International Journal of Economics and Financial Research
ISSN(e): 2411-9407, ISSN(p): 2413-8533
Vol. 4, Issue. 8, pp: 266-273, 2018
URL: http://arpgweb.com/?ic=journal&journal=5&info=aims

Academic Research Publishing Group

Original Research Open Access

Transfer Pricing of Multinational Corporations and Macroeconomic Volatility: Evidence from the U.S.

Patrick Ofei*
Zenith University College, Ghana

Abieku Neizer-Ashun
Hampton University, Virginia

George Owusu-Antwi
Higher Colleges of Technology, UAE

Evans Darnor Maka
Graduate School of Public Policy, University of Tokyo, Japan

Abstract

This paper investigates the extent of macroeconomic volatility caused by the transfer pricing behavior of multinational corporations. The study examined two possible transmission channels through which transfer pricing causes macroeconomic volatility, namely, terms of trade and budget policy channels. Using the EGARCH model with annual data on selected variables from 1980 to 2017, the paper found evidence of macroeconomic volatility caused by transfer pricing. The size of the shock from transfer pricing is high and statistically significant in the terms of trade and budget policy channels. Negative shock from multinational corporations shifting taxable income between high and low tax regimes had a larger effect than a positive shock on the country's budget policy. The volatility caused by transfer pricing was short-lived in the terms of trade channel. However, in the budget policy channel, past volatility of transfer pricing persisted for a longer period to explain current volatility.

Keywords: Transfer pricing; Macroeconomic volatility; Principal component analysis; Terms of trade; Budget policy.

1. Introduction

Economic globalization is perceived with much optimism by multinational corporations due to the opportunity for expanded markets and global production networks. Multinational corporations seek to achieve economies of scale through production networks established globally and expanded markets through mergers and acquisitions. Consequently, intra-firm trade among multinational corporations has grown significantly across different geographical borders, fueling foreign trade and investment. Nonetheless, this phenomenon has generally resulted in censured chicaneries of multinational corporations, due to the vulnerability of affected economies to absorb external shocks. Thus, globalization has an impact on both multinational corporations and economic policy makers.

The contribution of foreign trade to macroeconomics volatilities across countries cannot be overemphasized (Cariolle, 2012). To this end, policy makers have developed countercyclical and, sometimes, pro-cyclical policies and strategies that can determine the magnitude of volatility experienced by their economies (Cariolle, 2012; Rodrik, 1998;2000). Economic policy managers are usually confronted with the dilemma of growing their economies through foreign investments and developing strong institutions on the one hand and developing mechanisms and internal controls to absorb shocks from the volatilities created by foreign investors on the other. Consequently, multinational corporations continue to face the challenge of double taxation from their operations in multiple locations, as tax administrators seek to tax the same income more than once (OECD, 2013). Thus, multinational corporations with profit as their objective function, likewise develop strategies to circumvent double taxation by shifting taxable income from high to low tax regimes (Ofei, 2018).

The unprecedented economic crisis witnessed over the past decades in many economies has made the analysis of macroeconomic volatility a key issue in the economics and public finance discourse. Thus, the contribution made by international trade to macroeconomic volatility is one of the major themes commonly investigated in the literature (Cariolle, 2011; Guillaumont, 2010; Loayza and Raddatz, 2007). According to the foregoing literature, macroeconomic volatility covers a wide spectrum of indicators. Therefore, it is of utmost significance to understand the role of such volatility indicators on economic performance. Notwithstanding, there is a diverse range of methods available for measuring volatility (Gelb, 1979; Tsui, 1988).

Other supporting literature on sources of macroeconomic volatility (Combes and Guillaumont, 2002; Guillaumont, 2010), focused on external sources of volatility, namely, exports, global prices, terms of trade, or global interest rates. The internal forms of volatility identified were economic policy and natural disaster. Mauro and Becker (2006) investigated and showed that external shocks are the causes of growth shocks, a notable example being deterioration in terms of trade and a sudden decline in the flow of capital.

*Corresponding Author

Economic volatility was assessed to emanate partly from terms of trade and budget policy (Fatas and Mihov, 2007; Raddatz, 2007). This study draws on the findings of Fatas and Mihov (2007) and Raddatz (2007) to investigate macroeconomic volatility that could emanate from transfer pricing. Existing literature has not adequately examined the economic volatility caused by transfer pricing. However, the impact of transfer pricing on tax revenue was researched by Ofei (2018). The motivation of this study is to expand on the scope of the existence of transfer pricing, its determinants, and its impact on government revenue as researched by Ofei (2018) to examine the volatilities in the general economic landscape. Thus, the study hypothesizes that transfer pricing has a causal effect on macroeconomic volatility through two key channels, namely, (a) the terms of trade channel and (b) the budget policy channel.

