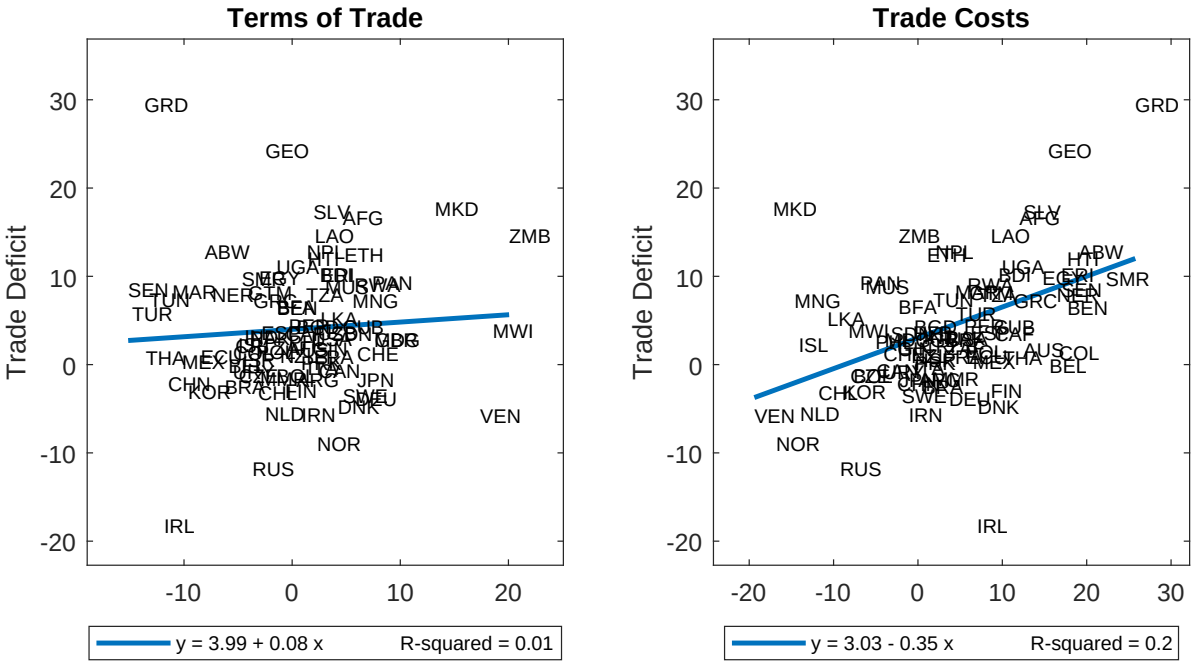
## Figure 1 - Decomposition for the U.S. and Its Major Trade Partners



## Figure 2 - Decomposition of Trade Deficit for Country Groups

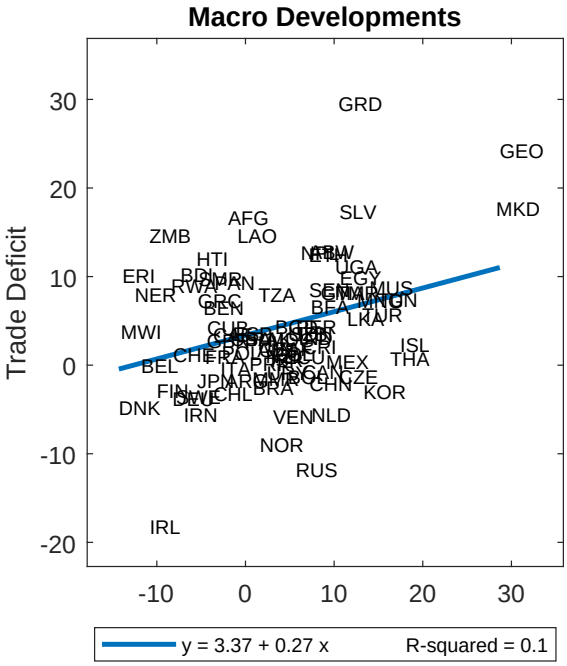


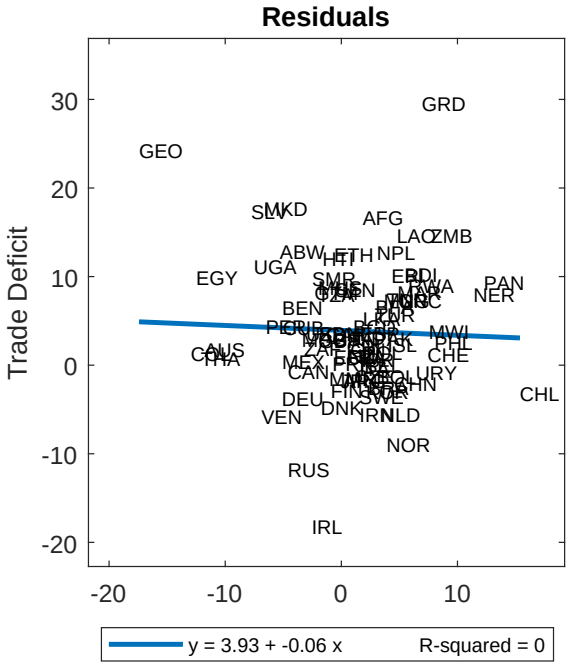
## Figure 3 - Trade Deficit versus Components: All Countries



