The Haitian Tsunami: Where Does It Come From?

Kathleen Dorsainvil

Dorsainvil Consulting Group

Abstract: This paper assesses the relative importance of external shocks--measured through terms of trade, foreign aid, disaster ratio, US GDP and US interest rates on six month CDs--in explaining economic performance in the Haitian economy. Using a VAR, it shows that the flow of foreign aid has a low impact on reinforcing economic performance whereas shocks generated through other variables-US GDP, US interest rates, Disaster ratio for instance-have a significant impact on GDP of that economy. The paper also shows that these shocks account for only a small fraction of the observed volatility in that economy. The paper suggests other avenues, institutional quality for instance, as an important determinant of economic performance. Lastly, the interconnection with the neighboring country’s economy appears significant.

Key Words: Growth, External Shocks, VAR

JEL Classification: F35, O54

1. Introduction

On April 8, 2008, angry mobs and violent riots beset Port-au-Prince, the Haitian capital, and other major cities around the country. They had been protesting rising basic food and oil prices. During that same period, at least fourteen other countries including Egypt, Cameroon, Cote d’Ivoire, Mauritania, and Indonesia faced similar unrest. This world-wide phenomenon was a result of shrinking supply of wheat and other agricultural commodities due in major part to the biofuel frenzy. Haïti is one country highly reliant on imports of much of its food, a tendency aggravated in 2007 by damage to domestic agricultural supplies caused by rains and floods.

Haitian policymakers responded to the riots by providing food subsidies. This measure did not appear convincing enough to protesters, and the Prime Minister was toppled after a week of heavy protest. Protesters were also commanding central authorities to come up with policies to alleviate unemployment and to revamp agricultural production in a country which was traditionally perceived as dominantly agricultural1.

For a week, thousands of protesters set up flaming barricades, threw rocks at the national palace, burned gas stations and looted businesses. Across the countryside, farmers erected road blockades, shoot at peacekeepers, looted containers at UN compounds. It looks like a wave of destruction that Haitian policymakers were unable to bring to a halt.

---

1 According to IMF Staff Reports, in 1993 40% of GDP was coming from primary products. This number was 25% in 2006. A recent study by the author confirms the declining trend, at least for exports of agricultural products.
The observation of these events is the motivation behind this paper. Its main contributions are first to assess the impact of external shocks vis-à-vis internal factors in explaining the low economic performance of the country. The second main contribution is to pinpoint the impact of the weak institutional framework of the country on such low performance. The external shocks considered include fluctuation in aid flow, terms-of-trade shocks, natural disasters, changes in the US economic performance, US interest rates, and change in the Dominican Republic economic performance.

A small, Caribbean country with an open economy, Haïti has suffered balance-of-payment problems since the fixed exchange rate was overvalued in the early 1980s. Since the American occupation from 1915 to 1934, the official currency the “gourde” (gde), was pegged to the US dollar ($) at the rate of five gourdes per one US dollar. Over the years, a parallel market developed and played a crucial role until 1990 when, in the face of complete depletion of foreign reserves, the economy was moved to a floating exchange rate system. Also in 1990, the country began to face political instability which causes the international community to place a trade embargo on Haïti from 1992 to 1994. More recently, the earthquake of January 2010 destroyed the basic infrastructure of Haïti, and compelled Haitian policymakers to resort to a reconstruction plan under the auspices of the international community. This plan, financed by international donors, relies greatly on the hypothesis of revamping the agricultural sector as a source of growth for that economy.

To examine the tsunami of forces affecting Haïti’s economic development, this study uses yearly data from 1966 to 2009. The results confirm the assertion of the interconnection between the Haïtian and the US economies through the strong positive impact of USGDP shock (5% the first year) and the negative impact of US interest rate (2.5% the first year). It also corroborates that interconnection with the Dominican Republic as a non-negligible trend. Foreign aid is another issue of importance in this study. The results exemplify its low impact with an average change in GDP of .2% on a ten year period. Regarding the importance of the two types of shocks, internal versus external, this study shows that external shocks account for a small fraction of the variance of Haïtian GDP with less than 20% in the long-run. Among the external shocks, disaster ratio has the most important impact (explaining 43% of the 19.1% of the variance), followed by USGDP with 26.4%. Internal factors account for 88% of the variance. The author was not able to disentangle the specific internal factors. Instead, the author tries to test the hypothesis that the instability in the economic performance may reflect institutional problems that the country is facing. Using proxies of institutional quality, this study shows that fiscal irresponsibility of the Haïtian government over the years has a negative impact on growth whereas both openness and capital formation are positively linked to economic performance. They both lend themselves easily to corrupt practices.