The study therefore seeks to (a) investigate the transmission channels through which transfer pricing by multinational corporations cause macroeconomic volatility and (b) ascertain the extent to which macroeconomic volatility causes transfer pricing. To this end, the study deploys a more quantitative approach through the use of volatility clustering models, particularly the ARCH family of models, to achieve its purpose. This study is significant and an original contribution to knowledge on how transfer pricing causes macroeconomic volatility. The study elucidates the discovery of new facts, innovative reinterpretation of known data, and established ideas on transfer pricing theory and practice. The study finds strong evidence of volatility caused by transfer pricing behavior of multinational corporations with a high and statistically significant impact on the size of volatility in the terms of trade and budget policy channels.

2. Review of Related Literature

Literature on transfer pricing examined for this study was broadly categorized under three thematic areas: theoretical framework, existence of transfer pricing, and determinants of transfer pricing. The strand that examined the theoretical framework of transfer pricing were found in the works of Eccles (1985), Hirshleifer (1956), Grabski (1985), and Kanodia (1979). The second strand of literature examined the existence of transfer pricing (Clausing, 2003; Harris, 1993; Lall, 1973; Ofei, 2018; Swenson, 2001). The third strand of literature examined the determinants of transfer pricing (Mulyani, 2010; Ofei, 2018; Serrasqueiro, 2009). Nonetheless, literature that focuses explicitly and extensively on transfer pricing as a causal factor in macroeconomic volatility does not exist. Even if it does, it is very rare and remains limited, leaving this critical issue largely unexplored.

Cariolle (2012) synthesized existing literature on measuring macroeconomic volatility and outlined the principal methods used for calculating macroeconomic volatility. The study compared the methods and their properties based on export revenue data for 134 countries from 1970 to 2005. The study attempted to draw a distinction between measurements of the magnitude of volatility and those of asymmetry, using a diverse range of volatility indicators such as export revenue, global prices, terms of trade, and international interest rates.

Ramey and Ramey (1995) examined the effect of economic volatility on growth rate using GDP per capita. Using a sample of 92 countries and a sample of OECD countries, the study showed that countries with higher volatility experienced lower growth. The study presented empirical evidence against the standard dichotomy in macroeconomics that separates growth from the volatility of economic fluctuations. It further postulated that government spending-induced volatility was negatively associated with growth.

Serven (1998) examined the effects of volatility on the investment in sub-Saharan Africa by using two measures of macroeconomic volatility: (a) standard deviation and (b) coefficient of variation of several economic aggregates such as terms of trade, black-market premium, and inflation. Using large cross-country time series data, the paper presented empirical evidence on the negative association between investment and uncertainty. The findings showed that uncertainty and instability were important factors behind the poor investment record of most African countries over the last two decades.

Di Giovanni and Levchenko (2010) examined the impact of a high level of exposure to external shocks combined with measures of macroeconomic volatility using the standard deviation of the growth rates of terms of trade, GDP per capita, and exports. The study showed that the measure of standard deviation was strongly correlated with terms of trade and output volatility. However, the standard deviation did not exhibit any close relationship with the level of income, trade openness, and country characteristics.

Raddatz (2007) examined the contribution of external shocks to the volatility in output in developing countries using measures based on the standard deviation of growth rate of selected macroeconomic variables such as price of primary products, terms of trade, aid per capita, GDP per capita, and London Interbank Offered Rate (LIBOR). The study quantified the effect of external and internal shocks using a panel Vector Auto Regression (VAR) approach and compared the relative contributions of both shocks to output volatility. It found that the effect of external shocks to output was relatively small in absolute terms.

Fatas and Mihov (2007) examined fiscal policy and macroeconomic volatility in Latin America. The study found a negative impact of volatility in budget policy on growth in both OECD and developing countries. The study concludes that economic volatility results partly from the volatility in budget policy.

3. Analytical Framework

This study provided a theoretical illustration of how transfer pricing of multinational corporations causes economic volatility. The literature on economic volatility, particularly in developing countries, underscores the contribution of both internal and external shocks to the vulnerability of these countries (Cariolle, 2011; Guillaumont, 2010). Two transmission channels of economic volatility stemming from transfer pricing were hypothesized,

following the findings of Fatas and Mihov (2007) and Raddatz (2007). The channels were categorized into the terms of trade channels — which identify terms of trade as a conduit through which transfer pricing causes macroeconomic volatility — and the budget or fiscal policy channel, which identifies tax revenue as a conduit through which transfer pricing causes macroeconomic volatility.