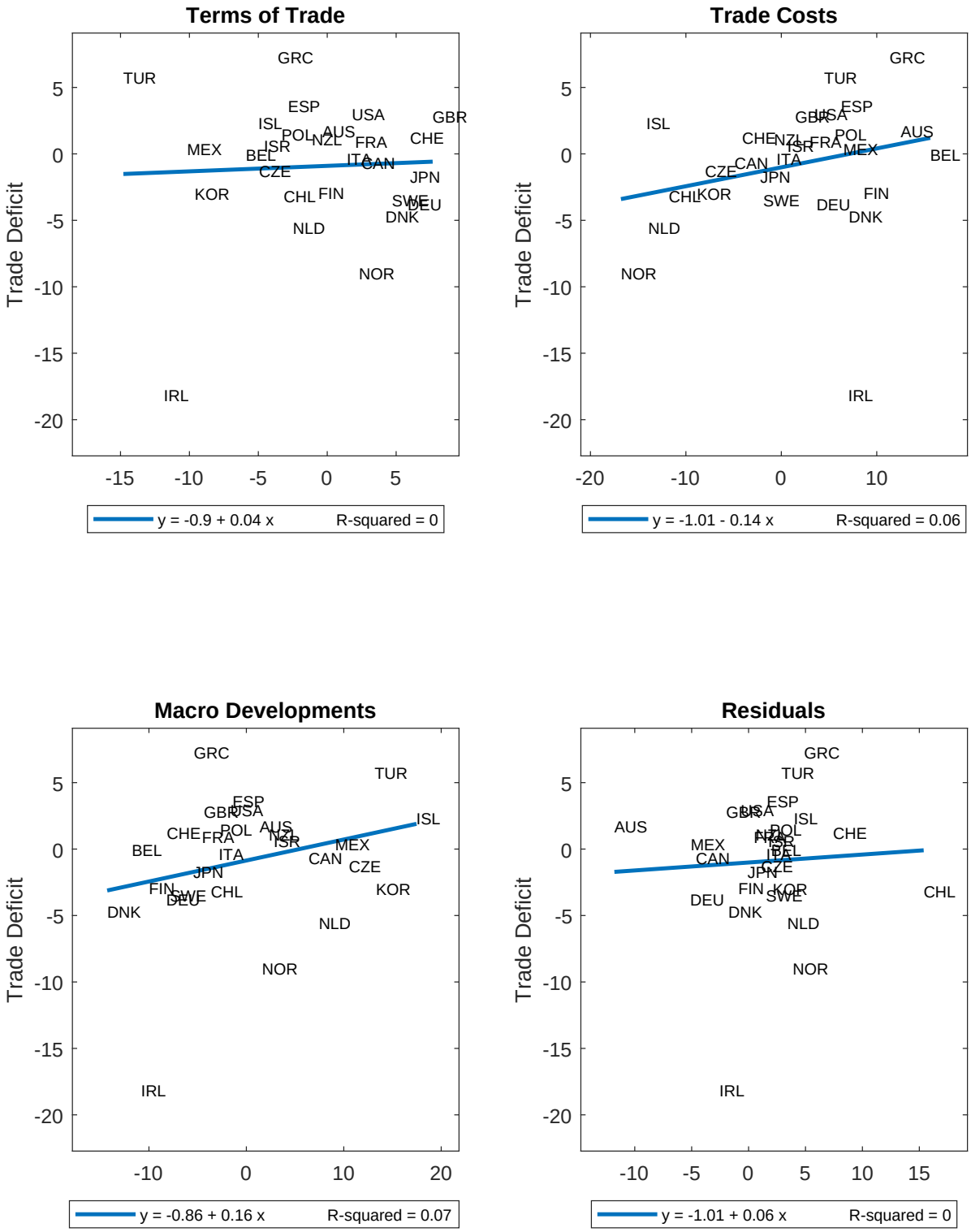




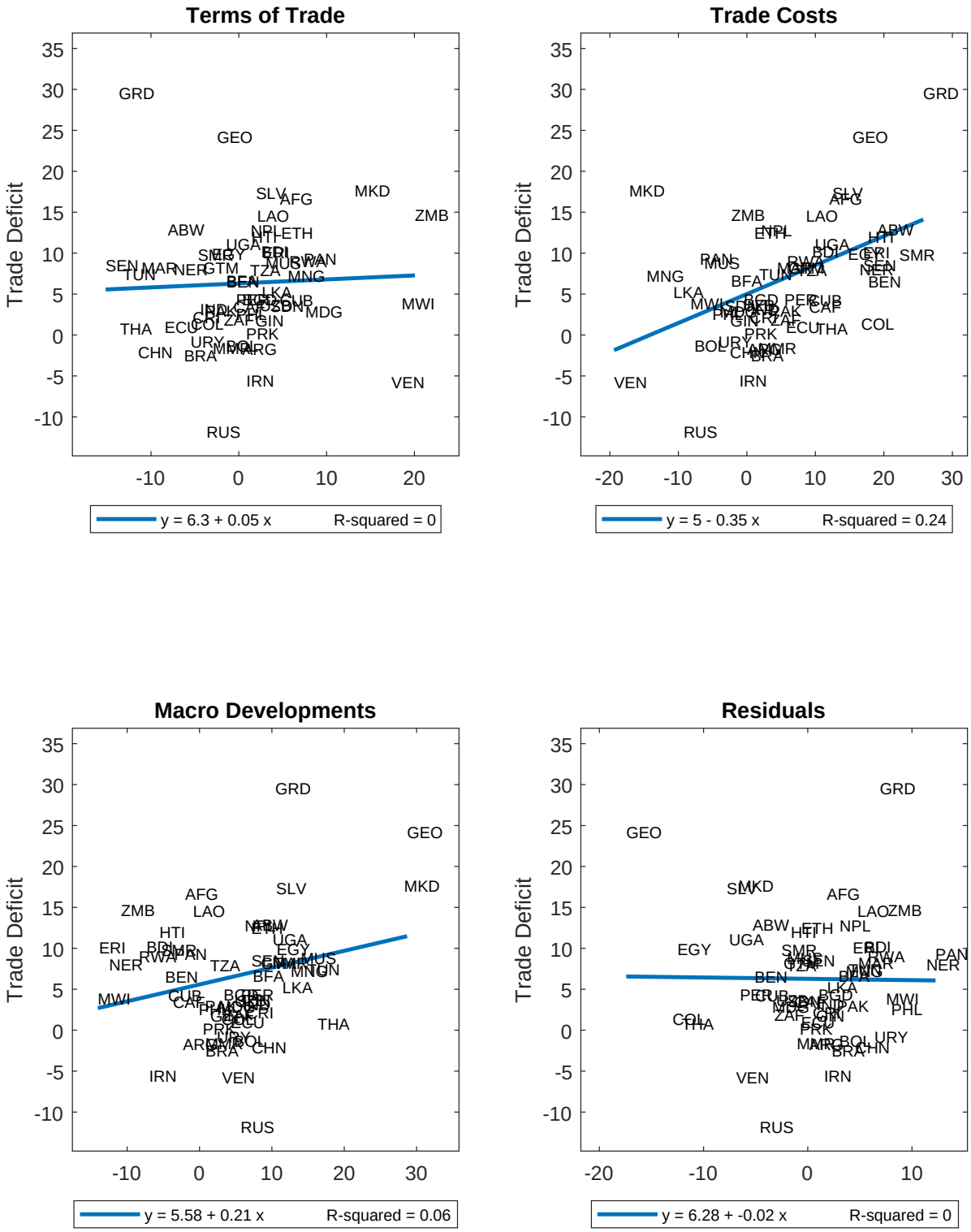


## Figure 4 - Trade Deficit versus Components: OECD Countries



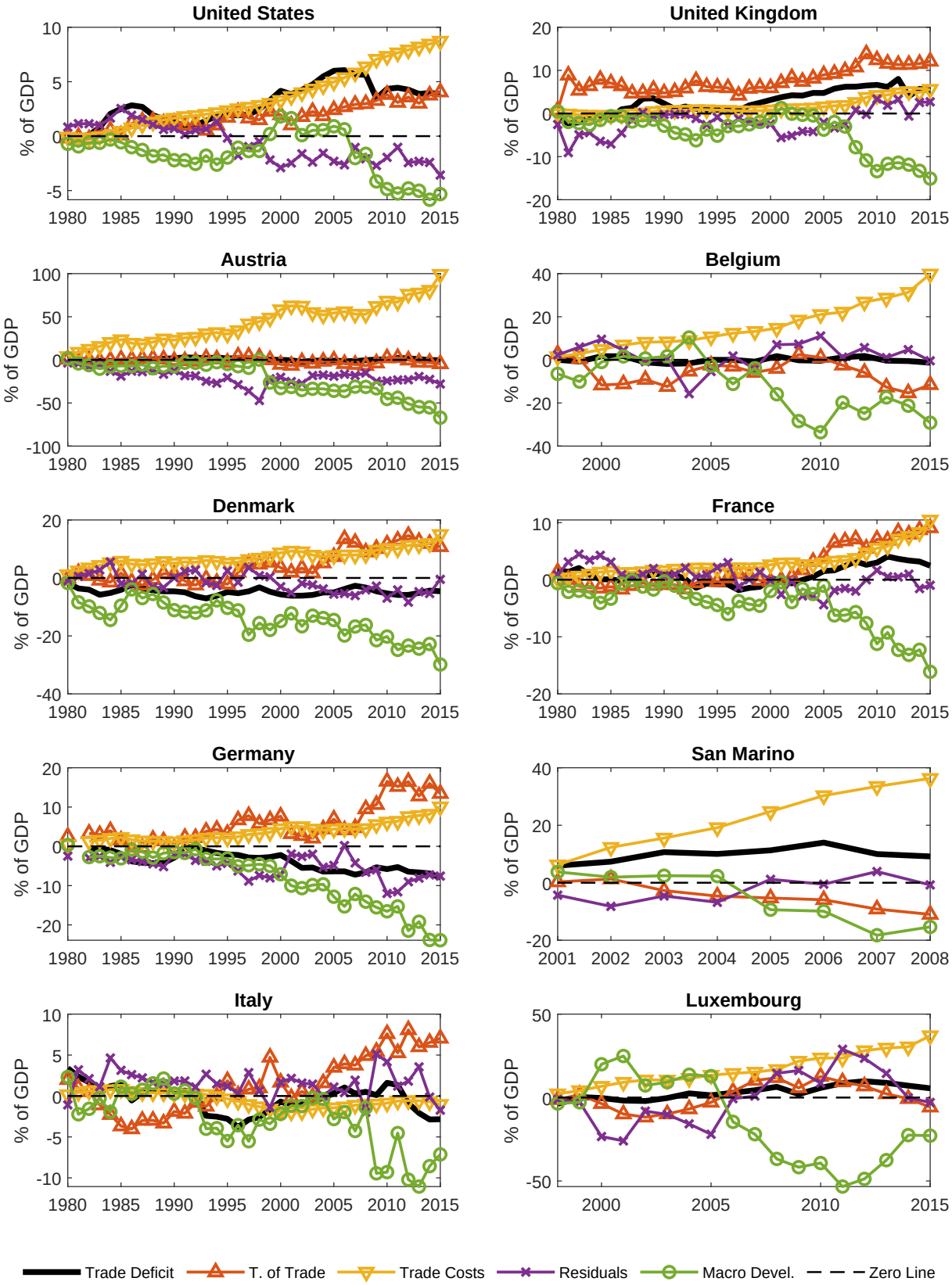
## Figure 5 - Trade Deficit versus Components: Non-OECD Countries



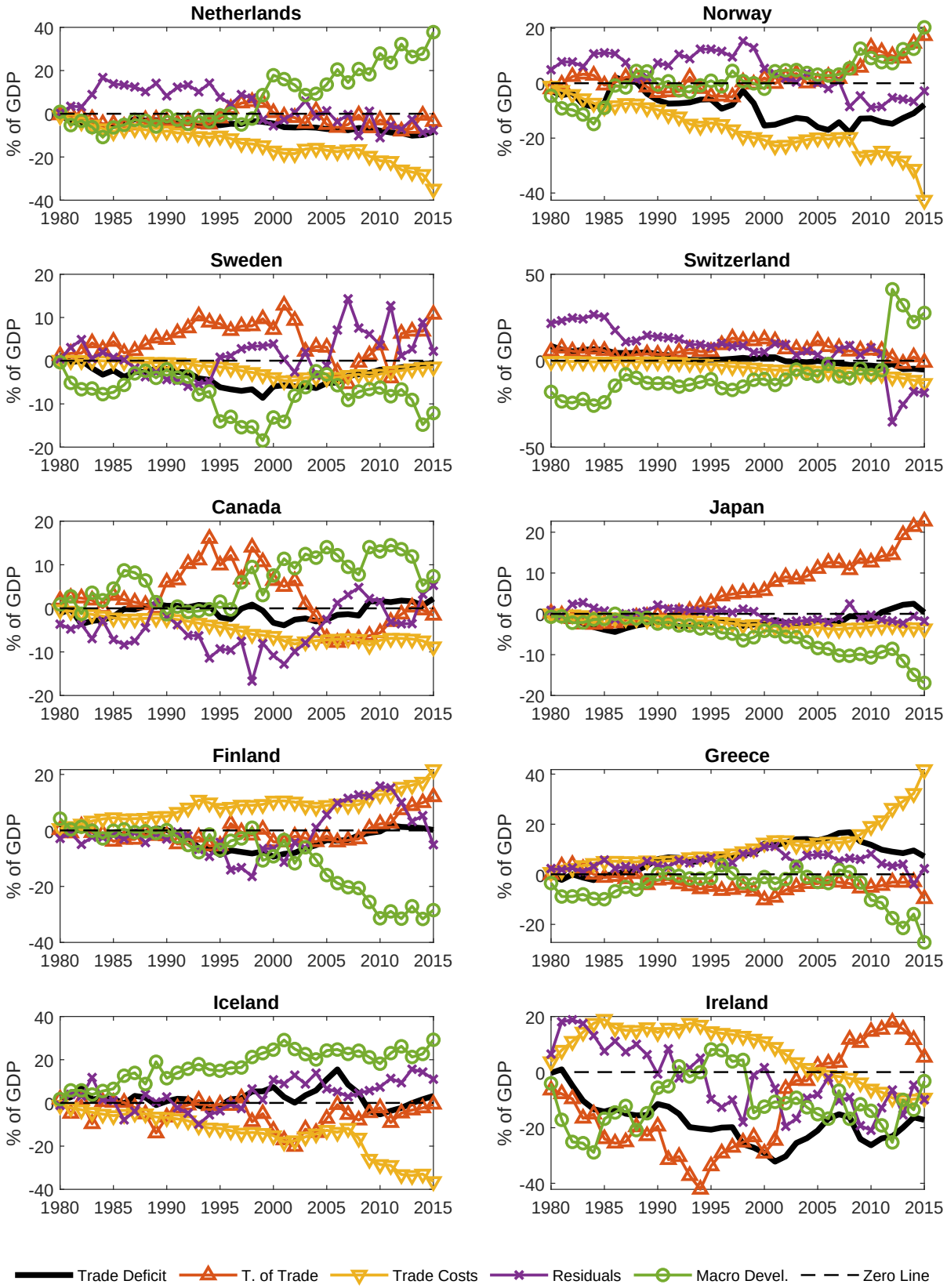
# Online Appendix for "Accounting for Trade Deficits"

This section depicts decompositions of trade deficits for individual countries. The figures show the patterns over time, whereas Table A.1 presents average decompositions (between 1980-2015) for individual countries.

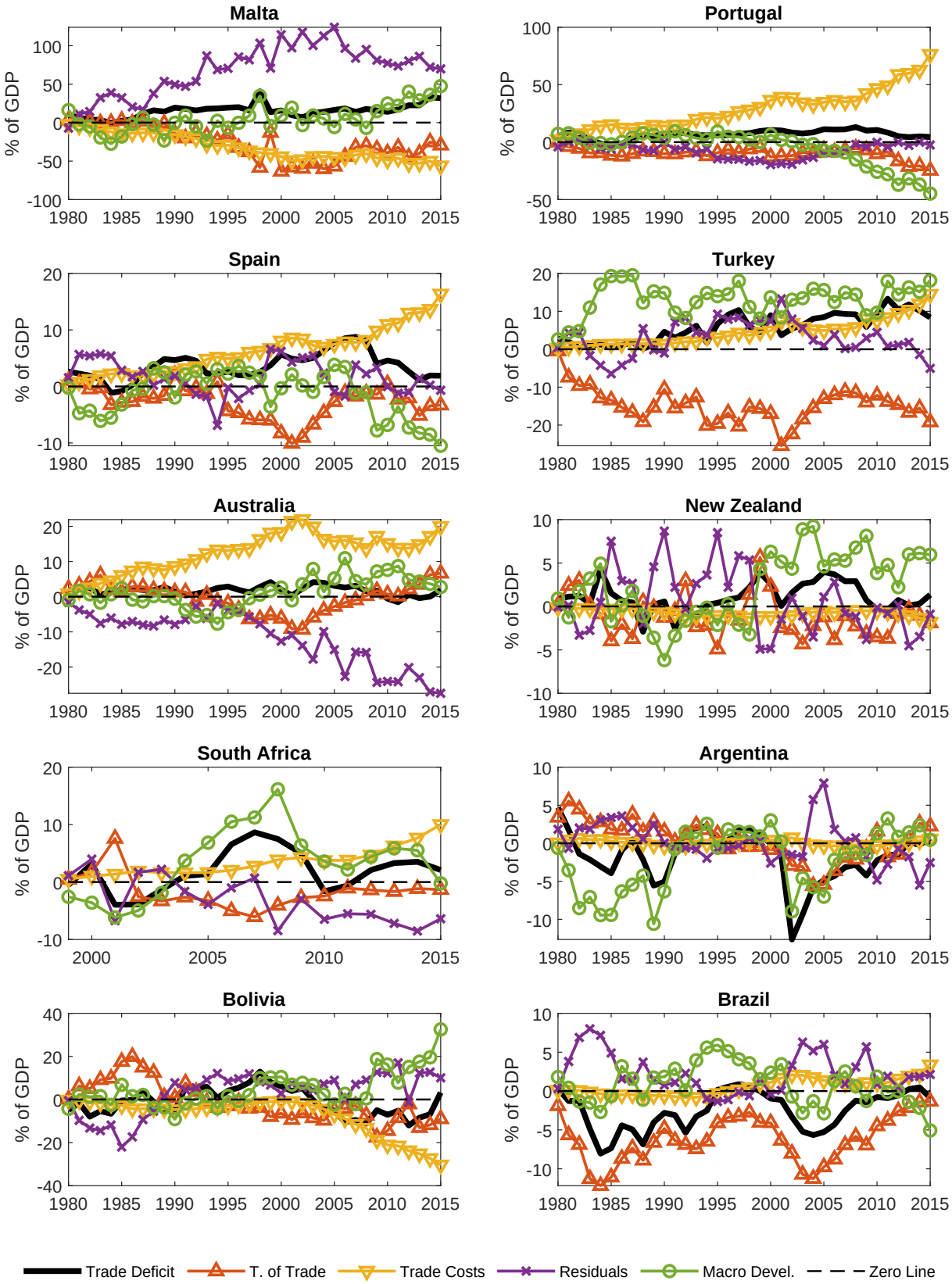
# Figure A1 - Decomposition of Trade Deficit #1



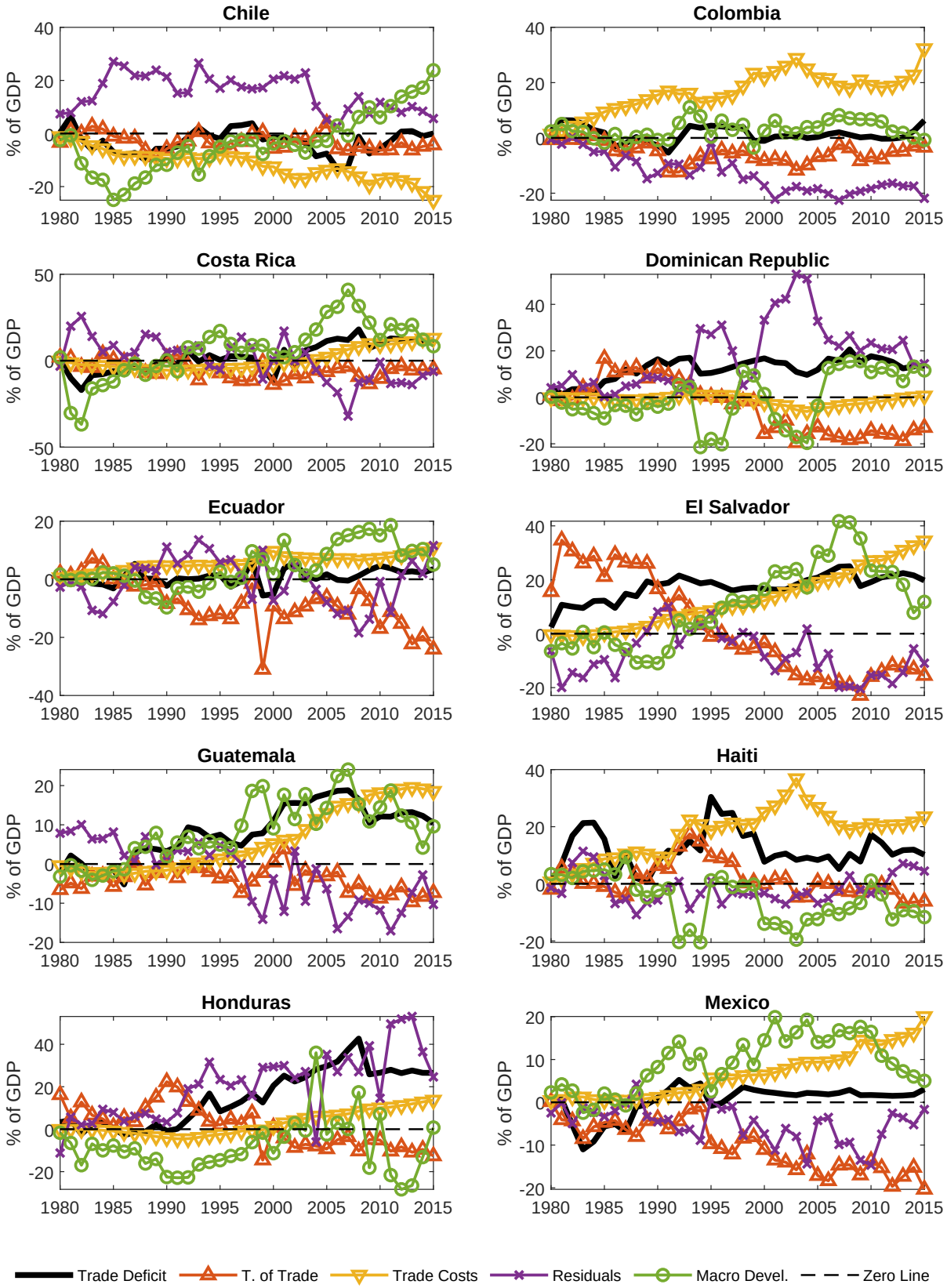
# Figure A2 - Decomposition of Trade Deficit #2