---

2 The US is the dominant economic partner of Haïti. Exports of Haïtian products to the USA account for about 80% of total Haïtian exports. Lately, the presence of the Dominican Republic in Haiti through trade is becoming very noticeable.
3 The study did not include data on year 2010 because of the earthquake of January 12, 2010.
4 The order of importance does not change when DRGDP is included in the VAR model.
The remaining text is organized as follows. Section 2 provides a selective review of previous literature related to external shocks in low income countries. Section 3 lays out the empirical methodology for the VAR and discusses the data. The results are presented in Section 4. Robustness tests are conducted in Section 5. Section 6 discusses the impact of additional variables, institutional quality variables for instance, in explaining economic performance of that economy. Concluding remarks appear in Section 7.

2. Literature Survey

The stylized facts of macroeconomic fluctuations in developing countries have been documented by Agénor, McDermott, and Prasad (2000) using a sample of twelve middle-income countries. They found that output fluctuations in developing countries are interconnected to those of industrial countries. The findings in Agénor et al. are reinforced by a recent paper by Arora and Vamvakidis (2005), which centers on trading partners’ economic conditions. Both papers failed to identify the specific shocks which impact economic performance of the countries under study.

The identification of external shocks when investigating developing countries is essential given the dependency of these countries on the rest of the world. There does not seem to be a consensus among researchers on the impact of external shocks on economic performance of these developing countries. On one side, Mendoza (1995), Edwards and Vegh (1997), and Cashin and Sosa (2009), for instance, have found that external shocks such as terms of trade shocks, world interest rates, and climatic shocks have a large impact on output fluctuations of developing countries. On the other side, Hoffmaister and Roldos (1997), Ahmed and Loungani (1998), Dehn (2000), and Ahmed (2003) have found that the same external shocks previously mentioned such as terms of trade shocks, world interest rate, in particular are playing a relatively small role in explaining output fluctuations in developing countries. Guillaumont and Chauvet (2001) have concluded that external shocks especially terms of trade shocks have adverse effects on growth.

The impact of aid on development is another issue that has been studied by development economists. One of the first papers on this topic is an article by Chenery and Strout (1966) which uses a “two-gap” model to show the effectiveness of foreign aid as a necessary complement to domestic saving to reach a certain level of investment. Another influential paper by Burnside, Craig and Dollar (2001) was the basis of a policy recommendation to increase foreign aid for countries pursuing sound macroeconomic policies. Many authors have reacted to their results by creating variations of their model. Collier and Dollar (2002), for instance, solve for a “poverty-efficient” allocation of aid across countries. Both papers were criticized for neglecting shocks to the economy, something that has been introduced in the Burnside et al. model by Collier and Dehn (2001). They have found that foreign aid is more important for countries experiencing negative shocks than for countries implementing good macroeconomic policies. Along the same line, for Hansen and Tarp (2001), aid is effective even in an unfavorable environment.
3. Theoretical Model

To study the impact of external shocks on economic performance in Haïti, a six-variable vector autoregression model (VAR) has been used here. It can be expressed as:

$$A_0 Y_t = a_0 + \sum \alpha_j X_{t-j} + U_t$$

(1)