3.1. The Terms of Trade Transmission Channel

Terms of trade was identified as a key source of macroeconomic volatility (Mauro and Becker, 2006; Raddatz, 2007). It is defined, for the purpose of this study, as the relative price of export and import of goods and services between two countries Deardorff (2016). Thus, a higher export price relative to import price improves the trade balance for an exporting country and the converse is true for an importing country.

The findings of Xing and Detert (2010), in their study, support the importance of export and import pricing. They studied how pricing of exports and imports of iPhone components and finished parts between China and the U.S. worsened and improved the trade balance of the U.S. and China respectively. From the perspective of multinational corporations with global production networks and subsidiaries, underpricing or overpricing of their intra-firm transactions could cause a trade imbalance among the countries. Specifically, the terms of trade for the country whose export has been underpriced would deteriorate and vice-versa. This suggests that manipulation of export prices in intra-firm transactions between high and low tax regimes could cause macroeconomic volatility. Therefore, it is plausible to carry out measures of volatility, based on the variance or coefficient of variation to differentiated series of terms of trade (Cariolle, 2012).

3.2. The Budget Policy Transmission Channel

Afonso and Furceri (2010) supports Fatas and Mihov (2007) in emphasizing the negative effect of budget policy volatility on growth in OECD and developing countries. A budget is an instrument of a fiscal policy, which entails government tax revenue, government expenditure, fiscal balance, and primary balance. From a country's fiscal policy standpoint, the transfer pricing behavior of multinational corporations could be attributable to income-shifting from a higher to lower tax rate jurisdiction (Ofei, 2018), as higher taxes tend to deplete the profits of multinational corporations (Klassen and Laplante, 2012). This suggests that multinational corporations are able to keep income out of the reach of the IRS by retaining their foreign income abroad (Ofei, 2018).

When mulitinational corporations shift taxable income from high to low tax regimes, it narrows the tax revenue base of governments to support the budget and developmental initiatives. This affects primary balance in the affected country. Primary balance describes the condition where expenditures, excluding interest payment and debt redemption, are covered by tax revenues. It is computed by determining the balance of general expenditures and the tax burden for the year under review. In recent years, the U.S. has been experiencing a considerable deficit in primary balance (Bohn, 1998).

4. Methodology

4.1. Data

Time series data on variables with annual frequency was used to achieve the objectives of this study. The variables are transfer pricing, nominal effective exchange rate, terms of trade, government revenue, tax revenue, and trade openness. Transfer pricing data was obtained by computing the spread between the ratio of the total income tax after credit to total sales (receipts) of foreign-controlled domestic corporations (FCDC) and domestic corporations (DCC) (Ofei, 2018). The data was obtained from the U.S. (Internal Revenue Service, 2012) (IRS) statistics of income.

The annualized time series data on nominal effective exchange rate from 1980 to 2017 was obtained from the IMF international financial statistics (IFS) database. Data on terms of trade was obtained by computing the ratio of the U.S. value of export to import from 1980 to 2017 denominated by the price deflator obtained from the IMF World Economic Outlook (WEO) database. Trade openness was obtained by computing the ratio of the U.S.'s total volume of trade to GDP with volume of export and import data from 1980 to 2017 obtained from the IMF WEO statistical database. The data on government and tax revenues from 1980 to 2017 were obtained from IMF IFS. The first difference of the selected series has been taken to ensure that the variables are mean reverting. Figure 1 in the appendix shows the variables in their levels;

4.2. Empirical Model

4.2.1. Model Justification

The mainstream econometric analysis assumes a constant variance of the disturbance term over time. However, the use of models and techniques to model the volatility (variance) of financial series has gained much attention in financial econometrics in recent times (Asteriou and Hall, 2011). This underscores the fact that financial and economic time series do show periods of unusually high volatility followed by a period of low volatility.

This implies that the expectation of the disturbance term might be greater in some periods than in others. In this case, the assumption of homoskedasticity is limiting and a more robust means of examining the pattern to allow the variance to depend on its history is preferable. The Autoregressive Conditional Heteroskedasticity (ARCH) family of models, particularly the GARCH model built to deal with conditional variance (Engle, 1995), is considered for this study. The study aims to examine the volatility caused by transfer pricing in relation to selected macroeconomic

indicators of volatility; therefore, it assumes asymmetries in the response. That is, negative and positive shocks to transfer pricing may impact differently on the selected indicators of macroeconomic volatility.

However, in the simple GARCH (1, 1) process, bad news and good news, that is, negative and positive shocks are deemed to have the same impact on the conditional variance. Thus, to allow for an asymmetric volatility effect in the conditional variance, the Exponential GARCH introduced by Nelson (1991) was chosen for this study.

