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Article

The twin deficits hypothesis and reverse causality: A short-run analysis of Peru

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ABSTRACT

This study examines causation between the current account and the fiscal surplus and fiscal spending for a commodity-based economy, Peru. Using quarterly data for the open economy, the outcomes reject the twin deficits hypothesis. Instead, the evidence points strongly to reverse causality, that is, the current account causes the fiscal account. However, unlike previous empirical evidence on this subject, for a year, the reverse causality indicates a negative causation because the fiscal consumption is not smoothed when positive permanent shocks to the current account occur. In the short run, the fiscal policy has no effect on the current account, but improvements in the current account increase the probability of attaining a lower bounded fiscal deficit. This evidence is consistent with a small open commodity-based economy that is highly exposed and sensitive to external price shocks.

La hipótesis del doble déficit y la causalidad inversa: un análisis a corto plazo del Perú

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RESUMEN

Este estudio examina la causalidad entre la cuenta corriente y el superávit fiscal y el gasto fiscal para un país primario exportador, Perú. Usando data trimestral de un periodo de apertura comercial y financiera, los resultados rechazan la hipótesis de déficits gemelos. En cambio, la evidencia revela la existencia de una causalidad invertida, es decir, que la cuenta corriente causa a la cuenta fiscal. Sin embargo, a diferencia de la evidencia encontrada previamente en la literatura, para un periodo de un año, existe un efecto negativo porque el consumo fiscal no es suavizado cuando se presentan los choques positivos permanentes de cuenta corriente. En el corto plazo, la política fiscal no afecta a la cuenta corriente, pero incrementos en cuenta corriente aumentan la probabilidad de superar el límite mínimo del déficit fiscal. Esta evidencia es consistente con una pequeña economía abierta primaria exportadora que esté altamente expuesta y es sensible a los choques de precios externos.

1. Introduction

The twin deficit hypothesis, hereafter the TDH, argues that fiscal deficits lead to current account deficits. The empirical literature involves the presence of TDH, bidirectional causality, which indicates that both balances affect each other, and reverse causality, which is unidirectional from current account to fiscal balance. For net debtor developing countries; according to Reisen (1998) and Khalid and Teo (1999), reverse causality should be apparent rather than the TDH, because those countries have limited domestic resources and require external funds. In addition, Alkswani (2000) implies that for commodity-based exporters such as Saudi Arabia, this causality should hold as well, because an increase in export revenues improves fiscal revenues.

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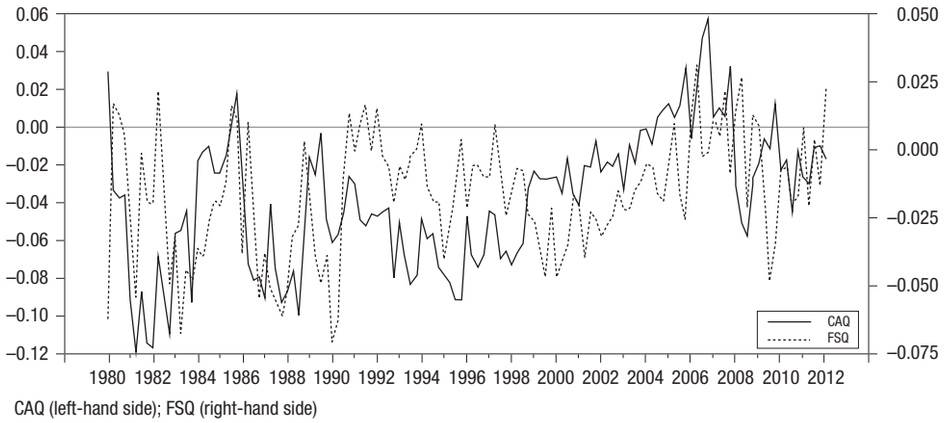

Figure 1. CAQ and FSQ.