Where $a_0$ is an intercept term, $X_j$ are matrices representing lagged effects,

$$X'_t = (HGDP_t, HAID_t, USGDP_t, USCD_t, HTOT_t, DR_t)$$

Of the six variables we consider, Haïtian GDP (noted here HGDP_t) is the measure of economic performance. Foreign Aid is noted HAID_t. The other four variables of the VAR model are US GDP, US Real Interest Rates on six-month CDs, the Terms-of-Trade Index, and the Disaster Ratio, noted USGDP_t, USCD_t, HTOT_t, DR_t respectively. The rationale behind the choice of USGDP_t and USCD_t as explanatory variables of the Haïtian economy’s performance lies in the fact that the US is Haïti’s dominant trading partner, receiving 85% of the country’s total exports.\(^5\) In addition, the high dollarization ratio\(^6\) makes Haïti very dependent on changes in US financial conditions. The HAID_t variable includes loans on a concessional term and grants, i.e., components of both the current account and the capital account. The case for the introduction of such variable as an explanatory variable of economic performance is well warranted. Indeed, grants to support Haïti’s budget amount to more than 10% of the revenues of fiscal year 07/08 and to fifty seven percent (57%) of the revenues of fiscal year 2008/09\(^7\).

Except for USCD_t and DR_t, all variables are in log form. The model is estimated by ordinary least squares (OLS)\(^8\).

$U_t$ is assumed to be a vector of i.i.d. structural errors. This assumption does not fully identify structural models like the one above. Additional restrictions are needed. The study imposes the Choleski factorization, i.e., a causal ordering on the contemporaneous interactions. This implies a lower triangular $A_0$ matrix of the form with some of the $a_{ij}$ taking the null value.

$$A_0 = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & 1 \end{bmatrix}$$

The ordering in $X_t$ implies that USGDP_t and USCD_t are not affected by current and past economic performance of the Haïtian economy. It also implies that US output does not react

---

\(^{5}\) This figure comes from the IMF Country Report on Haïti dated August 2007.

\(^{6}\) The IMF characterizes an economy as highly dollarized when more than 30% of the financial liabilities are dollarized.

\(^{7}\) This information comes from the IMF Country Reports, No.08/223 “Haiti: Third Review Under the Three Year Arrangement Under the Poverty Reduction and Growth Facility”, and No.10/263 “Haiti: 2010 Article IV Consultation and Request for a Three year Arrangement Under the Extended Credit Facility”.

\(^{8}\) Due to the small sample size, the model is estimated with one lag length.
contemporaneously to US monetary policy. This is a standard identification assumption made in studies of US monetary policy. Ahmed (2003) has pointed out that this assumption is overly strong for annual data as in our study. DR\(_t\) is assumed to be fully exogenous and not related to the other variables of \(X_t\). HAID\(_t\) appears after economic performance in order to capture the idea that aid flow may respond to current economic performance. In the robustness section, the impact on the results of assuming alternative orderings of that variable will be discussed.

4. Data Source and Empirical Results

4.1 Data Source


USGDP\(_t\), HGDP\(_t\), HAID\(_t\) measure per capita growth in real terms. HTOT\(_t\) measures the growth of the ratio of export to import value at constant prices. DR\(_t\) is a measure of natural disaster per capita. Natural disasters that are recorded for the purpose of this study are flood, and storm. Indeed, Haïti’s geographical location creates large exposure to hurricanes. In his study of the impact of natural disasters on Eastern Caribbean countries, Rasmussen (2004) has found that it is large in the short-run. This is due to the pressure these disasters put on the functioning of the economy, especially for the poorer segment of the population of these countries. These findings are confirmed by a more recent study by Raddatz (2009).

4.2 Empirical Results

4.2.1 Unit Root Tests

Unit root tests have been conducted on all variables of the model. The results appear in table 1 below and indicated that the variables are stationary in first difference\(^9\).

