

Macroeconomic Shocks

Simulations in a CGE model for Haiti

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Macroeconomic Shocks

Simulations in a CGE model for Haiti.

Martín Cicowiez¹ and Agustín Filippo²

Simulations

This document presents the group of simulations related to “Macroeconomic Shocks”, and analyzes the results for both the CGE model and the microsimulation model. In a companion document, we provide a detailed description of the reference scenario results (Cicowiez and Filippo, 2018a). In addition, a document that provides an introduction and describes the method and data used in this study is also available (Cicowiez and Filippo, 2018b).

1. Scenarios

The apparel industry has expanded rapidly since 2009 with exports especially to the US market helped by preferential access agreements. These exports have been growing at 18 percent per year. Thus, in the first scenario (pwetex) in this set, we simulate an increase in the world export price of Textiles, wearing apparel and leather, the main export product of Haiti (see Table 2.2). In other words, this scenario represents an improvement in the terms of trade for Haiti. Next, the second scenario (pwm) simulates an across the board decrease in the world price of imports; i.e., also an improvement in the terms of trade for Haiti. In the third scenario (remit),

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we simulate an increase in remittances, both to rural and urban households. Finally, we assess the impact of a negative shock such as the decrease in foreign capital inflows. In this set of simulations, the magnitude of the different shocks was decided rather arbitrarily, with the aim of emphasizing the main qualitative results. As explained, the baseline scenario is the same as in the first set of simulations. On the other hand, the counterfactual model closure rule assumes that adjustments in the direct tax rate clear the government budget. Specifically, the following four simulations were implemented:

- pwetex = 25 increase in world export price of Textiles, wearing apparel and leather
- pwm = 25 percent decrease in world price of imports
- remit = 25 percent increase in remittances
- forcap = 25 percent decrease in foreign capital inflows; this is equivalent to an average decrease in capital inflows of 1.5 and 12 percent of baseline GDP and exports, respectively

2. Aggregate Results

Figure 2 and Table 3 show key macroeconomic results for the base and the non-base scenarios for the year 2016 (i.e., the year when all scenarios start deviating from the base) and 2030, the last simulation year. In the base scenario, the economy evolves according to recent trends, as described in the companion document that presents the results from the “Government and Institutional Capacity” simulations (Cicowiez and Filippo, 2018a).

Figures 3, 4, 5 and 6 summarize the main transmission channels in the pwetex, pwm, remit and forcap scenarios, respectively. In scenarios pwetex and pwm, compared to the baseline, better terms of trade for Haiti lead to improvements in the macroeconomic situation (see Table 1).

This includes GDP growth, private consumption and investment, and trade indicators. In the pwetex scenario, the annual growth rate of the GDP at factor cost for the 2013-2030 period rises by 0.9 percentage points. As expected, the increase in the growth rate is higher for Textiles, wearing apparel and leather than for other activities (see Table 2). In addition, the unemployment rate decreases by 11.5 percentage point in 2030 with respect to the baseline scenario. On the other hand, the outward orientation of the expanding industry appreciates the real exchange rate which generates a form of “Dutch disease” for the rest of the tradables (again, see Table 2).

In the remittances scenario (i.e., remit), the exchange rate appreciates at the same time as the trade deficit increases with a surge in imports and a decline in exports. Undoubtedly, Dutch Disease effects can be a serious concern (see Katz, 2018). In our case, remittances-induced appreciation of the real exchange rate and the drop in exports are severe in view of the large (absolute) increase in remittances under consideration. In fact, exports in 2030 are 15.8 percent lower than in the base scenario, while the real exchange rate appreciates by 3.1 percent.

In the scenario with foreign capital outflows, the decrease in foreign savings has a strong negative impact on investment and consequently growth. Interestingly, in the short run, the real exchange rate depreciation promotes an increase in exports. In the long run, however, the impact of a smaller capital stock dominates and, with the slower growth in GDP, exports and imports decrease. Overall, GDP growth is, on average, 0.4 percentage points lower during 2013-2030 than in the baseline scenario.