The main goal of this study is to provide further evidence on the nexus between the fiscal deficit and the current account for a small open commodity-based economy, Peru. Specifically, we test for the presence of the TDH, as well as bidirectional or reverse causality. Previously, Fleegler (2006) found that the TDH holds for Peru. This economy is an interesting case for two reasons: 1) It has historically had limitations to finance its fiscal budget.[1] The lack of domestic funds increases its external debt, and taxations on exports revenues are volatile due to the terms of trade fluctuations. Overall, the traditional exports are around 70% of total exports.[2] 2) In the 1990s, persistent current account deficits increased the probability of a balance of payments crisis like those in East Asia in 1997 and Russia in 1998. In a dollarized Peruvian economy,[3] the output costs of default would have been increased. Tight fiscal policies were applied in that decade,[4] however, and as shown in Figure 1, those policies were unsuccessful in reducing the current account deficit.

According to the IS-LM approach and Corsetti and Müller (2006), the TDH holds in open economies. For this reason, the period of analysis starts in the second half of 1990, when the Washington Consensus openness policies took effect. In addition, unlike previous literature on this issue, fiscal spending is included in this study because, according to the Ricardian equivalence hypothesis (REH), fiscal spending alone worsens the current account. Likewise, in contrast to Fleegler (2006), who assumes the exogeneity of the fiscal deficit, we run a Granger causality–Wald test like Khalid and Teo (1999) and Alkswani (2000), among others. Once the business cycles are properly accounted for, the evidence rejects the TDH. Instead, it accepts reverse causality in the short run. Using a broader range of data, the results are not sensitive for a specific regime. Likewise, variance decomposition and the impulse response function outcomes support reverse causality.

Unlike previous empirical evidence on this subject, for a year, reverse causality indicates negative causation because fiscal spending is more responsive to current account shocks than fiscal revenues are. This implies that fiscal consumption is not smoothed when positive current account innovations occur. In addition, in the short run, the fiscal policy does not alter the current account, but improvements in the current account increase the probability of attaining the lower bounded fiscal deficit. The reverse causality is consistent with a small open commodity-based economy highly exposed and sensitive to external price shocks. In this case, the diversification of sources of national income should alter this causality.

The second section of this study discusses the theoretical framework and empirical literature on the relationship between fiscal deficits and current account. The third section presents the data, vector autoregression (VAR) specifications, and outcomes. The final section concludes.

2. Theory and related empirical literature

National accounting systems define the current account as follows:

$$CA = S^{Pr} + S^{Pu} - I \qquad \text{Eq.(1)}$$

where CA is the current account balance; S^{Pr} represents private savings, which is the gross national product (GNP) minus consumption minus taxes; S^{Pu} represents public savings, which are tax revenues minus fiscal spending; and I is investment. In addition, the current account is also defined as the net exports plus the net income from abroad plus the net current transfers. Likewise, in the intertemporal approach, the current account shows the consumption and investment decisions of a country, which determine whether the country is a net creditor or a net debtor.

The twin deficits hypothesis states that fiscal deficits, or negative public savings, induce current account deficits. According to the IS-LM approach, assuming sticky prices, perfect capital mobility and a flexible exchange rate, there are two effects on the current account. The direct effect is the impact of the public savings on the current account. Here, private savings and investment are unaffected because, due to perfect capital mobility and sticky prices, the real interest rate returns to its initial level. The indirect effect is when the expansionary fiscal policy increases the domestic real interest rate, attracting foreign capital. The capital inflows cause the real exchange rate to appreciate, and consequently, the trade balance to deteriorate.[5]

On the other hand, according to the REH, there is no link between the fiscal deficit and the current account deficit, because holding constant the real interest rate, any decrease in taxes determines a decrease in present consumption, which increases private savings.