---

\(^9\) The hypothesis of unit root was rejected for USCD\(_t\), HTOT\(_t\), and DR\(_t\). These variables will appear in level in the VAR.
4.2.2 Impulse Response Function

The dynamic response of output to the different external shocks appears in Figures 1-5. They illustrate how the Haitian economy through GDP reacts to the occurrence of climatic or foreign economic shocks. Figure 1 shows the impact of a positive shock to aid flow. It takes three years to observe a positive effect on GDP of around 0.4%, which declines thereafter. Part of the explanation of this amount lies in the fact that foreign aid for the most part is used to overcome shortfalls of the budget. These effects may be destabilizing, especially when swings in aid disbursement occur, something that has been also mentioned by Odedokun (2003). In his study, he named donor countries as France, USA, Japan, all major donors of Haiti. Another explanation is the real exchange rate appreciation caused by aid inflows10. Figures 2 and 3 mirror the dependence of Haiti’s economy on the world business cycle, especially the US economy. Indeed, one standard deviation shock to US output resulted in an increase of Haitian GDP of close to 5% the first year. Its effect reduces gradually to 0.2% after the tenth year. A shock to US interest rate increases the cost of capital for the Haitian economy and results in a decrease of output of 2% the first year. This damaging effect tends to die out after the tenth year (0.1%). Those two results confirm the interdependence between the two economies.

Figure 4 illustrates the response of the economy to a shock to TOTt. It is largely negative, which tends to support Guillaumont and Chauvet’s contention about the negative effects of terms-of-trade on growth. This result may not be surprising given the economic conditions of Haiti. Indeed, imports account for 20% of GDP on average whereas exports account for only 9%. The impulse response is translating the time lag it takes for the economy to react to a positive shock to TOT. Figure 5 shows the response of the economy to shocks due to natural disasters. At first, the economy experiences a 6% increase in output which declines thereafter. The increase may be capturing the reaction of the international community to natural disasters which usually pours assistance to the afflicted country before softening its support. Moreover, during two periods, the effect appears negative and may be summarizing some type of crowding out effect, a well-known problem in the Haitian economy.

4.2.3. Variance Decomposition Functions

A standard variance decomposition has been performed to determine the relative importance of each shock as well as its ability to explain GDP. As it appears in Table 2, external shocks account for a small fraction of the variance of the forecast error. It increases over time, reaching 20% for a ten-year forecast horizon. These results tend to indicate that external shocks are not the main factors driving economic fluctuations in the Haitian economy. They are similar (11%) in magnitude to those obtained by Raddatz (2006).

4.2.4. Robustness

This section investigates the robustness of the results presented in the previous section. The results put forward in Table 3 show that they are very robust. The first two lines of Table 3 present two alternative orderings of the VAR. For the first, HAID, appears after world economic conditions in order to capture the idea that the amount of aid flowing to Haiti is affected by

---

10 The impact of aid inflows on the Haitian economy will be the object of future research.
economic conditions in the rest of the world. For the second, TOT, appears before the international variables to test the assumption that TOT may have no significant effect on international variables. In both cases, the magnitude of external shocks in explaining variance of Haitian output remains small (less than 20%). When the aid variable is excluded, the relative importance of external variables increases. It still remains within the boundary of less than 20% however. The exclusion of the disaster variable results in a lower share for external shocks in explaining the variance of output.

In addition, this study has investigated the link between the Haitian economy and its neighbor, the Dominican Republic. Data on trade between the two countries show that exports from the Dominican Republic to Haiti have more than doubled since 2000. The Haitian counterpart figures are less than 50%. The study uses a VAR model replacing HTOT by (growth rate of) DRGDP.11 No change occurs regarding the global effect of foreign shocks. However the impact of a shock to the Dominican economy results in an increase in Haitian GDP of almost 3%. This response appears in Figure 6 and provides empirical evidence of the extent of the interconnection between these two economies.

4.2.5. Variables of Institutional Quality

In this section, the hypothesis advanced by Rodrick (1999) and reinforced in Rodrick, Subramanian, and Trebbi (2004) is tested, i.e., that the instability in Haitï’s economic performance may reflect institutional problems that the country is facing. In selecting variables which may serve as good proxy for these institutional problems, papers by Ades and Di Tella (1997) and Brunetti and Weder (1998) have offered some guidance. They argue that, because of corruption, openness has a deterrent effect on growth. Indeed, they contend that industrial policies aimed at promoting growth have a side effect of transferring rents to bureaucrats through bribes. Other guidance has come from a paper by Tanzi (1998). He has stressed that corruption may encourage growth because it can create a situation where payment of bribes to bureaucrats allows industrialists to get better access to opportunities in the domestic market where they then contribute to higher growth. These discussions are the motivation behind the idea of testing the impact of openness on growth in the Haitian economy.