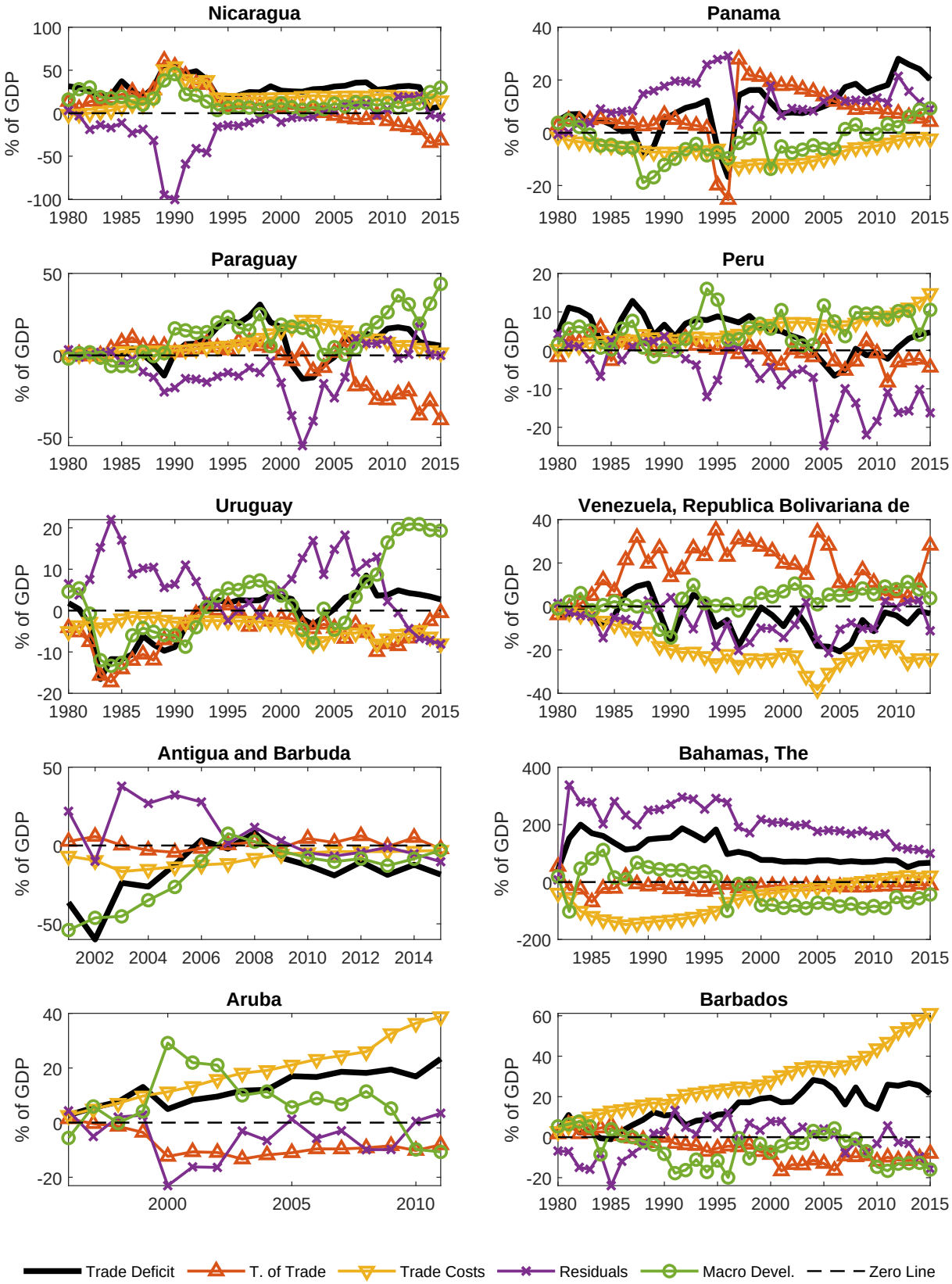
# Figure A3 - Decomposition of Trade Deficit #3



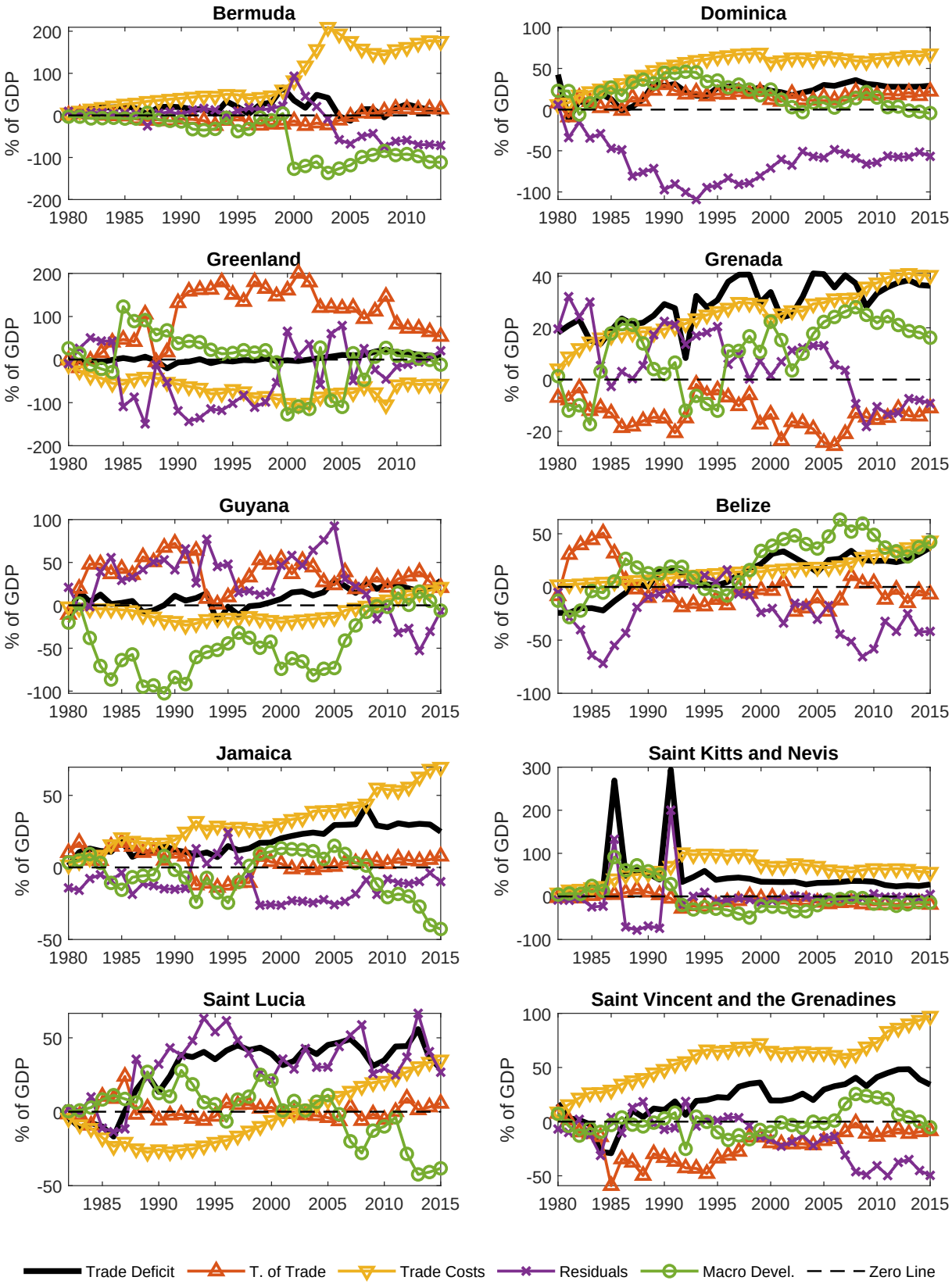
# Figure A4 - Decomposition of Trade Deficit #4



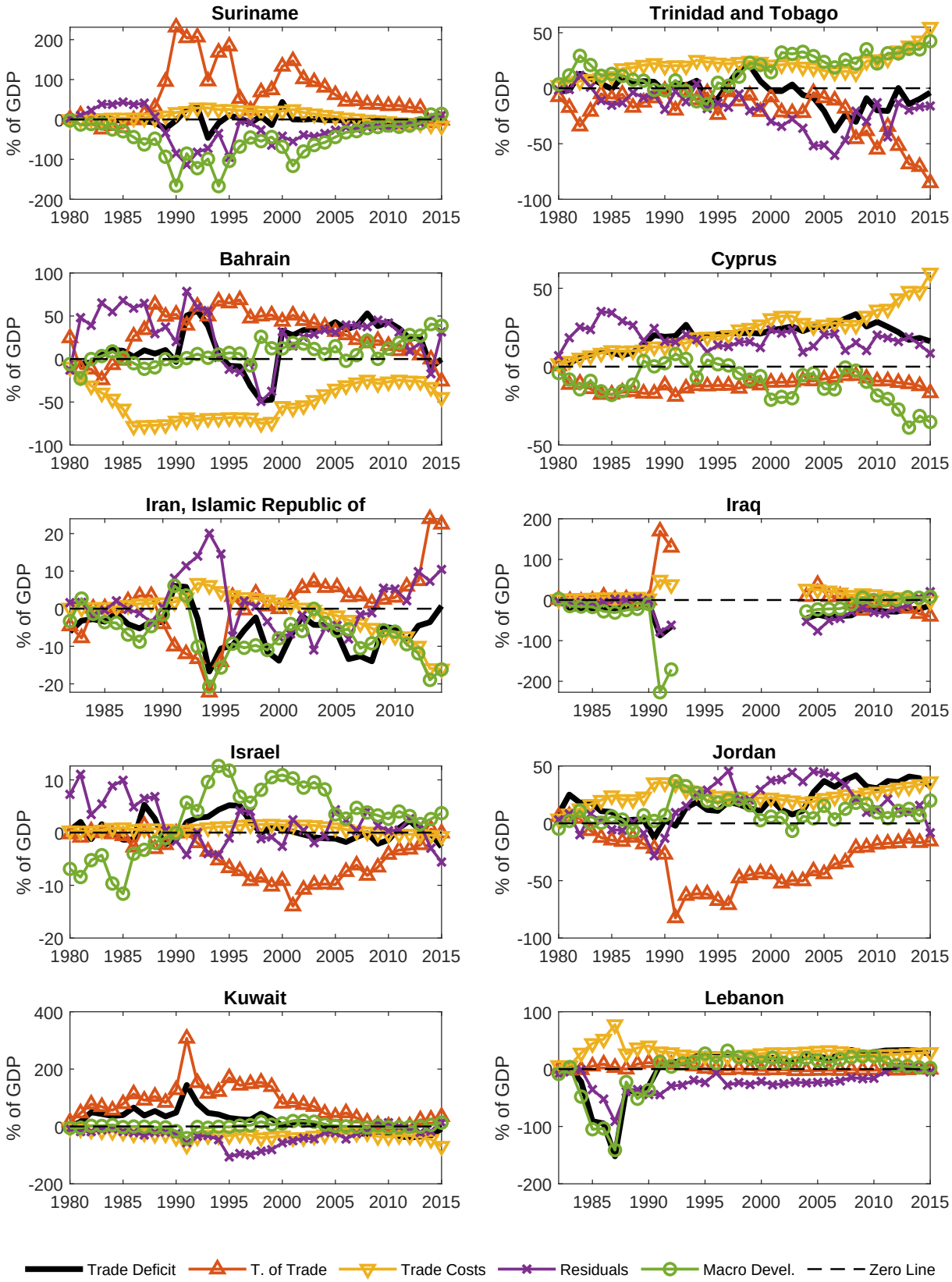
# Figure A5 - Decomposition of Trade Deficit #5