1. Since 1999, the Fiscal Responsibility and Transparency Act has bounded the fiscal deficit to 2% of the gross domestic product (GDP).
2. Central Bank of Peru web page.
3. Currently, this economy is experiencing high output growth rates with a high level of international reserves, in progress de-dollarization (Garcia-Escribano, 2010) and the decline in the exchange rate pass-through (Winkelried, 2011).
4. Moreover, it was tight due to the inflationary process in the 1980s.
5. In addition, Corsetti and Mueller (2006) argue that TDH holds when there are persistent fiscal spending shocks on domestic goods and openness.

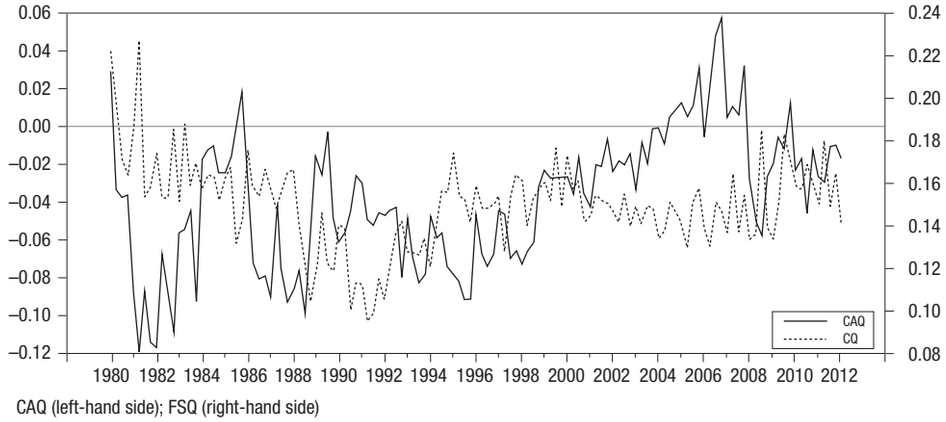

Figure 2. CAQ and GQ. The response of FSQ to a positive permanent shock to current account.

However, other things being equal, the TDH holds after an increase in government expenses.[6]

2.1. Related empirical literature

Focusing on flexible exchange rate regimes, the economic literature does not show a pattern for developed and developing countries; further, there are different results for specific countries like the US and Canada. The explanation for this is that some specifications assume the exogeneity of the fiscal deficit, and restrictions are imposed on VARs following the TDH, as Kim and Roubini (2008) and Corsetti and Müller (2006) did. The tendency of research on this topic has involved causality tests using VARs.[7]

For the US, Hutchinson and Pigott (1984), Zietz and Pemberton (1990), and Bacham (1992) found that the TDH holds. Also for the US, Erceg et al. (2005) found that an increase in government expenditures and a decrease in labor income tax rates have small negative effects on the trade balance.[8]

Bartolini and Lahiri (2006) found that the TDH holds for countries belonging to the Organization for Economic Co-operation and Development (OECD). In addition, for OECD countries, Bussière et al. (2005) found that the contemporaneous effects of fiscal deficits on current account deficits are significant and very small. For Canada and the UK, Corsetti and Müller (2006) found that the TDH holds. Chinn and Prasad (2003), in a panel data setting, reported that the TDH holds for developed and developing countries. Chinn and Ito (2007) derived the same results; in other words, TDH holds for developed and developing countries. Kouassi et al. (2004) findings indicate that TDH holds in Israel. For Thailand, Baharumshah et al. (2006) reported the same result.

On the other hand, bidirectional causality occurs when both balances affect each other. This framework suggests that fiscal deficits worsen the current account and that deterioration of the current account worsens fiscal accounts. Empirical literature on this subject includes Darrat (1988) and Hatemi and Shukur (2002) for the US; Islam (1998) for Brazil; Normandin (1999) for Canada; Kouassi et al. (2004) for Thailand; Lau and Baharumshah (2004) for Malasya; Baharumshah et al. (2006) for Malaysia and the Philippines; Jayaraman and Choong (2007) for Fiji; Arize and Malindretos (2008) for African data; and Lau and Tang (2009) for Cambodia.