In addition, Tanzi pointed out that corruption increases public investment in the developing world because public investment lends itself easily to corrupt practices. This is where the idea of investigating the link between investment and growth in the Haitian economy originated.

In regards to this debate, it should also be mentioned that corruption has a negative impact on tax revenues and growth because it reduces the ability of the government to carry out activities. Acemoglu et al. (2003) link the volatility of economic performance to the idea of “irresponsible” fiscal policy, and use the ratio of government spending to GDP as a measure of “irresponsible” fiscal policy.

11 Unit root test has been conducted on DCGDP in log form. It is significant.
From the discussion above, three variables have been used to capture the impact of institutional quality on growth in the Haïtian economy\textsuperscript{12}. They are: The ratio of imports over GDP, as a measure of openness, in log form, noted COMP\textsubscript{t}; Total capital formation over GDP, as a proxy for investment, in log form, and per capita, noted LHCF\textsubscript{t}; The ratio of government deficit per capita, as a measure of fiscal irresponsibility, noted IFGL\textsubscript{t}.

Unit root tests have been conducted on these variables not already tested and are reported on table\textsuperscript{4}\textsuperscript{14}. Each of these variables has been added to a regression with the variables defined previously as regressors\textsuperscript{15}. The results of the OLS estimation with HGDP (growth rate) as the dependent variable in first difference appear in Table 5 for variables capital formation, openness, and fiscal irresponsibility, which are significant. Openness is significant with a positive effect on growth, whereas it is negative for capital formation and fiscal irresponsibility. These results seem to place the burden on quality of institutions as one underlined vehicle for growth.

5. Summary and Conclusions

This study carries two important messages. The first one is for the Haïtian people by assessing the relative importance of external shocks in explaining economic performance in their economy. The study shows that they have a significant impact, but account for only a small fraction of economic variability. Therefore, the world food price’s increase appears as a trigger used by rioters of April 2008’s events to pour out their anger, and frustration rather than the underlined causes of the low performance of the Haïtian economy. The study investigates the impact of quality of institutions as one factor which may explains the volatility of Haïtian economic performance. It was done through some corollary effects. Indeed, openness has been identified as an important determinant to growth. Public investment and fiscal irresponsibility are also important determinants through their deterrent effect. Both lend themselves to corrupt practices, but they also constitute two stronghold areas for benevolent policymakers.

The second message is for the international community as a whole by assessing the impact of its involvement in Haitian life over the years through foreign aid. The results show that foreign aid has a low impact in explaining economic performance of the Haïtian economy. This result is challenging Haïtian policymakers as well as foreign donors to bring changes to their assessment, their perception of what needs to be done to increase economic performance of the country. This issue is of importance especially in times when a reconstruction plan under the auspices of the international community is been implemented. This study did not address the issue of political

\textsuperscript{12} This approach assumes that institutional quality is a latent variable. It has been favored over using a constructed index from sources like the Heritage Foundation or PRS, for instance, because of their life span (ten and twenty five years respectively).

\textsuperscript{13} Part of the deficit of Haïti is financed by international donors. Therefore government deficit per capita appears to be a better ratio to capture the weakness of Haïtian institutions. In addition the results are stronger than those using the ratio Spending/GDP.

\textsuperscript{14} When appropriate, residuals were tested for unit root and the hypothesis was rejected.

\textsuperscript{15} COMP\textsubscript{t} is an additional measure of openness as well as TOT\textsubscript{t}, Therefore they do not appear simultaneously in a regression.
instability which has affected the country during the last twenty years. Its potential impact on the low performance needs to be investigated more fully. It will be the object of future research.