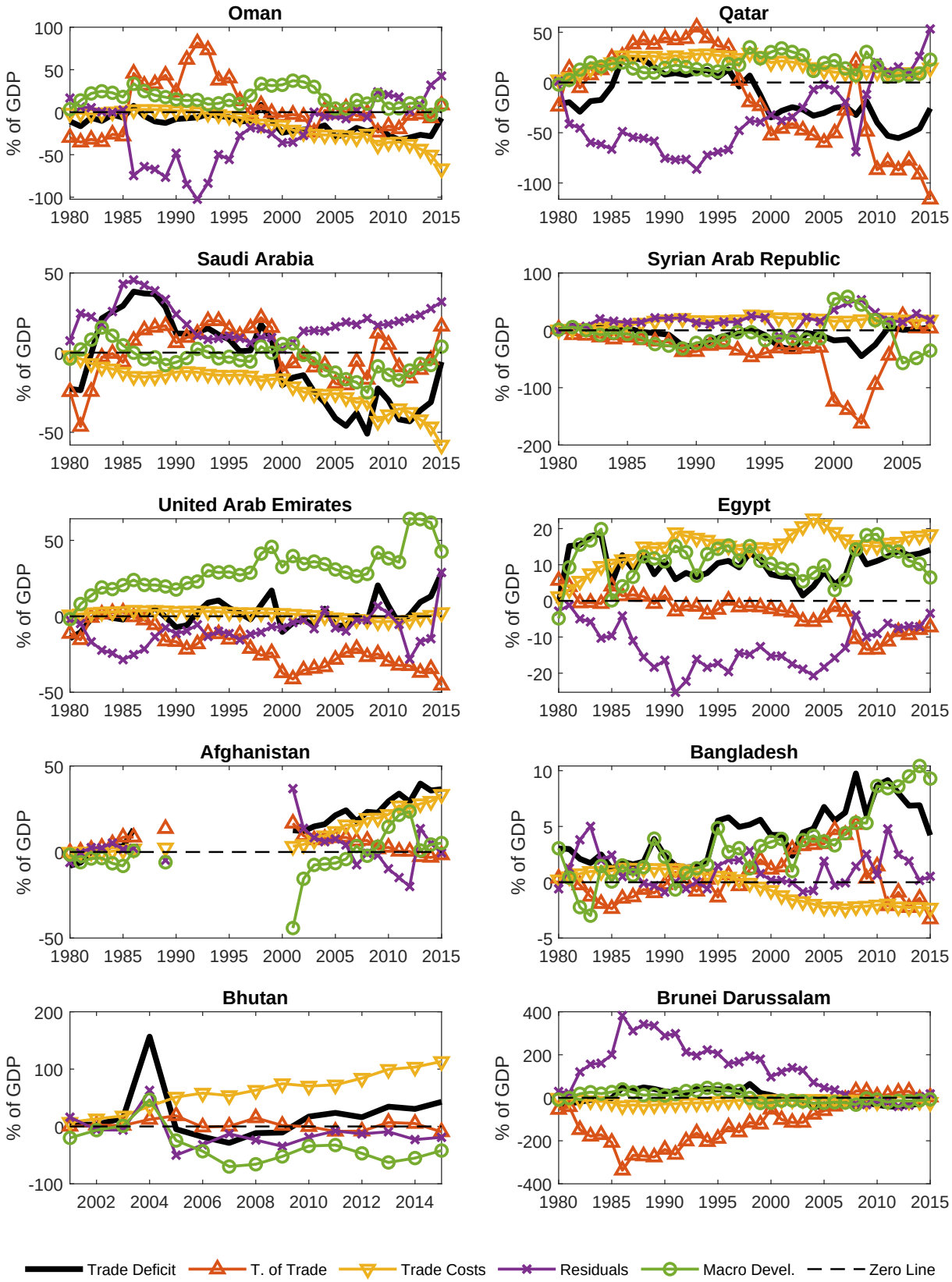
# Figure A6 - Decomposition of Trade Deficit #6



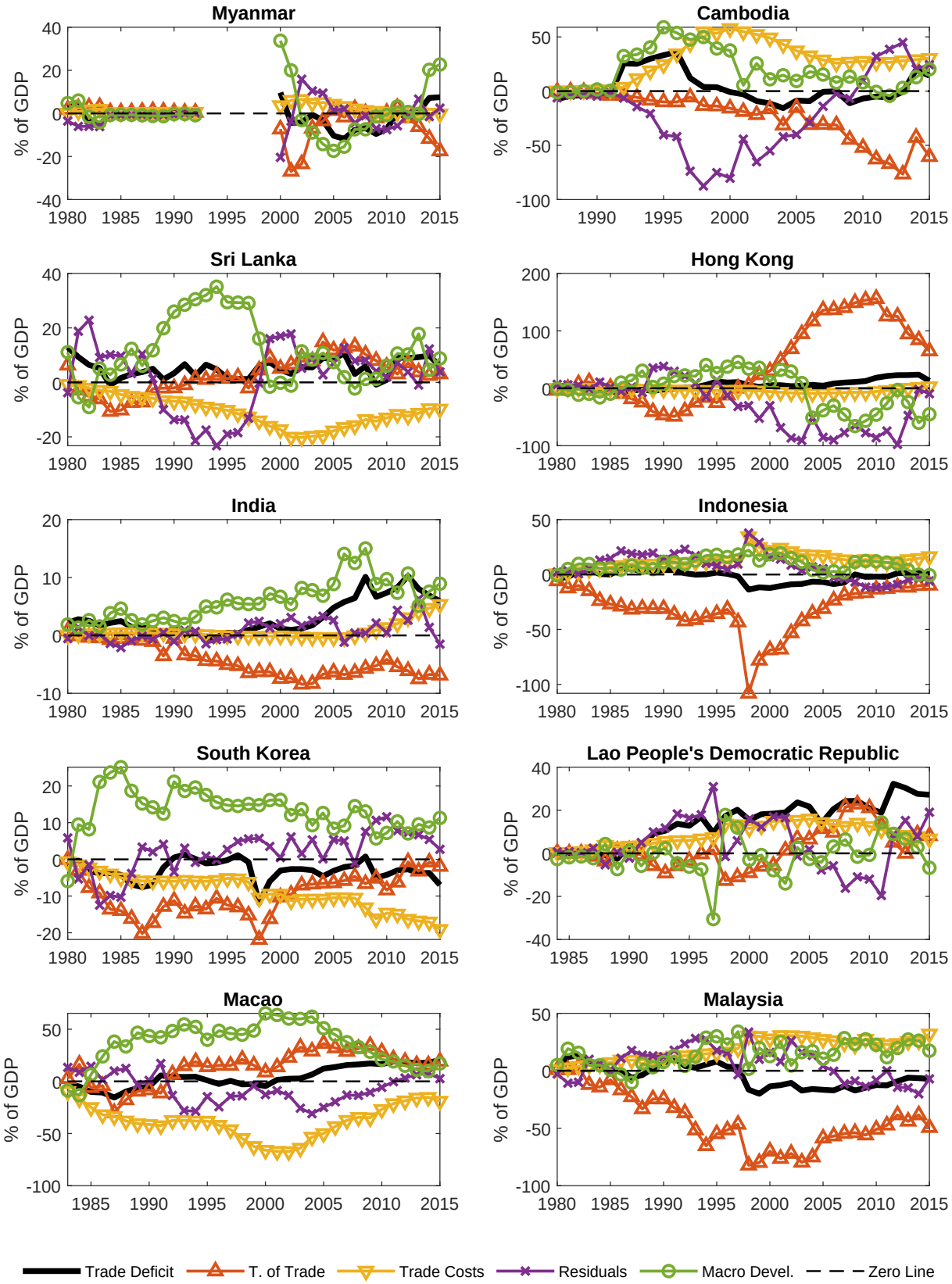
# Figure A7 - Decomposition of Trade Deficit #7



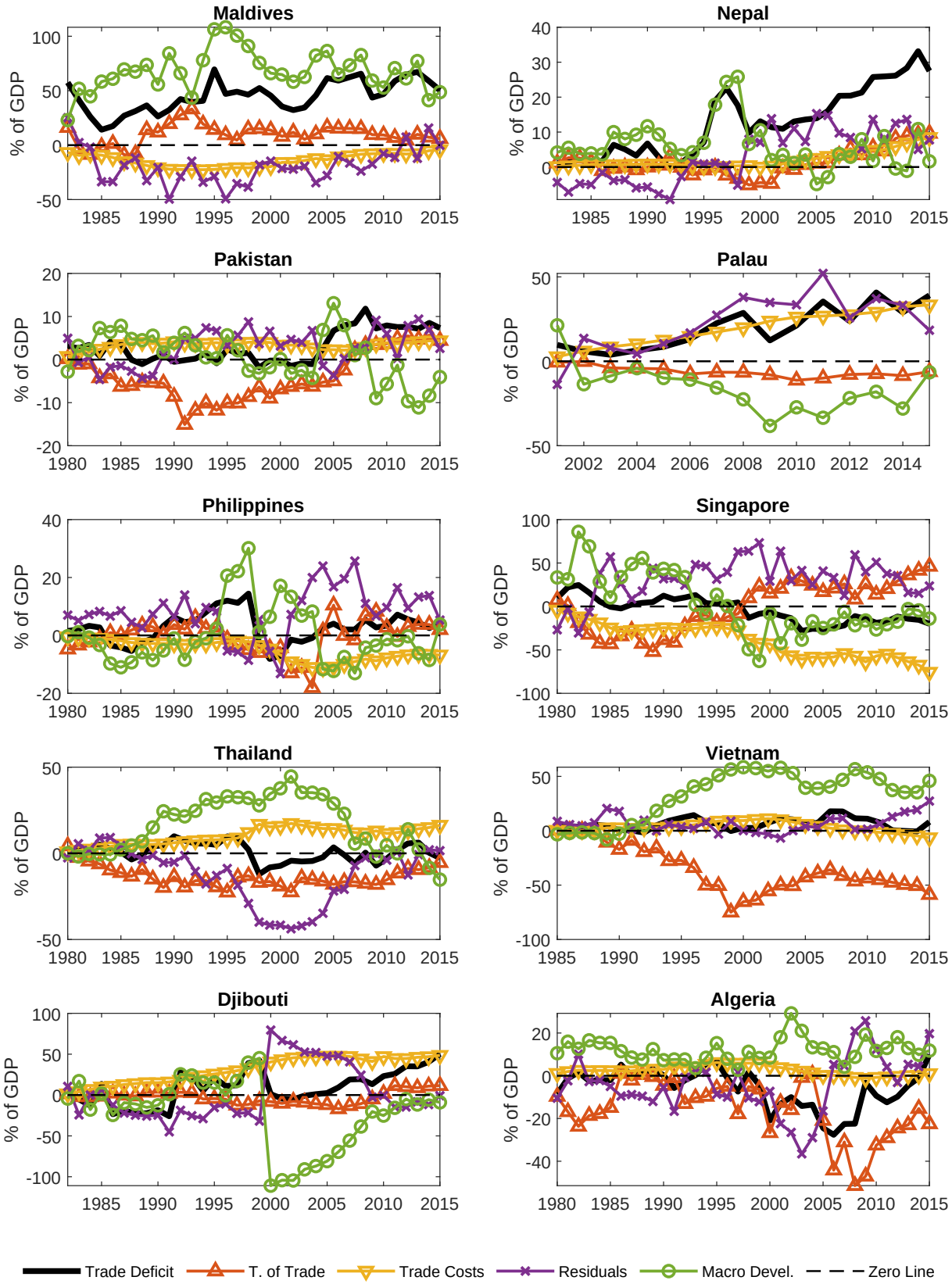
# Figure A8 - Decomposition of Trade Deficit #8