4.2.2. Model Specification

First, the specification starts by modeling the conditional volatility as a GARCH (1,1) process.

The GARCH (p,q) model has the following form:

$$Y_t = \alpha + \beta^1 X_t + u_t \quad [1]$$

Where $u_t | \Omega_t \sim iid\ N(0,h_t)$

Thus, h_t enters the model as:

$$h_t = \gamma 0 + \sum_{i-1}^{p} \delta_i h_{t-1} + \sum_{j-1}^{q} \gamma_j u^2_{t-1} \quad [2]$$

The above specification indicates that the value of the variance parameter h_t depends on the historical value of the shocks, for which the model captures at the lagged squared residual error term and on the past values of itself, which the model captures at h_t *terms*.

The simplest form of the GARCH (p,q) model is the GARCH(1,1) model with a variance equation indicated as follows:

$$h_t = \gamma_0 + \delta_1 h_{t-1} + \gamma_1 u^2_{t-1} \quad [3]$$

Now, introducing the asymmetric term into the variance equation transforms the model to the Exponential GARCH (1, 1), which was first developed by Nelson (1991), given by:

$$log(h_t) = \gamma + \sum_{j=1}^{q} \varphi_j \left| \frac{ut-j}{\sqrt{ht-j}} \right| + \sum_{j-1}^{q} \sigma_j \frac{ut-j}{\sqrt{ht-j}} + \sum_{i=1}^{p} \beta_i log(h_{t-1}) \quad [4]$$

Where γ, φs, σs, and βs are the parameters to be estimated and $\log(h_t)$ is the logarithm of the variance series. In effect, this makes leverage effect exponential and not quadratic. This implies that the estimate of the conditional variance is expected to be non-negative. When $\sigma_j < 0$, then a positive shock (good news) generates less volatility than a negative shock (bad news) (Asteriou and Hall, 2011).

The model is augmented further to include explanatory variables in the variance equation, since it is assumed that there are other factors, apart from transfer pricing, that cause variability in the selected macrocosmic volatility indicates.

Thus, the study estimates the EGARCH (1,2) process as follows:

$$\Delta ln(TOT) = \beta_0 + \beta_{1i} \sum_{t=0}^{2} \Delta ln(TP_{t-I}) + \beta_{2i} \sum_{t=0}^{2} \Delta ln(NEER_{t-I}) + \beta_{3i} \sum_{t=0}^{2} \Delta ln(TO_{t-I}) + u_t \quad [5]$$

$$\Delta ln(GR) = \beta_0 + \beta_{1i} \sum_{t=0}^{2} \Delta ln(TP_{t-I}) + \beta_{2i} \sum_{t=0}^{2} \Delta ln(TO_{t-I}) + \beta_{3i} \sum_{t=0}^{2} \Delta ln(TR_{t-I}) + u_t \quad [6]$$

Where $u_t \sim iid\ N(0,h_t)$ and $h_t = b_1 e^2_{t-1} + b_2 h_{t-1}$

5. Empirical Result and Analysis

Given the important role played by volatility clustering in the implementation of macroeconomic policies, measuring the degree of volatility is of key interest to this study. As a result, the empirical analysis focuses on the variance equation rather than the mean equation as shown in Table 1 in the appendix.

The parameter estimation in the variance equation indicates coefficients of -2.691 and 2.358, showing an impact of the magnitude (size) of shock from transfer pricing to the terms of trade and budget policy channels respectively. Having controlled for exchange rate and trade openness, the values are high and statistically significant. Interestingly, the negative sign on the size coefficient for the terms of trade channel implies that transfer pricing behavior has a relative effect, suggesting that when multinational corporations shift taxable income from high to low tax regimes, it increases the volatility in one regime and reduces the volatility in the other. This observation is not true for the budget policy channel.

The positive and negative coefficients of 2.729 and -1.461 for the terms of trade and budget policy channels, respectively, indicates a positive leverage effect for the terms of trade channel and a negative leverage effect for the budget policy channel. This implies that, given a positive shock from transfer pricing behavior of multinational corporations and having controlled for exchange rate, trade openness, and tax revenue, the impact outweighs that of a negative shock. However, a negative shock from multinational corporations shifting taxable income between high and low tax regimes has a larger effect on a country's budget policy than a positive shock.