Reverse causality, or current account deficits causing fiscal deficits, has been shown in the empirical literature. Summers (1988) indicated that this kind of causality occurs when countries target the current account. According to Reisen (1998) and Khalid and Teo (1999), reverse causality should be more present in developing countries because those countries, including Latin American countries in the 1980s and 1990s, have limited domestic resources and a strong dependence on external funds. In addition, analyzing Saudi Arabia, Alkswani (2000) implied that this causality should hold as well for commodity-based exporters, because export revenues improve fiscal revenues. Empirical literature on this subject includes Anoruo and Ramchander (1998) for India, Indonesia, Korea, Malaysia, and the Philippines; Khalid and Teo (1999) for Indonesia and Pakistan; Kouassi et al. (2004) for Korea; and, Kim and Kim (2006) and Baharumshah et al. (2006) for Indonesia.

3. Empirical examination

3.1. Data and variables

We collected data on current account, fiscal surplus, fiscal spending, and real GDP. Moreover, like Kim and Roubini (2008), we use the real GDP to account for the cyclical movements of both balances, because they have different responses to cyclical movements.

The Central Bank of Peru (http://www.bcrp.gob.pe/statistics.html) has provided quarterly data from 1980:1 to 2012:1.[9] All processes are seasonally adjusted. CAQ denotes the current account–GDP and is derived from the difference between national savings– GDP and investment-GDP; FSQ denotes the fiscal surplus–GDP and is derived from the difference between tax revenues–GDP and fiscal spending-GDP. GQ denotes the fiscal spending–GDP. Figure 2 shows CAQ and GQ, which have different paths. In addition, obtained using the Hodrick-Prescott filter on real GDP, GAP denotes the cyclical movements of the economy.

The focus of analysis is the period from 1990:3 to 2012:1. These dates are set because a drastic price shock and strong nominal depreciation occurred in August 1990, and gradually, trade and financial openness policies were initiated. In addition, the full sample is used to evaluate whether data are sensitive for a specific

6. An extension is the overlapping generations model where a negative variation in taxes affects consumption and net wealth decisions, and a current account deficit is achieved (Obstfeld & Rogoff, 1996).

7. This technique is used in Khalid and Teo (1999), Kouassi et al. (2004), Lau and Baharumshah (2004), Kim and Kim (2006), Baharumshah et al. (2006), and Lau and Tang (2009).

8. However, it is important to note that for the US, Kim and Roubini (2008) find a twin divergence instead of TDH accounting for cyclical movements. Finally, Enders and Lee (1990) find that TDH does not hold in a REH perspective.

9. Fleegler (2006) uses annual data from 1979 to 2004.

regime. Table 1 reports the descriptive statistics of all series across samples. CAQ and FSQ display a close to zero correlation in the main sample and 0.22 in the full sample. In contrast, CAQ and GQ display a small positive correlation in the main sample and a small negative correlation in the full sample.

Table 2 reports unit root tests. The outcomes indicate that the time series do not have a unit root, although in the main sample, CAQ does not show strong results. Regarding this, the results in Table 2 indicate that time series at levels may be used in the VARs and dismiss the use of vector error correction models (VECMs), even though stability tests are needed to run on VARs.

Table 1
Descriptive statistics

	Main sample				Full sample			
	CAQ	FSQ	GQ	GAP	CAQ	FSQ	GQ	GAP
Mean	−0.03	−0.01	0.15	0.00	−0.04	−0.02	0.15	0.00
SD	0.03	0.02	0.02	0.04	0.04	0.02	0.02	0.05
Correlations								
CAQ	–	0.06	0.11	−0.12	–	0.22	−0.09	−0.38
FSQ	0.06	–	–	−0.01	0.22	–	–	−0.1
GQ	0.11	–	–	0.37	-0.09	–	–	0.15

SD, standard deviation.
Main sample (1990:3-2012:1); full sample (1980:1-2012:1).