Figure 1a: change in real private consumption 2013-2030
(percent deviation from base)

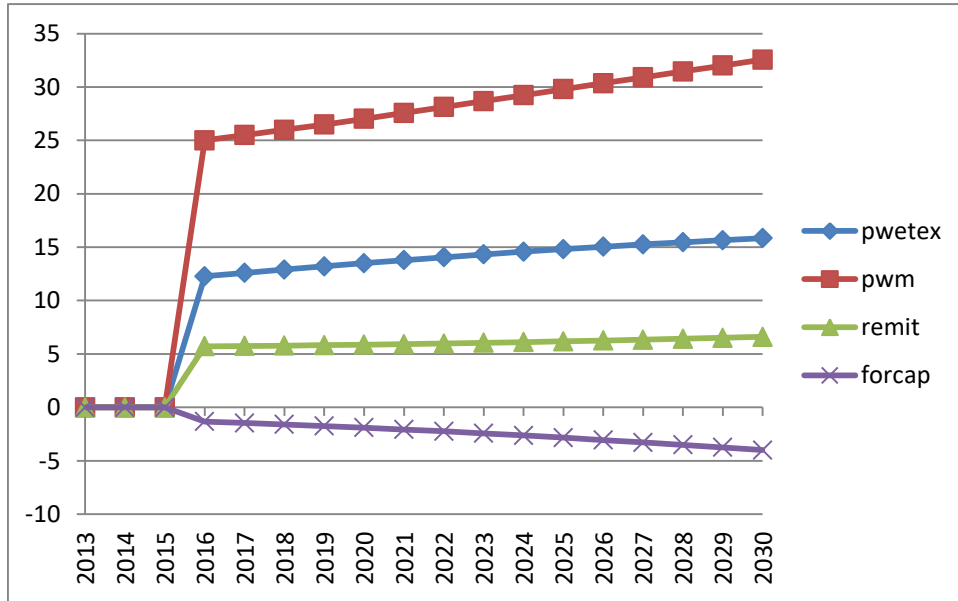
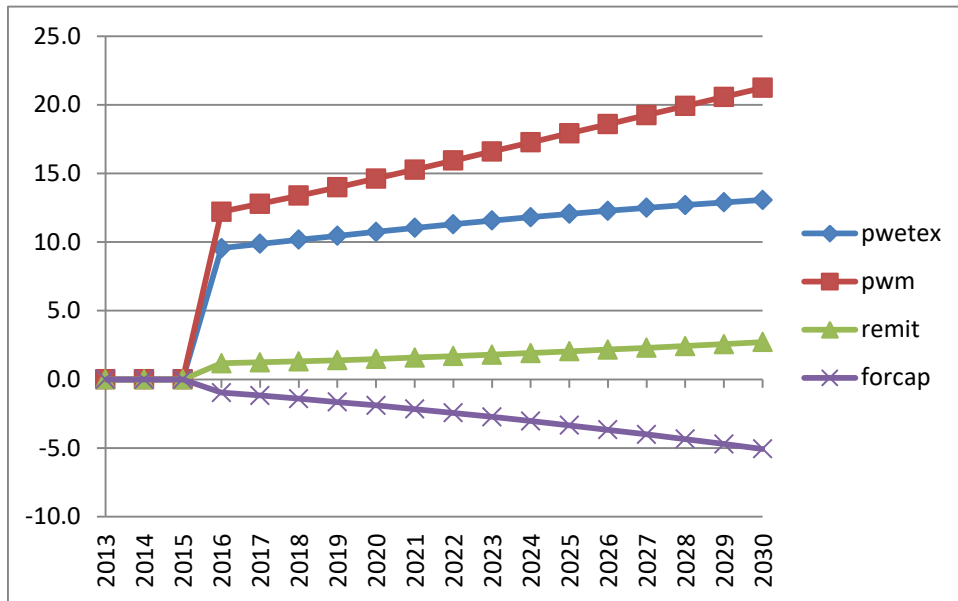


Figure 1b: change in real GDP at factor cost 2013-2030
(percent deviation from base)



Source: Author's elaboration.