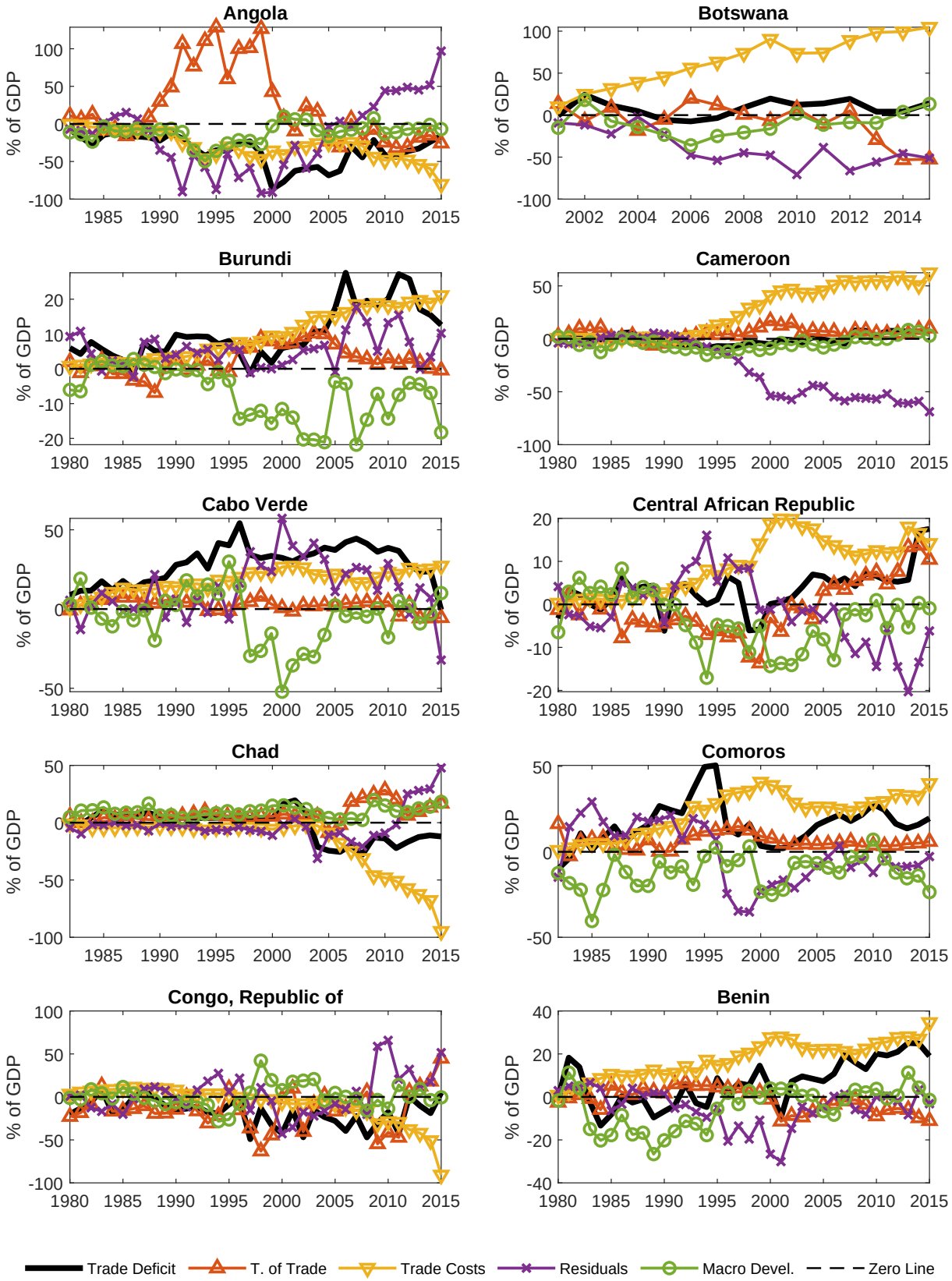
# Figure A9 - Decomposition of Trade Deficit #9



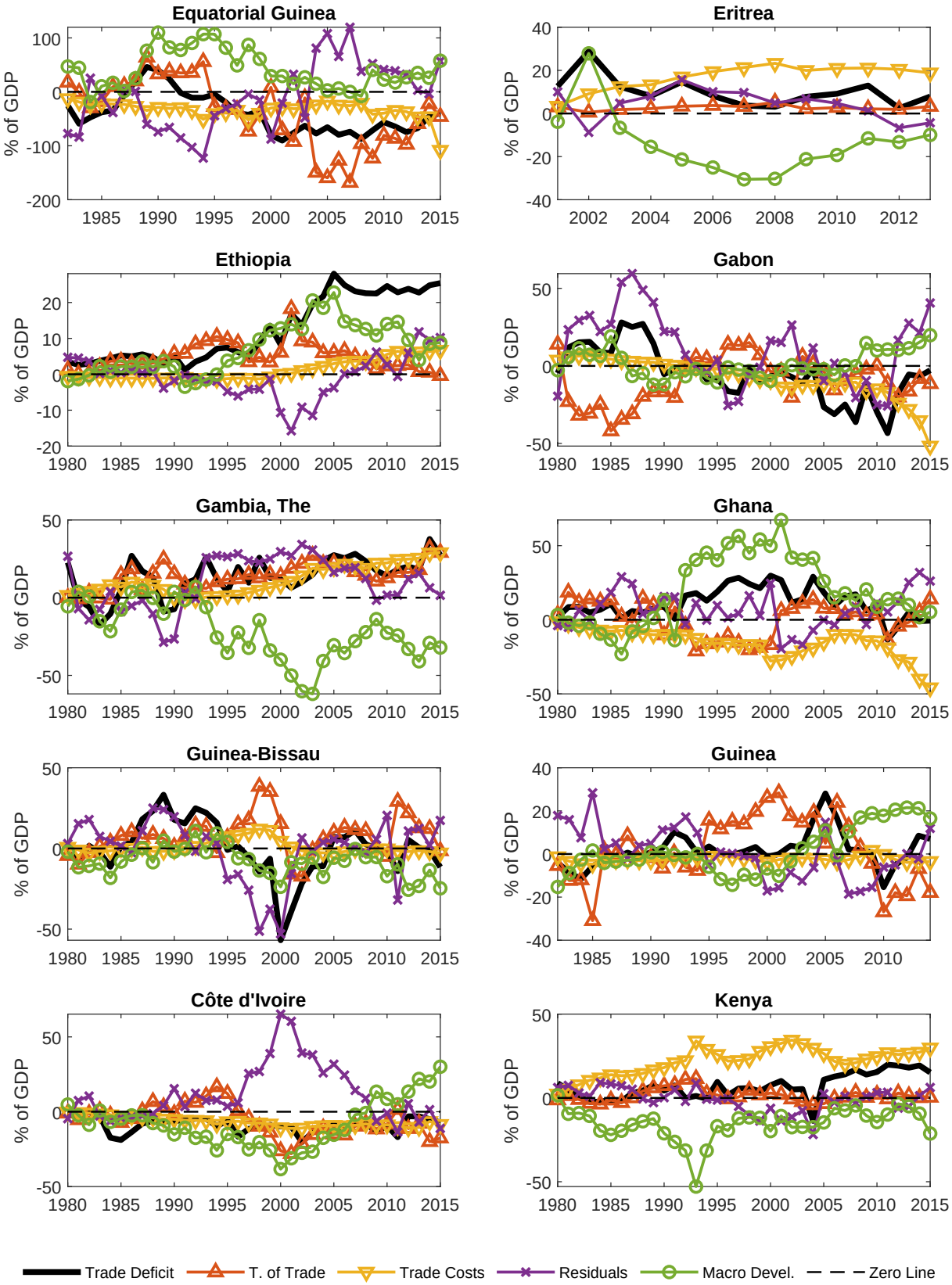
# Figure A10 - Decomposition of Trade Deficit #10



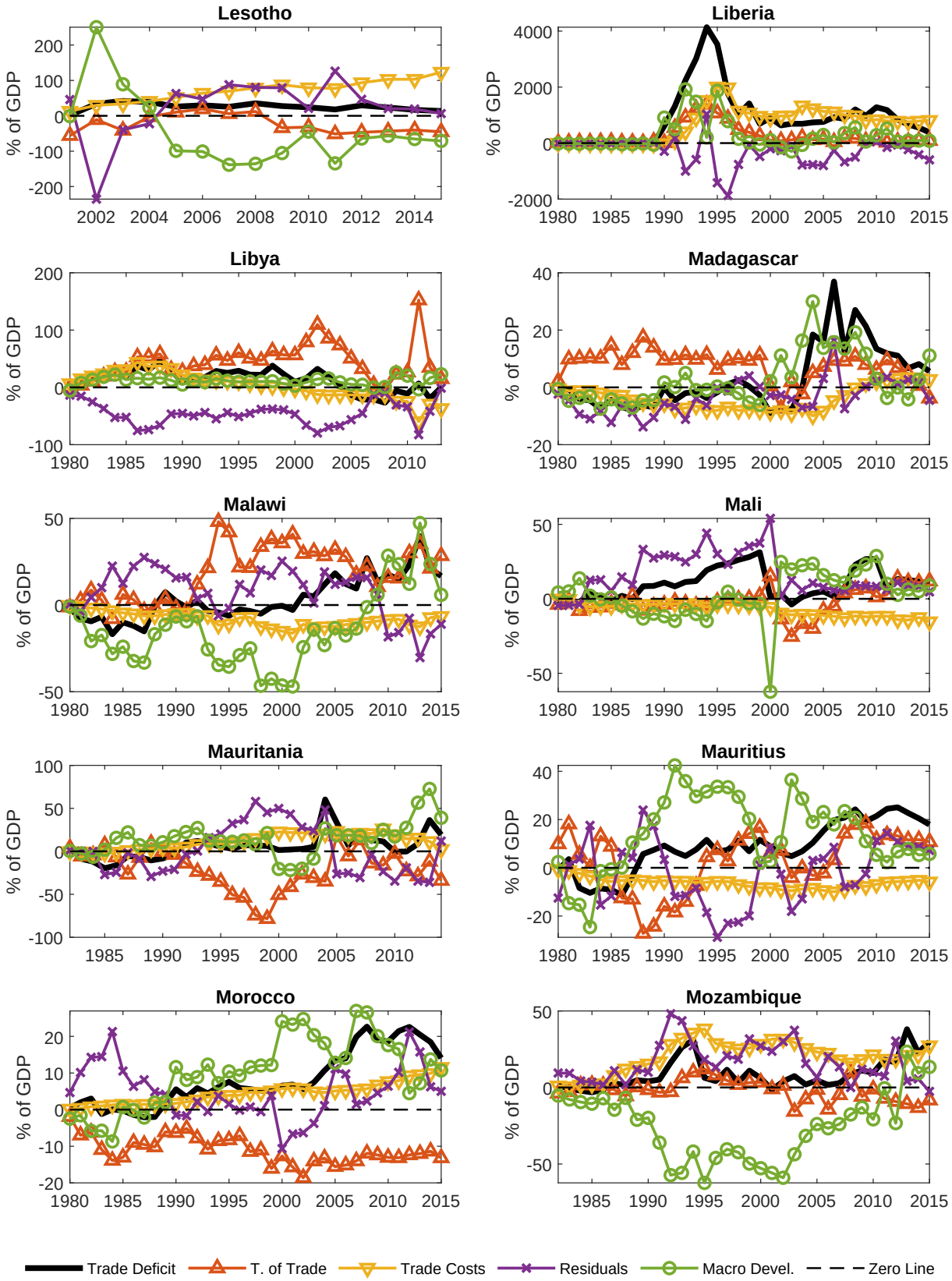
# Figure A11 - Decomposition of Trade Deficit #11



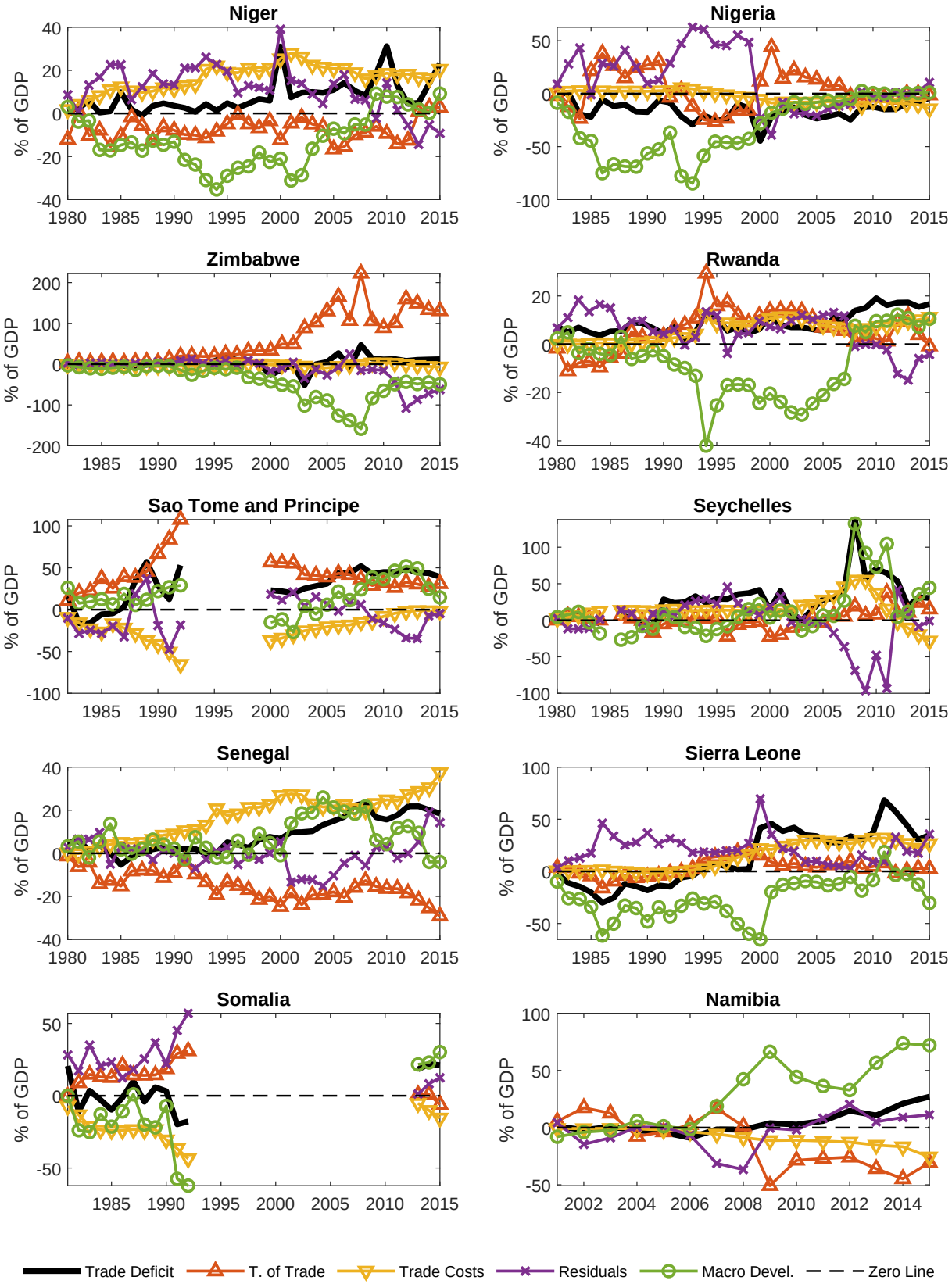
# Figure A12 - Decomposition of Trade Deficit #12