The coefficients -0.271 and -0.103 that measure the persistence of conditional volatility — that is, how past volatility explains current volatility for the terms of trade channel as depicted in Figure 2 in the appendix are negative, small, and statistically insignificant. However, the coefficients 1.647 and -0.874 for the budget policy channel are relatively large above 0.8 and statistically significant. This indicates that the volatility of transfer pricing does not persist (short-lived) in the terms of trade channel. Conversely, the past volatility of transfer pricing persists to explain current volatility in the budget policy. The conditional variance graph in Figure 2 in the appendix depicts some ebbs and flows with much volatility witnessed, particularly from 1980 to 1989 and 2001 to 2003.

6. Robustness Check

In an attempt to interpret empirical results, some important caveats cannot be overlooked. As such, the empirical model deployed by this study can be subject to major specification problems. As a result, alternative specifications with an equally robust volatility model were considered to ascertain the degree of variance caused by transfer pricing

on terms of trade and government budget, after controlling for exchange rate, trade openness, and tax revenue. This study further hypothesized that there could be other factors whose omission could cause overestimation of the parameters in the parsimonious EGARCH (1, 2) model.

The study chose the principal component analysis (PCA) model to capture variability and interdependence among the selected variables. The PCA aims at reducing the dimensionality of the dataset in which there is a large set of interrelated variables. The model works by identifying a set of principal components, which are linear combinations of the original variables, while retaining much variation present in the original dataset. The new set of principal components (PCs) are characterized by two properties: (a) That each principal component is uncorrelated and (b) The PCs are arranged according to how much variation they possess (Sharma, 1996). The result is presented in Table 2 in the appendix:

The result of the PCA shows that transfer pricing is the major source of volatility through the terms of trade channel. From the table, the second and third PCs hold the substantial portion of the terms of trade variability. Cumulatively, 89% of the original dataset is contained in the third PC and, by asymptotically analyzing the loadings, it can be inferred that transfer pricing contains greater weight in the third PC than in all the other variables.

The result from Table 3 below shows that transfer pricing is the major source of volatility through the budget policy transmission channel. Similar to the analysis under the terms of trade channel, cumulatively, PC 2 contains a significant proportion of the original data set with a variance proportion of 27% and a cumulative variance of 77%; thus, this study selects the component for further analysis. It can be observed that transfer pricing contains the highest weight in PC 2 to underscore the fact that it causes much volatility relative to the other variables.

7. Conclusion

The recent economic crisis fueled by budget misalignments in both developed and developing countries has called for fiscal consolidation and improvement in the primary balance across countries. Achieving primary balance is necessary for medium-term debt sustainability, which has become a major concern for policy makers. While individual and corporate income tax has been declining steadily in major advanced economies like the U.S., their debt to GDP ratio continues to increase (Bohn, 1998). This discourse provides succinct evidence that corporate institutions have adopted unconventional mechanisms of circumventing tax payments. Given that the U.S. tax rate was consistent for all entities, the shortfall in tax values could be attributed to transfer pricing activities of multinational corporations (Ofei, 2018). Transfer pricing is seen as a plausible strategy through which these corporate institutions could achieve their goal of shifting taxable income from higher to lower tax rate jurisdictions.

It is crucial to assess the importance of transfer pricing activities of multinational corporations on the economy. Nonetheless, very limited literature on transfer pricing and macroeconomic volatility exists. Consequently, this paper aims to fill the current knowledge gap. The study attempted to investigate the impact of transfer pricing on macroeconomic volatility through two key channels: terms of trade and budget policy. The study applied the Exponential GARCH model to examine volatilities in the two channels using annual frequency U.S. data on transfer pricing, nominal effective exchange rate, terms of trade, trade openness, government revenue, and tax revenue.

From the result of the estimation of the two models presented in Table 1, the study draws a valid conclusion: Firstly, testing for the impact of magnitude of a shock showed that transfer pricing had a high impact on both the terms of trade and budget policy channels. The magnitude of the impact was high and statistically significant in both channels. Secondly, testing for asymmetries of bad (negative shock) and good news (positive shock) showed that negative shock from the activities of multinational corporations in shifting taxable income between high and low tax regimes had a larger effect than a positive shock on the country's budget policy, even with the same impact magnitude. Thirdly, testing for the persistence of past volatility showed that the volatility caused by transfer pricing was not persistent in the terms of trade channel, but was persistent in the budget policy channel for a longer period.

The findings of the study offer a formidable framework through which policy makers could ascertain the degree of volatility caused to the structural economy by the transfer pricing behavior of multinational corporations. Overall, the findings of the study imply that countries can be affected by global movement in relative prices, particularly through the terms of trade accounting and budget policy dynamics. The result, therefore, has an implication for policy makers in both advanced and small economies. Though the movements in global prices transcend the control of economic policy makers in specific country settings, policy makers can influence how such global prices movements affect their economies. To achieve this, there is a need for international policy coordination and guidelines on transfer pricing across member countries.