Table 1: change in real macro indicators
(percent deviation from base)

Item	base	pwetex		pwm		remit		forcap	
	2013	2016	2030	2016	2030	2016	2030	2016	2030
Absorption	493,643	9.41	12.27	20.02	27.38	4.57	5.69	-1.90	-4.88
Private consumption	352,731	12.27	15.84	25.00	32.56	5.72	6.60	-1.34	-4.01
Fixed investment	109,528	2.97	5.05	9.85	20.07	2.20	4.71	-4.29	-9.26
Private fixed investment	50,796	6.41	10.89	21.24	43.28	4.75	10.16	-9.25	-19.97
Government fixed investment	58,732	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Government fixed inv, infra	56,624	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Change in stocks	57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Government consumption	31,327	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exports	44,879	64.37	77.07	19.26	44.42	-18.78	-15.80	7.83	-3.80
Imports	171,307	24.07	30.58	37.40	46.84	5.59	5.73	-1.34	-4.24
GDP at market prices	367,215	9.42	12.41	11.74	20.30	1.16	2.68	-0.95	-5.03
Net indirect taxes	19,907	19.95	25.81	25.00	36.01	2.20	3.21	-0.44	-4.69
GDP at factor cost	347,308	9.56	13.07	12.21	21.23	1.17	2.71	-0.97	-5.07
Real exchange rate	1.00	-19.90	-22.47	-9.58	-6.67	-5.98	-3.17	2.85	-0.47
Wage, average	1.00	7.29	9.86	8.24	13.42	-0.27	-0.12	-0.78	-1.03
Capital return, average	1.00	16.97	13.23	35.72	15.01	5.35	0.08	-5.04	4.30
Unemployment rate	31.72	-32.78	-45.07	-50.10	-64.74	-7.39	-8.81	2.77	8.32
2013 = million gourdes									

Source: Author's elaboration.