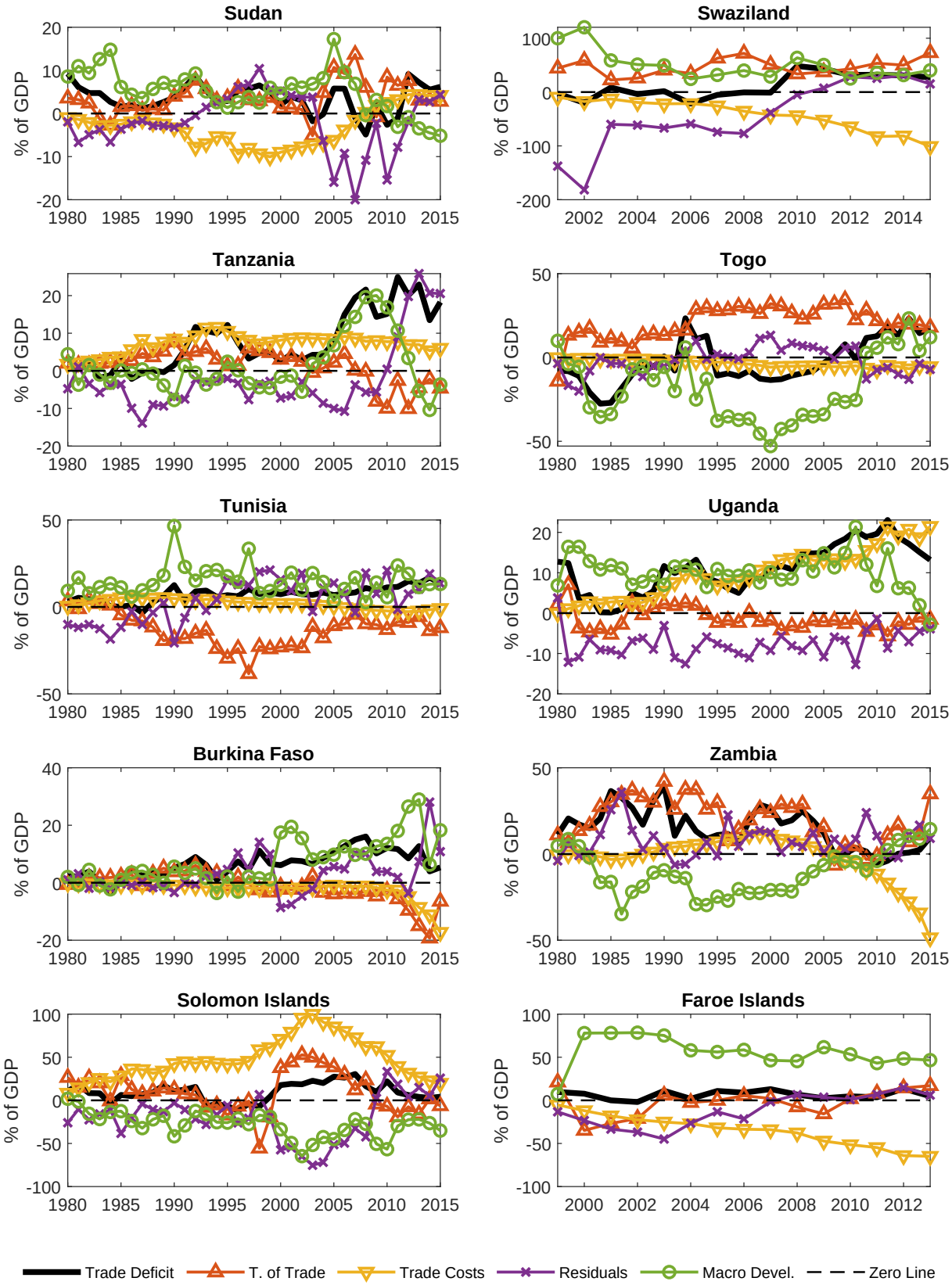
# Figure A13 - Decomposition of Trade Deficit #13



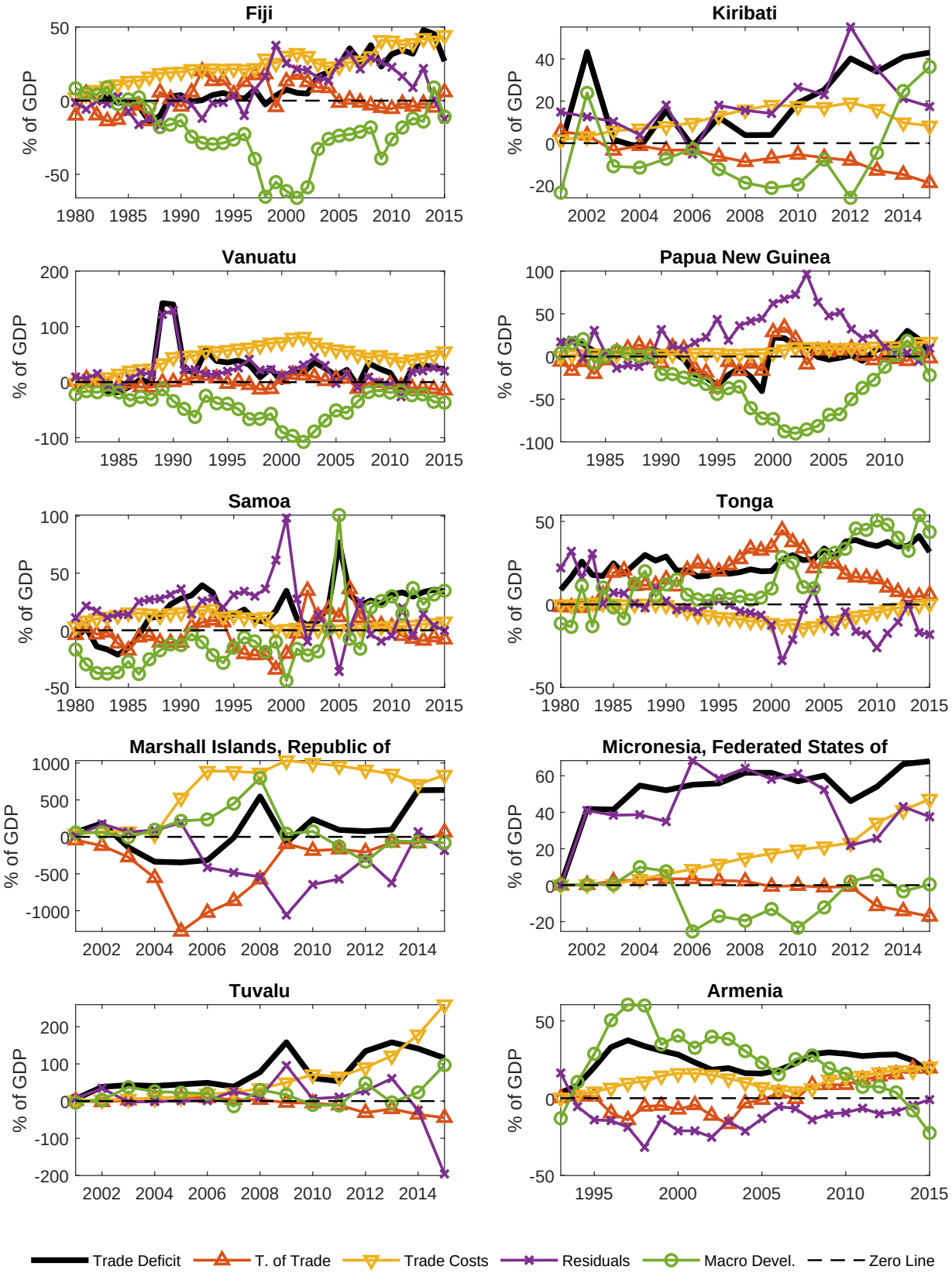
# Figure A14 - Decomposition of Trade Deficit #14



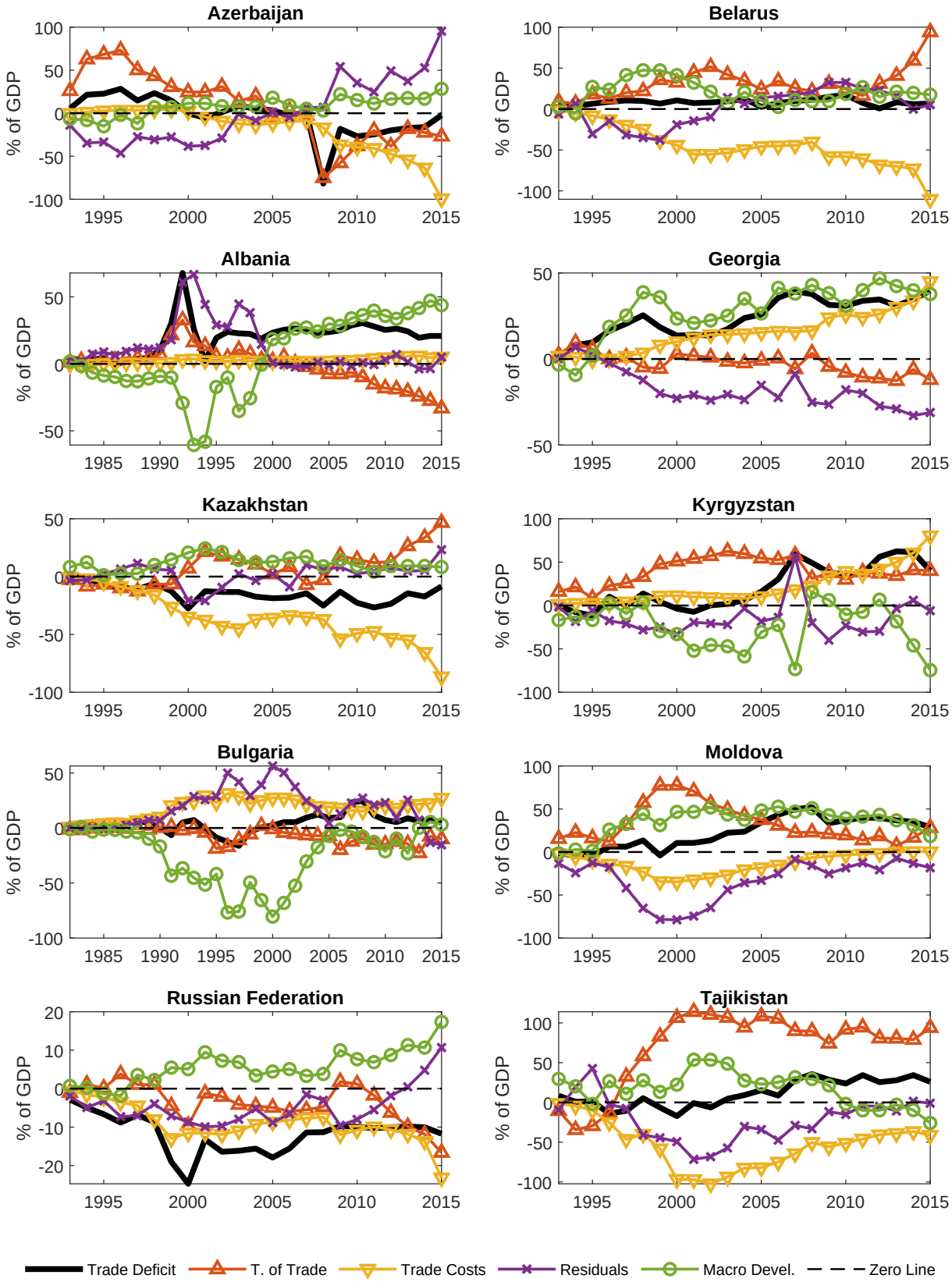
# Figure A15 - Decomposition of Trade Deficit #15