References

Afonso, A. and Furceri, D. (2010). Government size, composition, volatility and economic growth. *European Journal of Political Economy*, 26(4): 517-32.

Asteriou, D. and Hall, S. (2011). *Applied Econometrics.* Palgrave Macmillan: New York, NY.

Bohn, H. (1998). The behavior of U.S. public debt and deficits. *Quarterly Journal of Economics*, 113(3): 949-63.

Cariolle, J. (2011). L indice de vulnerabilite economique, elaboration et analyse des series retrospective de 1975 a 2008, document de travail, fondation pour les etudes et recherches sur le developpement international6/172, international monetary fund.

Cariolle, J. (2012). Measuring Macroeconomic Volatility: Application to Export Data 1970–2005. Working paper no. I14, Innovative indicators series, FERDI.

Clausing, K. A. (2003). Tax-motivated transfer pricing and US intrafirm trade prices. *Journal of Public Economics*, 87(9): 2207-23. Available: http://gabriel-zucman.eu/files/teaching/Clausing03.pdf

Combes, J. L. and Guillaumont, P. (2002). Commodity price volatility, vulnerability and development. *Development Policy Review*, 20(1): 25-39.

Deardorff, A. V. (2016). The terms of trade and other wonders: Deardorffs' glossary of international economics. Available: http://wwwpersonal.umich.edu/~alandear/glossary/intro.html

Di Giovanni, J. and Levchenko, A. A. (2010). The risk content of exports: A portfolio view of international trade. Working paper series No. 16005, NBER.

Eccles, R. (1985). Control with fairness in transfer pricing. *Harvard Business Review*: 149-61. Available: https://hbr.org/1983/11/control-with-fairness-in-transfer-pricing

Engle, R. (1995). Multivariate simultaneous GARCH. *Econometric Theory*, 11(1): 122-50.

Fatas, A. and Mihov, I. (2007). Fiscal discipline, volatility, and growth. In fiscal policy, stabilization, and growth, edited by G. Perry, l. Serven, and R. Suescun, Latin american development forum, The world bank, 2007.

Gelb, A. H. (1979). On the definition and measurement of volatility and the costs of buffering export fluctuations. *The Review of Economic Studies*, 46(1): 149-62.

Grabski, S. (1985). Transfer pricing in complex organizations: A review and integration of recent empirical and analytical research. *Journal of Accounting Literature*, 4: 33-75. Available: https://link.springer.com/chapter/10.1007/978-1-4899-7138-8_22

Guillaumont, P. (2010). Assessing the economic vulnerability of small island developing states and the least developed countries. *Journal of Development Studies*, 46(5): 828-54.

Harris, D. G. (1993). The impact of U.S. tax law revision on multinational corporations capital location and income shifting decisions. *Journal of Accounting Research*, 31: 111-40. Available: https://www.jstor.org/stable/2491167?seq=1#page_scan_tab_contents

Hirshleifer, J. (1956). On the economics of transfer pricing. *Journal of Business*, 29: 172-84. Available: http://www.jstor.org/stable/2350664

Internal Revenue Service (2012). Statistics of Income Division (February). *Electronically*: Available: http://www.irs.gov/uac/SOI-Tax-Stats-Foreign-Controlled-Domestic-Corporations

Kanodia, C. (1979). Risk sharing and transfer price systems under uncertainty. *Journal of Accounting Research (Spring)*, 17(1): 74-98.

Klassen, K. J. and Laplante, S. K. (2012). Are U.S. multinational corporations becoming more aggressive income shifters? *Journal of Accounting Research*, 50(5): 1245-85. Available: http://dx.doi.org/10.2139/ssrn.1815320

Lall, S. (1973). Transfer pricing by multinational manufacturing firms. *Oxford Bulletin of Economics and Statistics*, 35(3): 173-95.

Loayza, N. V. and Raddatz, C. (2007). The structural determinants of external vulnerability. *World Bank Economic Review*, 21(3): 359-87.

Mauro, P. and Becker, T. (2006). Output drops and the shocks that matter. *IMF Working Paper*.

Mulyani, Y. (2010). Factors influencing transfer pricing compliance: An Indonesian perspective. Unpublished PhD Thesis, University of New South Wales, Australia.

Nelson, D. (1991). Conditional heteroskedasticity in asset returns: A new approach. *Econometrica*, 59(2): 347-70.

OECD (2013). *Action Plan on Base Erosion and Profit Shifting.* OECD.

Ofei, P. (2018). *Exploring Transfer Pricing of Multinational Corporations.* Lambert Academic Publications: Berlin.