Figure 2: main transmission channels pwetex scenario

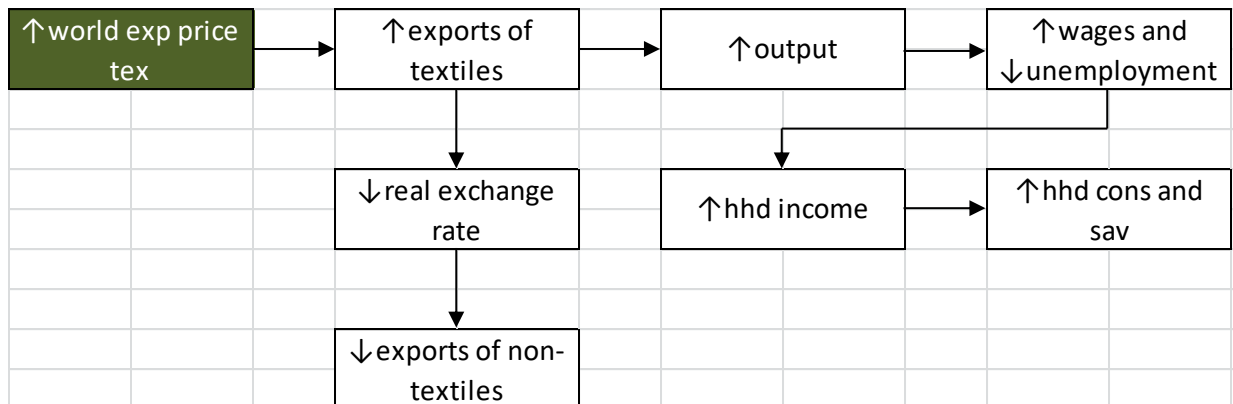


Figure 3: main transmission channels pwm scenario

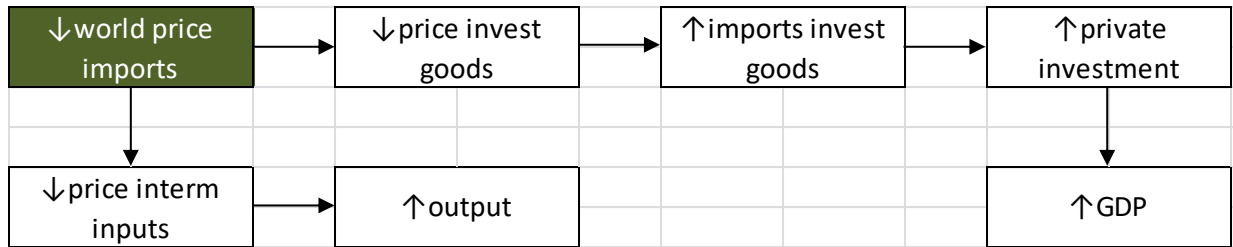


Figure 4: main transmission channels remit scenario

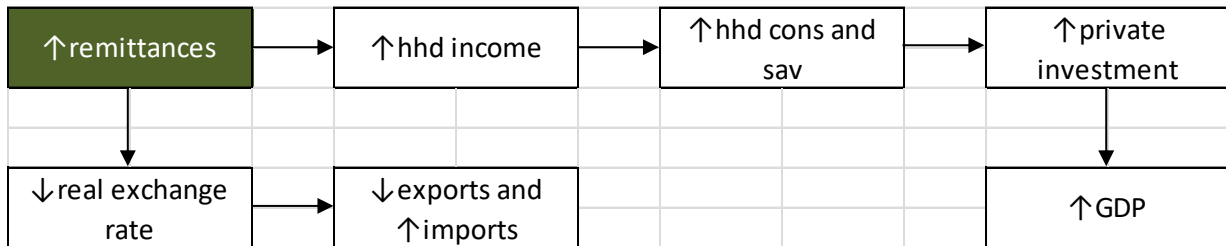
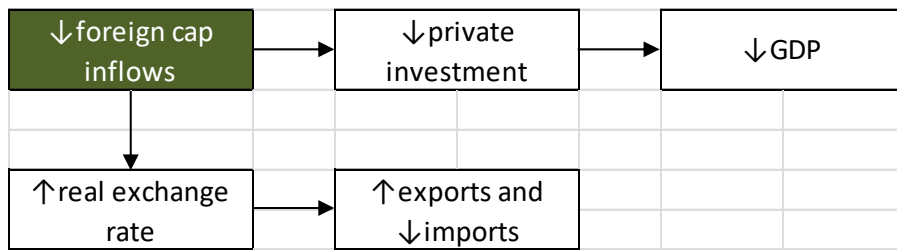


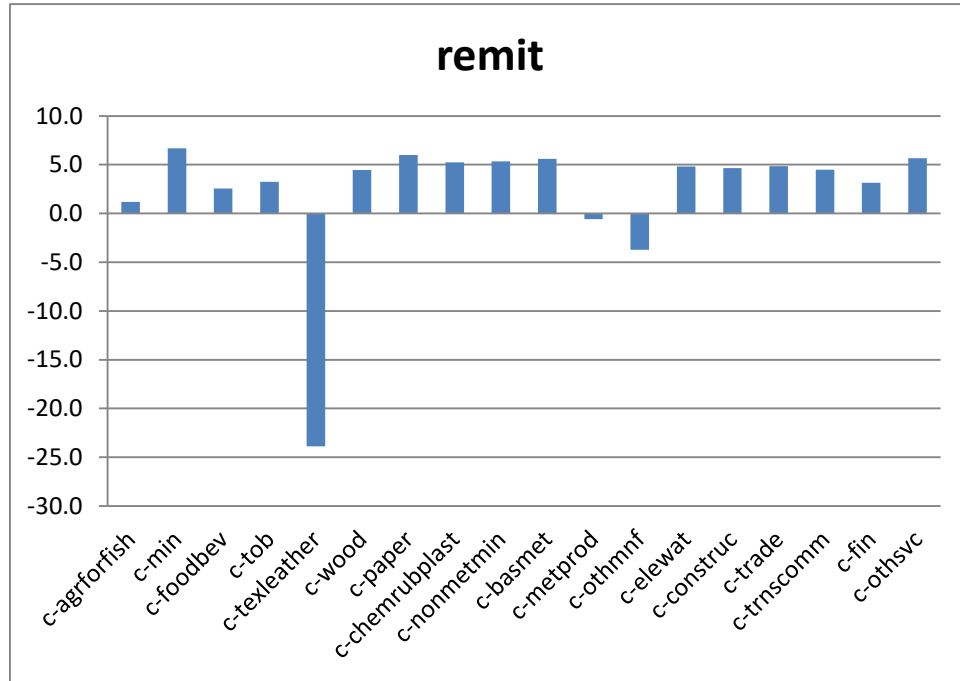
Figure 5: main transmission channels forcapp scenario