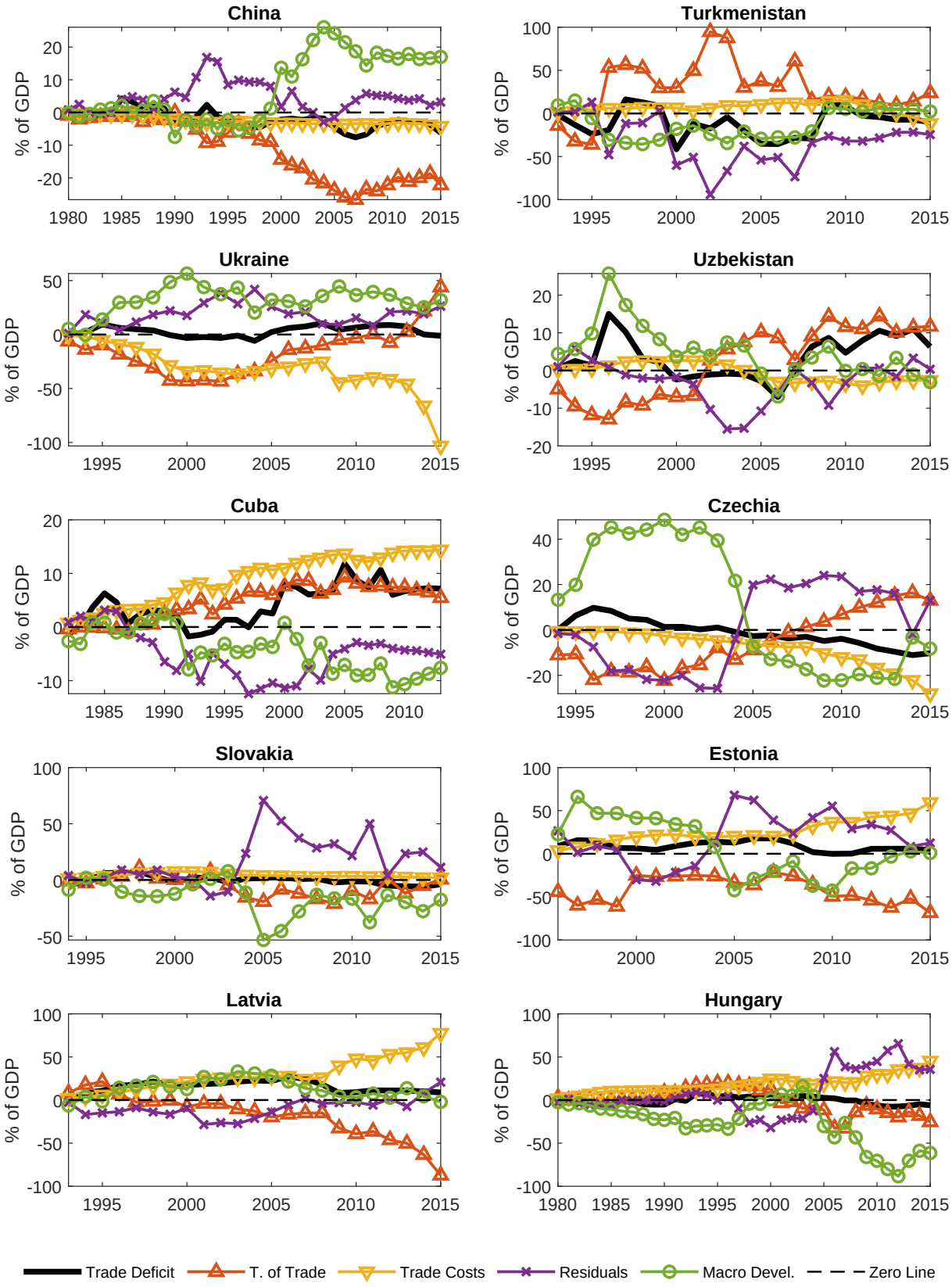
# Figure A16 - Decomposition of Trade Deficit #16



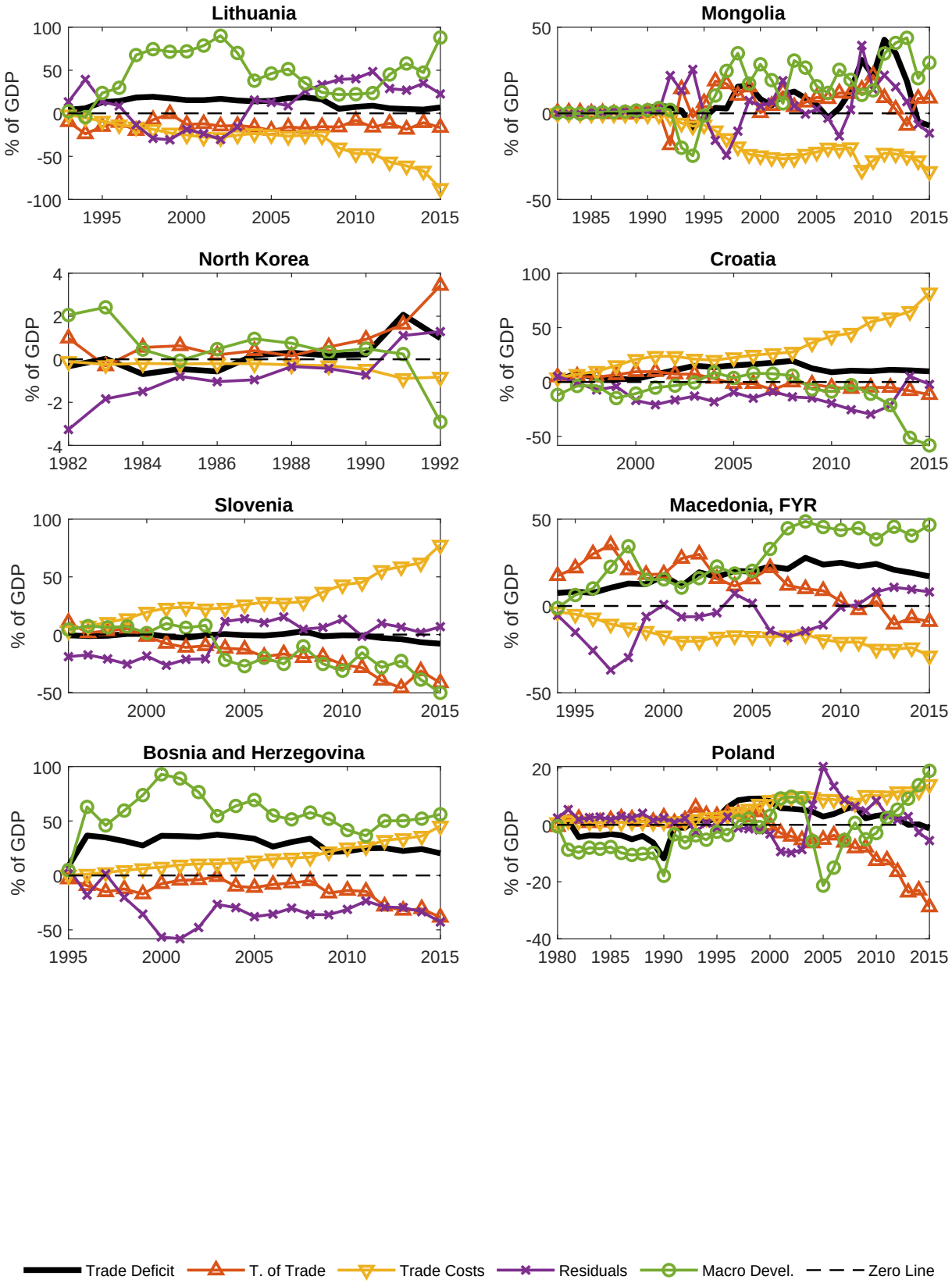
# Figure A17 - Decomposition of Trade Deficit #17



# Figure A18 - Decomposition of Trade Deficit #18



# Figure A19 - Decomposition of Trade Deficit #19



## Table A.1 - Mean Decomposition of Trade Deficit for All Countries

| Code | Country | Trade Deficit | Terms of Trade | Trade Costs | Macro Developments | Residuals |
|---|---|---|---|---|---|---|
| USA | United States | 2.957 | 1.793 | 3.484 | -1.646 | -0.673 |
| GBR | United Kingdom | 2.786 | 7.649 | 1.443 | -4.347 | -1.960 |
| AUT | Austria | 0.348 | -0.961 | 42.765 | -21.794 | -19.662 |
| BEL | Belgium | -0.062 | -5.901 | 15.603 | -11.753 | 1.988 |
| DNK | Denmark | -4.740 | 4.223 | 7.086 | -14.285 | -1.764 |
| FRA | France | 0.917 | 2.028 | 2.971 | -4.538 | 0.456 |
| DEU | Germany | -3.814 | 5.843 | 3.688 | -8.225 | -5.119 |
| SMR | San Marino | 9.791 | -4.655 | 22.273 | -5.307 | -2.520 |
| ITA | Italy | -0.348 | 1.420 | -0.490 | -2.830 | 1.551 |
| LUX | Luxembourg | 3.186 | 0.659 | 17.175 | -14.322 | -0.325 |
| NLD | Netherlands | -5.576 | -2.483 | -13.943 | 7.437 | 3.412 |
| NOR | Norway | -8.978 | 2.311 | -16.805 | 1.622 | 3.893 |
| SWE | Sweden | -3.496 | 4.699 | -1.895 | -7.834 | 1.534 |
| CHE | Switzerland | 1.202 | 6.023 | -4.092 | -8.161 | 7.432 |
| CAN | Canada | -0.671 | 2.471 | -4.904 | 6.381 | -4.620 |
| JPN | Japan | -1.725 | 6.005 | -2.203 | -5.447 | -0.080 |
| FIN | Finland | -2.910 | -0.639 | 8.624 | -9.991 | -0.904 |
| GRC | Greece | 7.274 | -3.578 | 11.345 | -5.381 | 4.889 |
| ISL | Iceland | 2.304 | -4.995 | -14.133 | 17.462 | 3.970 |
| IRL | Ireland | -18.181 | -11.848 | 7.020 | -10.800 | -2.553 |
| MLT | Malta | 15.370 | -26.220 | -31.874 | 5.437 | 68.027 |
| PRT | Portugal | 6.729 | -9.857 | 28.901 | -5.008 | -7.306 |
| ESP | Spain | 3.585 | -2.839 | 6.242 | -1.423 | 1.605 |
| TUR | Turkey | 5.767 | -14.792 | 4.502 | 13.162 | 2.896 |
| AUS | Australia | 1.731 | -0.355 | 12.516 | 1.359 | -11.788 |
| NZL | New Zealand | 1.068 | -1.119 | -0.749 | 2.312 | 0.625 |
| ZAF | South Africa | 1.908 | -1.696 | 3.469 | 3.351 | -3.215 |
| ARG | Argentina | -1.700 | 0.395 | 0.049 | -2.281 | 0.138 |
| BOL | Bolivia | -1.287 | -1.445 | -7.650 | 4.777 | 3.031 |
| BRA | Brazil | -2.530 | -6.237 | 0.563 | 0.844 | 2.299 |
| CHL | Chile | -3.170 | -3.151 | -11.779 | -3.622 | 15.382 |
| COL | Colombia | 1.347 | -5.442 | 16.706 | 3.057 | -12.973 |
| CRI | Costa Rica | 2.138 | -5.242 | 0.430 | 6.463 | 0.487 |
| DOM | Dominican Republic | 12.273 | -4.205 | -1.250 | -0.624 | 18.352 |
| ECU | Ecuador | 0.946 | -8.445 | 5.712 | 4.318 | -0.640 |
| SLV | El Salvador | 17.304 | 1.966 | 12.510 | 10.596 | -7.768 |
| GTM | Guatemala | 8.204 | -4.062 | 6.089 | 8.490 | -2.312 |
| HTI | Haiti | 12.005 | 1.451 | 17.704 | -5.531 | -1.620 |
| HND | Honduras | 15.299 | 0.948 | 2.531 | -8.470 | 20.290 |
| MEX | Mexico | 0.354 | -10.174 | 6.505 | 9.115 | -5.091 |
| NIC | Nicaragua | 29.158 | 8.768 | 18.926 | 14.617 | -13.152 |
| PAN | Panama | 9.311 | 7.408 | -6.856 | -3.503 | 12.261 |
| PRY | Paraguay | 6.815 | -4.316 | 7.441 | 12.538 | -8.848 |
| PER | Peru | 4.369 | -0.310 | 5.477 | 5.714 | -6.513 |
| URY | Uruguay | -0.832 | -5.488 | -4.159 | 2.413 | 6.403 |
| VEN | Venezuela, Republica Bolivariana de | -5.749 | 17.400 | -19.390 | 3.119 | -6.878 |
| ATG | Antigua and Barbuda | -16.570 | 0.997 | -8.155 | -17.410 | 7.998 |
| BHS | Bahamas, The | 107.813 | -15.780 | -59.710 | -24.047 | 207.349 |
| ABW | Aruba | 12.851 | -8.082 | 19.028 | 7.190 | -5.286 |
| BRB | Barbados | 14.445 | -5.805 | 27.618 | -5.719 | -1.649 |
| BMU | Bermuda | 18.620 | -5.703 | 86.201 | -52.408 | -9.470 |
| DMA | Dominica | 22.387 | 15.161 | 52.255 | 18.732 | -63.760 |
| GRL | Greenland | 2.432 | 100.985 | -66.172 | 3.215 | -35.596 |
| GRD | Grenada | 29.505 | -13.666 | 25.760 | 10.483 | 6.928 |
| GUY | Guyana | 9.348 | 35.657 | -7.368 | -45.771 | 26.830 |
| BLZ | Belize | 11.404 | -0.762 | 16.162 | 22.027 | -26.023 |
| JAM | Jamaica | 18.846 | 3.249 | 32.135 | -5.066 | -11.472 |
| KNA | Saint Kitts and Nevis | 47.786 | -8.765 | 62.778 | -2.638 | -3.589 |
| LCA | Saint Lucia | 29.342 | 0.593 | -3.217 | 0.145 | 31.821 |
| VCT | Saint Vincent and the Grenadines | 20.482 | -21.639 | 57.599 | -0.305 | -15.172 |
| SUR | Suriname | -0.191 | 63.747 | 8.258 | -51.718 | -20.478 |
| TTO | Trinidad and Tobago | -3.394 | -22.483 | 20.975 | 17.042 | -18.927 |
| BHR | Bahrain | 14.800 | 29.168 | -49.906 | 7.866 | 27.672 |
| CYP | Cyprus | 19.151 | -11.581 | 23.134 | -10.559 | 18.158 |
| IRN | Iran, Islamic Republic of | -5.605 | 0.871 | -1.088 | -6.958 | 1.570 |