Table 2
Unit root tests

		CAQ	FSQ	GQ	GAP
Main sample	ADF	−2.04	−1.63*	−3.13**	−3.37**
	PP	−21.49*	−26.94**	−33.95**	−39.34**
Full sample	ADF	−1.80*	−1.99**	−2.60*	−3.45**
	PP	−10.21**	−45.63**	−63.84**	−46.98**

Critical t-values

	Zero-mean stationary		Stationary		Trend stationary	
	ADF	PP	ADF	PP	ADF	PP
5%	−1.93	−8.29	−2.89	−14.51	−3.40	−21.78
10%	−1.60	−5.88	−2.58	−11.65	−3.13	−18.42

ADF, Augmented Dickey-Fuller; PP, Phillips-Perron.
In most cases, Akaike Information Criterion and Hannan Quinn Criterion concur in the optimal lag order. Different lag order results were tested, and in all cases, the null hypothesis that the time series has a unit root is rejected. For GQ, in the full sample and the main sample, a constant is included. For CAQ in the main sample, a constant and time trend are included. Otherwise, regressions do not include a constant or time trend.
Main sample (1990:3-2012:1); full sample (1980:1-2012:1).
*Significant at 10%.
**Significant at 5%.

Table 3
Granger causality-wald test

	Dependent variable	Excluded variables			
		S1		S2	
		FSQ	CAQ	GQ	CAQ
Main sample	Fiscal	–	15.94**	–	17.81**
	CAQ	12.26	–	5.44	–
Full sample	Fiscal	–	14.58**	–	14.60**
	CAQ	7.55	–	11.92	–
Critical Chi-square values					
	DF	(5)	(6)	(7)	(8)
	5%	11.07	12.59	14.07	15.51
	10%	9.236	10.64	12.02	13.36

Main sample (1990:3-2012:1); full sample (1980:1-2012:1).
In S1 and S2, fiscal is FSQ and GQ, respectively.
The optimal lag length indicates the degrees of freedom (DF) for S1 and S2. In the main sample, for S1, FPE and AIC indicate 8 lags, and SC and HQ indicate 1 lag. The LR test settles it. At 5% of significance, the log Looklihood test indicates 8 lags. For S2, FPE and AIC indicate 5 lags for the optimal lag length, and SC and HQ indicate 1 lag. At 5% of significance, the log Looklihood test indicates 5 lags. For the full sample, for S1, FPE and AIC indicate 6 lags, and SC and HQ indicate 1 lag. Log Looklihood test settles it. At 5% of significance, this test indicates 6 lags. For S2, FPE and AIC indicate 7 lags, and SC and HQ indicate 1 lag. At 5% of significance, the log Looklihood test indicates 7 lags. For all cases, the max lag was 8.
**Significant at 5%.

3.2. Granger causality–wald test

To analyze the causation between both balances, we used Toda and Yamamoto's (1995) modified Wald test.[10] We set two specifications: S1 {GAP FSQ CAQ} and S2 {GAP GQ CAQ}. For S1 and S2, the reduced-form VAR is:

$$X(t) = A_0 D(t) + \Sigma_j^p A_j\, X(t-j) + \varepsilon(t) \qquad \text{Eq.(2)}$$

Here, $X(t)$ is the 3*1 column vector of the endogenous {GAP FSQ CAQ} or {GAP GQ CAQ} at time t; A_0 is the matrix of coefficients of the deterministic components; $D(t)$ is a matrix of deterministic components; A_j is the matrix of coefficients of $X(t-j)$ at lag j where j: 1,2,3,...p; $\varepsilon(t)$ is the 3*1 column vector of residuals; and p is the optimal lag order. For the full sample in S1 and S2, two dummies are included because two structural breaks are identified. The structural breaks are 1988:3 and 1990:3.[11]