3. Sectoral Results

At the sectoral level, our results show that promoted sectors (pwetex scenarios) and import-oriented sector and non-tradables (remit scenario) are gaining most in terms of VA. In turn, the forcapp scenario shows a negative impact across the board, given the smaller capital stock in 2030. In the pwm scenario, the decrease in the price of imported inputs promotes an increase in production in most sectors of the Haitian economy.

Figure 6: change in sectoral real value added in 2030 scenario abscap-g
(percent deviation from base)



Source: Author's elaboration.

Table 2 (cont.): change in sectoral real value added, exports, and imports
(percent deviation from base)

Commodity	base	pwetex		pwm		remit		forcap	
	2013	2016	2030	2016	2030	2016	2030	2016	2030
<i>Exports</i>									
Agr, hunting and forestry; Fishing	3,263	-23.67	-28.34	-7.46	-9.43	-6.29	-4.02	2.00	0.06
Food prod and beverages	892	-38.78	-42.50	-8.04	1.28	-10.51	-3.51	3.40	-4.90
Textiles, wearing apparel and leather	21,600	156.20	169.11	42.23	75.33	-29.87	-26.19	13.18	-1.87
Wood and of prod of wood and cork	906	-61.67	-64.93	-23.71	-6.89	-17.92	-6.03	5.93	-8.00
Chemicals; Rubber and plastics	599	-28.34	-29.88	0.16	19.49	-6.57	0.93	2.17	-7.85
Other non-metallic mineral prod	6	-41.67	-42.58	-16.22	4.70	-11.22	-0.94	3.28	-10.31
Fabricated metal prod; Mach and equip	501	-54.27	-61.37	-18.87	-1.32	-16.10	-7.20	5.31	-10.17
Other manufactures	8,161	-45.81	-54.97	-6.10	12.32	-14.07	-7.63	4.50	-10.11
Transport, storage and comm	3,801	-8.60	-8.28	6.59	18.25	-1.54	2.54	0.61	-6.04
Financial intermediation	566	-9.21	-10.26	6.65	15.18	-2.19	1.24	0.71	-5.43
<i>Imports</i>									
Agr, hunting and forestry; Fishing	26,478	29.62	38.89	46.81	57.05	6.12	5.53	-1.67	-3.80
Mining and quarrying	136	14.71	16.93	30.47	37.11	7.67	8.40	-2.72	-6.64
Food prod and beverages	24,386	16.19	21.72	31.00	38.72	5.57	5.60	-1.46	-2.49
Tobacco prod	546	18.54	24.45	35.94	44.19	6.56	6.48	-1.67	-2.74
Textiles, wearing apparel and leather	29,163	42.57	56.31	36.52	52.47	0.06	-0.25	1.04	-3.03
Wood and of prod of wood and cork	2,595	18.36	22.17	36.24	43.23	8.21	8.42	-1.98	-4.91
Paper and paper prod; Publishing	2,185	25.05	28.96	44.19	51.34	8.21	8.07	-1.91	-5.20
Chemicals; Rubber and plastics	25,695	16.73	20.43	34.90	42.75	7.05	7.58	-1.69	-5.05
Other non-metallic mineral prod	2,098	12.78	16.03	27.27	35.64	5.73	6.70	-3.72	-7.01
Basic metals	3,799	9.63	11.80	30.41	40.73	5.43	6.90	-2.16	-7.25
Fabricated metal prod; Mach and equip	19,595	14.25	17.77	30.23	38.92	7.24	8.28	-2.10	-5.89
Other manufactures	1,204	28.24	36.87	50.19	57.91	10.56	10.61	-4.74	-6.66
Hotels and restaurants	2,047	49.45	47.48	50.29	44.35	17.92	13.09	-4.29	-6.31
Transport, storage and comm	27,048	21.52	26.77	41.40	49.32	6.65	6.61	-1.69	-4.03
Financial intermediation	2,853	17.60	21.72	34.61	43.20	4.66	5.12	-1.40	-4.55
Other market services	1,476	30.40	33.73	58.12	59.71	9.00	7.51	-2.30	-4.03
2013 = million gourdes									