Raddatz, C. (2007). Are external shocks responsible for the volatility of output in low-income countries? *Journal of Development Economics*, 84(1): 155-87.

Ramey, G. and Ramey, V. A. (1995). Cross-country evidence on the link between volatility and growth. *The American Economic Review*, 85(5): 1138-51.

Rodrik, D. (1998). Why do open economies have bigger governments? *Journal of Political Economy*, 106(5): 997-1032.

Rodrik, D. (2000). Participatory politics, social cooperation, and economic stability. *The American Economic Review*, 90(2): 140-44.

Serrasqueiro, Z. (2009). Growth and profitability in Portuguese companies: A dynamic panel data approach. *Economic Interferences*, 11(26): 265-79. Available: http://www.amfiteatrueconomic.ro/temp/Article_897.pdf

Serven, L. (1998). Macroeconomic uncertainty and private investment in developing countries: An empirical investigation. Policy research working paper, The world bank.

Sharma, S. (1996). *Applied multivariate techniques.* John Wiley & Sons, Inc.

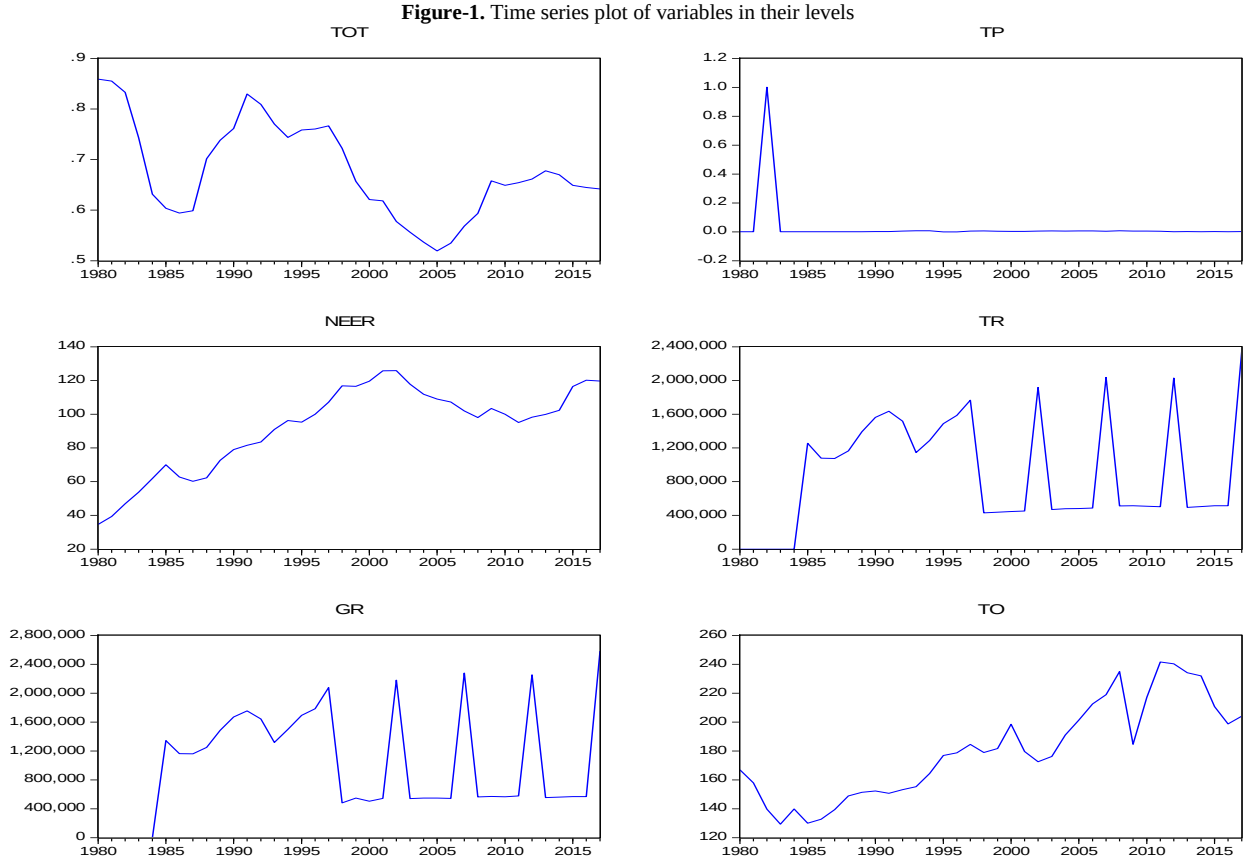
Swenson, D. L. (2001). Tax reforms and evidence of transfer pricing. *National Tax Journal*, 54(1): 7-25. Available: http://faculty.econ.ucdavis.edu/faculty/dswenson/

Tsui, K. Y. (1988). The measurement of exports volatility – a methodological note. *Economics Letters*, 27(1): 61-65.