Table 3 reports the results of the Granger causality–Wald test. For the main sample, S1 and S2, the reverse causality holds because the null hypothesis that CAQ does not Granger cause the fiscal variable ($A_{23j} = 0$, for all j) is rejected at 5% significance. For the full sample in S1 and S2, the reverse causality holds as well, because the null hypothesis that CAQ does not Granger cause the fiscal variable ($A_{23j} = 0$, for all j) is rejected at 5% significance. In contrast, across samples and specifications, the TDH does not hold because the null hypothesis that the fiscal variable does not Granger cause the current account ($A_{32j} = 0$, for all j) cannot be rejected at 10% significance.

For this country, the first approach of reverse causality was not evident because, according to Castillo and Barco (2008) and Rossini et al. (2009), to avoid overheating, the capital inflows determined a tight fiscal policy in the first half of the 1990s, and after the Asian and Russian crises, the fiscal policy was expansionary. The second approach of reverse causality is purely the effects of terms of trade on fiscal balance through the current account, which should hold in commodity-based economies like Peru. Then, those outcomes are consistent with the Peruvian economy depending on external prices.

3.3. Out-of-sample dynamics

Using the impulse responses function and forecast error variance decomposition, given the previous outcomes, this subsection provides evidence about the role and/or effects of permanent shocks to the current account on fiscal surplus and fiscal spending. Here, those shocks are temporary to fiscal variables and can be interpreted as innovations in terms of trade, US output growth, and/or Chinese output growth.

To obtain a just-identified system in the structural VAR representation for S1 and S2 and to avoid the ordering problem that Cholesky decomposition creates, we used Pesaran and Shin's (1998) scheme to obtain the generalized forecast error variance

10. In contrast to the Granger causality test, which just involves testing stationary series, this test allows of testing non-stationary series.
11. The first dummy is one from 1988:3 and onwards; otherwise, it is zero. The second dummy is one from 1990:3 and onwards; otherwise, it is zero. Using S1 and S2 in the VAR at 5% significance, the Likelihood Ratio (LR) test rejects the null hypothesis that the coefficients of those dummies are zero.

Table 4
Generalized forecast error variance decomposition for S1 – Percentage points

Horizons (quarters)	Main sample			Full sample		
	Due to permanent shocks to					
	Business cycle	Fiscal surplus	Current account	Business cycle	Fiscal surplus	Current account
	Panel (A): FSQ					
1	0	99	1	0	100	0
2	0	97	3	3	94	3
3	1	95	4	3	93	4
4	1	89	10	3	92	5
5	1	90	10	3	91	6
10	3	84	13	8	79	13
15	4	81	15	10	75	15
20	5	78	17	11	74	15
	Panel (B) : CAQ					
1	4	1	95	7	0	93
2	9	1	90	18	0	82
3	9	4	87	24	1	76
4	11	4	85	25	1	75
5	11	4	85	24	1	76
10	9	14	77	21	4	75
15	7	16	77	21	4	75
20	7	20	73	21	4	75

Main sample (1990:3-2012:1); full sample (1980:1-2012:1).

Table 5
Generalized forecast error variance decomposition for S2 – Percentage points

Horizons (quarters)	Main sample			Full sample		
	Due to permanent shocks to					
	Business cycle	Fiscal spending	Current account	Business cycle	Fiscal spending	Current account
	Panel (A): GQ					
1	0	100	0	0	99	1
2	0	100	0	1	98	1
3	3	97	0	1	95	4
4	3	87	10	1	93	6
5	3	85	12	2	91	7
10	7	79	14	5	86	9
15	9	77	15	6	86	9
20	10	76	15	6	85	9
	Panel (B) : CAQ					
1	5	0	95	5	1	94
2	12	0	88	17	1	82
3	14	3	83	22	4	74
4	17	4	79	24	5	71
5	17	4	79	23	5	72
10	19	3	78	24	6	70
15	18	3	79	24	9	67
20	17	3	80	23	13	64