Endnotes

CEO of Dorsainvil Consulting Group, Port-au-Prince, Haïti. E-mail: kdorsainvil@hotmail.com; Tel: (509) 34 83 8444

References


### Table 1: Unit Root Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Unit Root Test</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HGDP&lt;sub&gt;t&lt;/sub&gt;</td>
<td>-1.625726</td>
<td>.80512</td>
</tr>
<tr>
<td>HAID&lt;sub&gt;t&lt;/sub&gt;</td>
<td>-2.254064</td>
<td>.49171</td>
</tr>
<tr>
<td>USGDP&lt;sub&gt;t&lt;/sub&gt;</td>
<td>-1.830084</td>
<td>.72066</td>
</tr>
<tr>
<td>USCD&lt;sub&gt;t&lt;/sub&gt;</td>
<td>-3.622745</td>
<td>.03907</td>
</tr>
<tr>
<td>HTOT&lt;sub&gt;t&lt;/sub&gt;</td>
<td>-4.1277</td>
<td>.011</td>
</tr>
<tr>
<td>DR&lt;sub&gt;t&lt;/sub&gt;</td>
<td>-6.752497</td>
<td>.00002</td>
</tr>
</tbody>
</table>

### Table 2: External Shocks and Output Volatility

<table>
<thead>
<tr>
<th>Forecast Horizon Year</th>
<th>Fraction of the Variance of the Forecast Error Explained By</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>External Shocks %</td>
<td>Domestic Shocks %</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>18.3</td>
<td>81.7</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>19.0</td>
<td>81.0</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>20.0</td>
<td>80.0</td>
<td></td>
</tr>
</tbody>
</table>
### Table 3: Output Volatility for Different Specifications of the VAR

<table>
<thead>
<tr>
<th>Specification</th>
<th>Forecast Horizon Year</th>
<th>Fraction of the Variance of the Forecast Error Explained By</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>External Shocks</td>
</tr>
<tr>
<td>1. HAIDt After HGDPt and World Economic Variables</td>
<td>1</td>
<td>18.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>2. TOTt After HGDPt</td>
<td>1</td>
<td>18.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>3. VAR Excluding DRt</td>
<td>1</td>
<td>8.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>4. VAR Excluding HAIDt</td>
<td>1</td>
<td>18.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>5. VAR Including DCGDPt Excluding HTOTt</td>
<td>1</td>
<td>15.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
</tr>
</tbody>
</table>

### Table 4: Unit Root Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Unit Root Test</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPt</td>
<td>4.79</td>
<td>.98</td>
</tr>
<tr>
<td>LHCFt</td>
<td>-1.92</td>
<td>.67</td>
</tr>
<tr>
<td>IFGLt</td>
<td>-3.91</td>
<td>.02</td>
</tr>
</tbody>
</table>
Table 5: Results of Regressions\(^\text{16}\)

<table>
<thead>
<tr>
<th>Equation</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP(_{-1})</td>
<td>.27</td>
<td>.21</td>
<td>.13</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.54)</td>
<td>(2.09)</td>
<td>(1.36)</td>
<td></td>
</tr>
<tr>
<td>USGDP(_{-1})</td>
<td>7.68</td>
<td>4.84</td>
<td>8.17</td>
<td>10.5</td>
</tr>
<tr>
<td></td>
<td>(1.40)</td>
<td>(.97)</td>
<td>(1.60)</td>
<td>(2.10)</td>
</tr>
<tr>
<td>DR(_{-1})</td>
<td>.006</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.90)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LHCF(_{-1})</td>
<td>-02</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3.07)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HTOT(_{-1})</td>
<td>.03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-1.83)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IFGL(_{-1})</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(2.90)</td>
</tr>
</tbody>
</table>

Constant | -.05 | -.02 | -.04 | -.05 |
No. of obs. | 36   | 38   | 36   | 36   |
DW    | 2.20 | 2.52 | 2.10 | 1.84 |
R\(^2\) | .23  | .27  | .31  | .41  |

Figure 1: Impulse Response of HGDP to Change in Aid Flow

\(^{16}\) T-statistics in parentheses
Figure 2: Impulse Response of HGDP to Shock to USGDP

Figure 3: Impulse Response of HGDP to Shock to USIR
Figure 4: Impulse Response of HGDP to a Unit Shock to TOT

Figure 5: Impulse Response of HGDP to an Increase in natural Disaster
Figure 6: Impulse Response of HGDP to a Unit Shock to DRGDP