## Table A.1 - Mean Decomposition of Trade Deficit for All Countries

| Code | Country | Trade Deficit | Terms of Trade | Trade Costs | Macro Developments | Residuals |
|---|---|---|---|---|---|---|
| IRQ | Iraq | -28.711 | 8.926 | 12.202 | -27.696 | -22.143 |
| ISR | Israel | 0.595 | -4.591 | 0.639 | 2.821 | 1.726 |
| JOR | Jordan | 18.754 | -31.860 | 23.911 | 10.192 | 16.511 |
| KWT | Kuwait | 18.574 | 80.120 | -30.292 | 1.051 | -32.304 |
| LBN | Lebanon | 2.624 | 1.030 | 29.122 | -4.569 | -22.958 |
| OMN | Oman | -13.775 | 5.690 | -15.812 | 16.915 | -20.568 |
| QAT | Qatar | -14.354 | -14.139 | 18.003 | 16.512 | -34.730 |
| SAU | Saudi Arabia | -6.185 | -0.251 | -21.544 | -3.801 | 19.411 |
| SYR | Syrian Arab Republic | -8.970 | -36.059 | 16.008 | -7.038 | 18.119 |
| ARE | United Arab Emirates | 1.633 | -20.586 | 1.258 | 30.414 | -9.454 |
| EGY | Egypt | 9.864 | -3.060 | 14.767 | 10.660 | -12.502 |
| AFG | Afghanistan | 16.634 | 4.700 | 12.045 | -1.956 | 1.845 |
| BGD | Bangladesh | 4.347 | 0.408 | -0.439 | 3.356 | 1.022 |
| BTN | Bhutan | 17.930 | 2.419 | 61.204 | -33.873 | -11.820 |
| BRN | Brunei Darussalam | 0.887 | -116.200 | -16.532 | 3.410 | 130.208 |
| MMR | Myanmar | -1.559 | -2.956 | 1.670 | 0.779 | -1.052 |
| KHM | Cambodia | 3.139 | -24.021 | 28.423 | 19.056 | -20.319 |
| LKA | Sri Lanka | 5.223 | 2.608 | -10.714 | 11.466 | 1.862 |
| HKG | Hong Kong | 6.072 | 40.683 | -3.356 | -3.079 | -28.175 |
| IND | India | 3.138 | -4.409 | 0.668 | 6.023 | 0.855 |
| IDN | Indonesia | -1.919 | -31.856 | 12.851 | 9.502 | 7.583 |
| KOR | South Korea | -3.025 | -9.606 | -8.847 | 13.300 | 2.128 |
| LAO | Lao People's Democratic Republic | 14.597 | 2.090 | 8.632 | -0.890 | 4.764 |
| MAC | Macao | 4.276 | 13.426 | -38.492 | 36.186 | -6.843 |
| MYS | Malaysia | -4.484 | -43.719 | 18.670 | 14.582 | 5.982 |
| MDV | Maldives | 45.002 | 9.876 | -14.075 | 67.998 | -18.797 |
| NPL | Nepal | 12.747 | 1.348 | 2.077 | 6.253 | 3.069 |
| PAK | Pakistan | 3.012 | -3.866 | 3.316 | 0.772 | 2.790 |
| PLW | Palau | 20.028 | -6.205 | 19.435 | -15.821 | 22.620 |
| PHL | Philippines | 2.588 | -0.305 | -5.045 | -0.087 | 8.025 |
| SGP | Singapore | -4.345 | -0.156 | -39.217 | 3.563 | 31.465 |
| THA | Thailand | 0.764 | -13.537 | 10.065 | 16.330 | -12.095 |
| VNM | Vietnam | 6.440 | -36.151 | 3.125 | 32.849 | 6.618 |
| DJI | Djibouti | 9.438 | -2.436 | 30.906 | -21.394 | 2.362 |
| DZA | Algeria | -5.845 | -16.045 | 2.411 | 11.944 | -4.155 |
| AGO | Angola | -34.794 | 22.038 | -29.492 | -11.653 | -15.688 |
| BWA | Botswana | 8.003 | -7.651 | 64.984 | -9.972 | -39.359 |
| BDI | Burundi | 10.226 | 2.568 | 9.539 | -7.326 | 5.446 |
| CMR | Cameroon | -0.399 | 5.354 | 26.373 | -4.123 | -28.003 |
| CPV | Cabo Verde | 28.357 | 2.428 | 17.875 | -4.877 | 12.930 |
| CAF | Central African Republic | 3.508 | -0.625 | 9.091 | -3.640 | -1.319 |
| TCD | Chad | -2.263 | 7.679 | -17.592 | 9.720 | -2.070 |
| COM | Comoros | 15.915 | 6.167 | 22.779 | -11.859 | -1.172 |
| COG | Congo, Republic of | -17.901 | -13.883 | -8.209 | 0.993 | 3.199 |
| BEN | Benin | 6.495 | -1.393 | 17.717 | -4.735 | -5.094 |
| GNQ | Equatorial Guinea | -39.952 | -38.694 | -33.746 | 41.178 | -8.689 |
| ERI | Eritrea | 10.150 | 2.727 | 16.982 | -13.880 | 4.321 |
| ETH | Ethiopia | 12.463 | 4.832 | 1.105 | 7.134 | -0.608 |
| GAB | Gabon | -5.209 | -9.461 | -7.725 | 1.113 | 10.864 |
| GMB | Gambia, The | 13.578 | 14.037 | 11.269 | -21.496 | 9.769 |
| GHA | Ghana | 11.374 | 0.762 | -15.521 | 19.229 | 6.904 |
| GNB | Guinea-Bissau | -0.145 | 7.687 | 0.917 | -8.143 | -0.606 |
| GIN | Guinea | 1.792 | 1.878 | -2.407 | 1.523 | 0.797 |
| CIV | Côte d'Ivoire | -8.839 | -5.873 | -6.702 | -7.946 | 11.682 |
| KEN | Kenya | 6.957 | 1.402 | 21.949 | -15.428 | -0.965 |
| LSO | Lesotho | 25.748 | -23.721 | 69.970 | -43.567 | 23.066 |
| LBR | Liberia | 915.471 | 254.728 | 695.399 | 269.516 | -304.171 |
| LBY | Libya | 12.648 | 44.347 | 2.917 | 10.952 | -45.568 |
| MDG | Madagascar | 2.841 | 7.590 | -3.918 | 2.577 | -3.408 |
| MWI | Malawi | 3.822 | 18.566 | -8.216 | -14.052 | 7.523 |
| MLI | Mali | 9.987 | -1.785 | -7.205 | 2.713 | 16.263 |
| MRT | Mauritania | 5.953 | -20.630 | 11.370 | 13.905 | 1.309 |
| MUS | Mauritius | 8.811 | 3.045 | -6.228 | 13.980 | -1.986 |
| MAR | Morocco | 8.245 | -11.076 | 4.393 | 10.085 | 4.842 |
| MOZ | Mozambique | 8.927 | -1.637 | 20.215 | -25.910 | 16.257 |

## Table A.1 - Mean Decomposition of Trade Deficit for All Countries

| Code | Country | Trade Deficit | Terms of Trade | Trade Costs | Macro Developments | Residuals |
|---|---|---|---|---|---|---|
| NER | Niger | 7.979 | -7.388 | 16.467 | -12.481 | 11.382 |
| NGA | Nigeria | -15.920 | 4.149 | -3.096 | -30.581 | 13.608 |
| ZWE | Zimbabwe | 2.802 | 60.853 | -2.494 | -42.823 | -12.733 |
| RWA | Rwanda | 9.021 | 5.772 | 5.879 | -8.375 | 5.746 |
| STP | Sao Tome and Principe | 28.257 | 41.437 | -21.825 | 16.560 | -7.915 |
| SYC | Seychelles | 27.730 | 1.726 | 14.854 | 13.484 | -2.335 |
| SEN | Senegal | 8.492 | -15.163 | 17.001 | 7.186 | -0.533 |
| SLE | Sierra Leone | 13.614 | 3.655 | 14.243 | -26.040 | 21.756 |
| SOM | Somalia | 2.551 | 12.446 | -21.666 | -12.449 | 24.220 |
| NAM | Namibia | 4.463 | -13.282 | -8.519 | 29.020 | -2.756 |
| SDN | Sudan | 3.546 | 3.581 | -3.225 | 5.123 | -1.934 |
| SWZ | Swaziland | 11.245 | 46.856 | -42.113 | 50.107 | -43.604 |
| TZA | Tanzania | 7.975 | 1.310 | 7.273 | 1.458 | -2.066 |
| TGO | Togo | -2.566 | 20.638 | -3.485 | -17.946 | -1.773 |
| TUN | Tunisia | 7.398 | -13.193 | 1.798 | 14.867 | 3.926 |
| UGA | Uganda | 11.089 | -1.442 | 9.945 | 10.126 | -7.540 |
| BFA | Burkina Faso | 6.620 | -1.418 | -2.287 | 7.381 | 2.944 |
| ZMB | Zambia | 14.656 | 20.064 | -2.274 | -10.839 | 7.705 |
| SLB | Solomon Islands | 9.595 | 9.668 | 47.706 | -27.981 | -19.798 |
| FRO | Faroe Islands | 6.462 | -2.193 | -35.292 | 55.663 | -11.717 |
| FJI | Fiji | 11.885 | 2.162 | 24.212 | -21.894 | 7.405 |
| KIR | Kiribati | 18.528 | -6.079 | 11.334 | -5.442 | 18.715 |
| VUT | Vanuatu | 22.540 | -1.475 | 45.253 | -41.601 | 20.363 |
| PNG | Papua New Guinea | 1.390 | -0.771 | 6.285 | -29.659 | 25.535 |
| WSM | Samoa | 17.522 | -2.384 | 7.997 | -6.228 | 18.138 |
| TON | Tonga | 25.968 | 17.356 | -5.029 | 16.817 | -3.176 |
| MHL | Marshall Islands, Republic of | 88.831 | -366.296 | 645.225 | 90.712 | -280.810 |
| FSM | Micronesia, Federated States of | 51.702 | -1.921 | 16.606 | -5.836 | 42.853 |
| TUV | Tuvalu | 77.335 | -7.825 | 62.728 | 18.710 | 3.721 |
| ARM | Armenia | 23.478 | 1.449 | 11.044 | 22.947 | -11.961 |
| AZE | Azerbaijan | -2.818 | 7.335 | -19.360 | 7.868 | 1.340 |
| BLR | Belarus | 8.230 | 31.862 | -45.288 | 20.371 | 1.284 |
| ALB | Albania | 19.495 | -1.203 | 2.301 | 6.031 | 12.366 |
| GEO | Georgia | 24.212 | -2.478 | 15.424 | 28.688 | -17.421 |
| KAZ | Kazakhstan | -14.467 | 7.967 | -35.565 | 11.440 | 1.691 |
| KGZ | Kyrgyzstan | 21.332 | 39.780 | 21.073 | -24.818 | -14.702 |
| BGR | Bulgaria | 3.971 | -6.818 | 18.018 | -25.121 | 17.892 |
| MDA | Moldova | 22.738 | 33.412 | -13.536 | 35.424 | -32.562 |
| RUS | Russian Federation | -11.811 | -3.660 | -9.238 | 5.684 | -4.597 |
| TJK | Tajikistan | 11.424 | 69.907 | -53.879 | 17.531 | -22.134 |
| CHN | China | -2.124 | -11.470 | -2.450 | 7.240 | 4.557 |
| TKM | Turkmenistan | -10.980 | 28.803 | 6.185 | -12.896 | -33.072 |
| UKR | Ukraine | 3.065 | -15.412 | -32.387 | 31.802 | 19.063 |
| UZB | Uzbekistan | 3.619 | 2.368 | -0.551 | 4.832 | -3.030 |
| CUB | Cuba | 4.257 | 4.647 | 8.974 | -4.317 | -5.048 |
| CZE | Czechia | -1.293 | -4.944 | -7.990 | 10.543 | 1.098 |
| SVK | Slovakia | -0.102 | -5.556 | 4.062 | -16.087 | 17.479 |
| EST | Estonia | 8.872 | -41.698 | 26.331 | 6.330 | 17.909 |
| LVA | Latvia | 15.419 | -17.897 | 29.443 | 13.008 | -9.135 |
| HUN | Hungary | -0.573 | -1.210 | 18.063 | -26.043 | 8.617 |
| LTU | Lithuania | 12.126 | -14.088 | -31.485 | 46.805 | 10.894 |
| MNG | Mongolia | 7.237 | 5.585 | -14.619 | 12.610 | 3.661 |
| PRK | North Korea | 0.177 | 0.832 | -0.355 | 0.471 | -0.772 |
| HRV | Croatia | 10.351 | 0.231 | 31.481 | -8.984 | -12.377 |
| SVN | Slovenia | -1.443 | -16.163 | 31.790 | -13.414 | -3.656 |
| MKD | Macedonia, FYR | 17.668 | 13.203 | -17.161 | 28.295 | -6.669 |
| BIH | Bosnia and Herzegovina | 28.857 | -13.803 | 16.586 | 56.981 | -30.907 |
| POL | Poland | 1.464 | -3.316 | 5.594 | -2.679 | 1.865 |

Notes: Values are in % of GDP representing averages between 1980-2015.