Main sample (1990:3-2012:1); full sample (1980:1-2012:1).

decomposition (GFVD) and generalized impulses-response function (GIRF).[12]

3.3.1. Generalized forecast error variance decomposition

Over 20 quarters, Table 4 shows the results for S1 for both samples. For the main sample, Panel (A) shows FSQ variations. These variations are mainly caused by permanent shocks to fiscal surplus, but decrease over time. Starting at the 2nd quarter, the permanent shocks to current account increase their role on the FSQ changes, supporting reverse causality. Likewise, Panel (B) displays CAQ fluctuations. Permanent shocks to current account play a bigger role on those fluctuations, but decrease over time. In the 10th quarter, permanent shocks to fiscal surplus play an increasing role on CAQ fluctuations. Using the full sample, the outcomes are similar, but permanent shocks to fiscal surplus decrease their role on CAQ variations.

On the other hand, over 20 quarters, Table 5 shows results for S2 and both samples. For the main sample, Panel (A) shows GQ variations. Those variations are mainly caused by the permanent shocks to fiscal expenses, but decrease over time. Starting at the 4th quarter, the permanent shocks to current account increase their role on fiscal spending variations. Likewise, Panel (B) reports CAQ fluctuations. Permanent shocks to current account play a bigger role on those fluctuations, but decrease over time. Moreover, GQ shocks play a minor role on CAQ fluctuations, supporting the rejection of the TDH. Using the full sample, the outcomes are similar, but permanent shocks to current account decrease their role in GQ. Those shocks in GQ are more important in the open economy.

3.3.2. Generalized impulses-response function

In Figure 3, Panel (A) shows the outcomes of the main sample. There is a negative effect of FSQ to a positive permanent shock to the current account for four quarters. Later, FSQ increases over its steady-state level and remains there. The response of GQ to positive permanent shocks to the current account is positive for four quarters. Later, GQ tends toward its steady-state level. Finally, for the full sample in Panel (B), there is no significant difference in the results. All responses are small and short lived.

Variance decomposition and the impulse response function outcomes support reverse causality. However, unlike the previous empirical evidence presented above, for a year, the reverse causality indicates a negative causation because the response of fiscal spending to current account shocks is greater than the response of fiscal revenues to the same shocks. In this case, fiscal spending is more sensitive to current account shocks than the fiscal revenues is. This outcome implies that fiscal consumption is not smoothed when current account innovations occur.

4. Conclusions

This study examined the causation between the current account and the fiscal surplus and fiscal spending for Peru. As a result of the evidence, the TDH was rejected. In its place, the evidence accepted reverse causality. The results are not sensitive for a specific regime. Likewise, variance decomposition and the impulse responses function outcomes support the reverse causality.

Unlike previous empirical evidence on this subject, for a year, reverse causality indicates negative causation because the fiscal spending is more responsive to current account shocks than fiscal revenues are. This outcome implies that fiscal consumption is not smoothed when positive current account innovations occur. In addition, in the short run, the fiscal policy does not alter the current account, but improvements in current account increase the probability of attaining the lower bounded fiscal deficit. The reverse causality is consistent with a small open commodity-based economy highly exposed and sensitive to external price shocks. In this case, the diversification of sources of national income should alter this causality.

Finally, we focused on the direct causation between the fiscal balance and external balance. For this reason, further research is needed because we are not considering any indirect effect on the current account through the exchange rate in the analysis, as the IS-LM approach implies. Fiscal expansionary policies should increase the price of the domestic currency in terms of the foreign currency, which worsens the trade balance, thereby decreasing

12. Even though CAQ did not have strong results in unit root tests for the main sample, the stability condition of VARs is satisfied.