Xing, Y. and Detert, N. (2010). *How the iphone widens the united states trade deficit with the people's republic of china. adbi working paper 257.* Asian development bank institute: Tokyo. http://www.adbi.org/workingpaper/2010/12/14/4236.iphone.widens.us.trade.deficit.prc/

Appendix

Figure-1. Time series plot of variables in their levels



Source: Authors' own computation

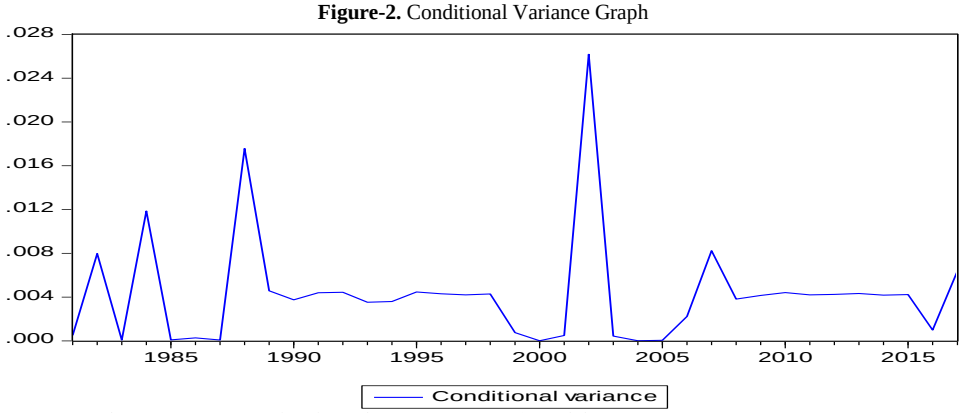
Table-1. Result from an EGARCH (1, 2) model

Dependent Variables: Model (1) Terms of trade and Model (2); Government revenue		
Parameters	Coefficients(Model 1)	Coefficients (Model 2)
Constant	-0.024 (33.13***)	-0.007 (-6.12***)
Transfer pricing	0.009 (6.79***)	0.002 (9.90***)
Trade openness	-0.268 (61.45***)	0.111 (4.59***)
Nominal effective exchange rate	-0.247 (23.97***)	
Tax revenue		0.987 (14.59***)
	Variance Equation	
Constant	-7.531 (-6.92***)	-3.260 (-9,26***)
Arch effect	-2.691 (-3.36***)	2.358 (3.63***)
Asymmetric effect	2.729 (4.95***)	-1.461 (-3.08***)
GARCH (1) effect	-0.271 (-1.63)	1.647 (12.54***)
GARCH (2) effect	-0.103 (-1.59)	-0.874 (-7.63***)
R^2	-0.217	0.907
S.E of regression	0.068	1.120

Note (1): ***, **. * indicates 1% ,5% and 10% significant levels respectively. T-statistics reported in parenthesis (2) Model 1 estimates the terms of trade channel while model (2) estimates the budget policy channel

Source: Author's own computation from EGARCH (1, 2) Model

Figure-2. Conditional Variance Graph



Source: Authors' own computation from the EGARCH (1, 2) model

Table-2. Principal Component Analysis (The Terms of Trade Channel)

Loadings:	PC 1	PC 2	PC 3	PC 4
Terms of trade	0.183	0.764	-0.519	0.335
Transfer pricing	-0.126	0.594	0.792	-0.059
Nominal effective exchange rate	-0.713	-0.115	0.024	0.690
Trade openness	0.664	-0.222	0.320	0.637
Importance of components:				
Proportion of variance	0.38	0.28	0.23	0.11
Cumulative proportion	0.38	0.66	0.89	1
Standard deviation	1.53	2.64	3.56	4.00

Author's own computation from PCA model
Note: PCs denotes principal components

Table-3. Principal Component Analysis (The Budget Policy Channel)

Loadings:	**PC 1**	**PC 2**	**PC 3**	**PC 4**
Government revenue	0.683	0.047	0.218	-0.695
Transfer pricing	-0.038	0.871	0.459	0.166
Trade openness	-0.255	-0.457	0.851	-0.014
Tax revenue	0.683	-0.169	0.125	0.699
Importance of components:				
Proportion of variance	0.51	0.27	0..22	0.00
Cumulative proportion	0.51	0.77	0.99	1
Standard deviation	2.02	1.06	0.89	0.02

Authors own computation from PCA model