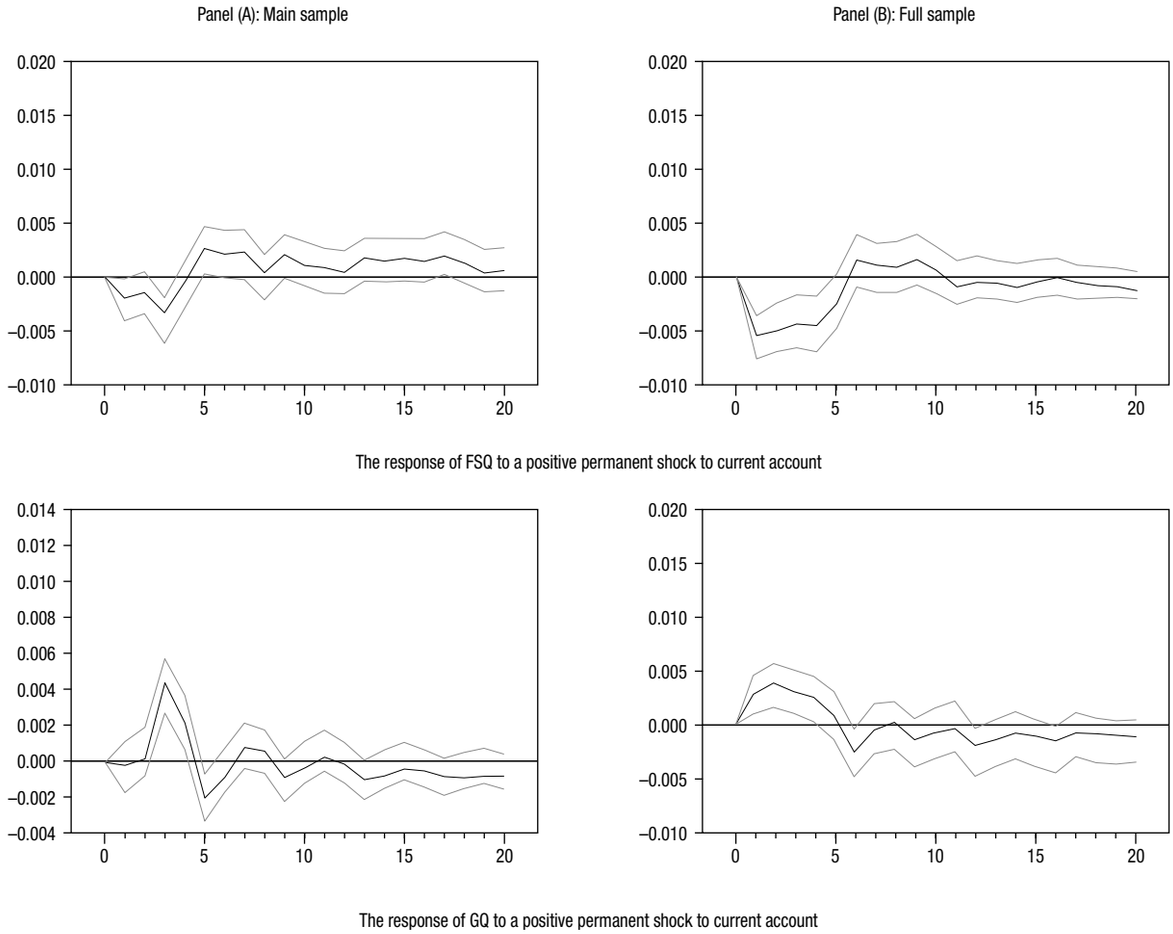

Figure 3. Generalized impulses-response function. The response of GQ to a positive permanent shock to current account. Main sample (1990:3-2012:1); full sample (1980:1-2012:1). Confidence intervals are 16%-84% percentiles (obtained after 10,000 draws).

fiscal revenues. In other words, the inclusion of the exchange rate in the analysis would imply bidirectional causality.

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