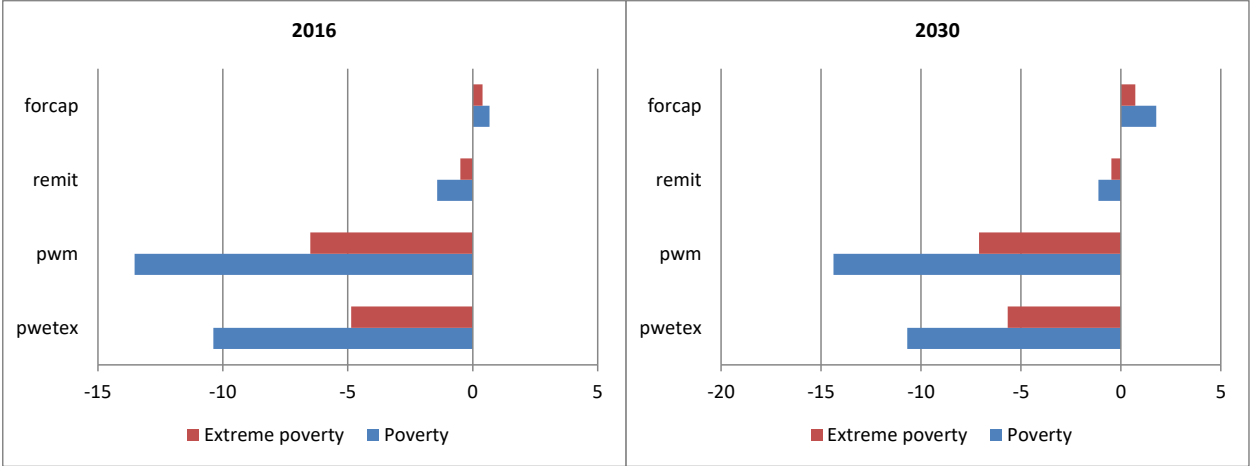
Source: Author's elaboration.

4. Distributive Results

As explained in Cicowiez and Filippo (2018b), the microsimulation model can decompose the poverty impact of a given non-base scenario into the following effects related to labor market

parameters: unemployment, sectoral structure, relative wages, and average wage. In terms of poverty, our results show that the poverty headcount ratio in the last year of the simulation period falls in the first three scenarios and increases in the last one (forcap) (Table 7). In general, the main drivers of the decrease in poverty are, again, decreases in unemployment and higher average wages. In the remit scenario, increases in non-labor income also contribute to the decrease in poverty, but not so much to the decrease in extreme poverty.

Figure 7: change in poverty (percentage points from base)



Source: Author’s elaboration.

5. Sensitivity Analysis

In a companion document (Cicowiez and Filippo, 2018a), we discuss the relevance of conducting sensitivity analysis when applying the CGE method. In this section, we focus on sensitivity analysis with respect to the values assigned to production and consumption

elasticities for the simulations presented in previous sections. Table 4 shows the percentage change in private consumption estimated (i) under the central elasticities, and (ii) as the average of the 500 observations generated by the sensitivity analysis. For the second case, the upper and lower bounds under the normality assumption were also computed; notice that all runs from the Monte Carlo experiment receive the same weight. As can be seen, the results reported above are significant, while estimates presented in Table 1 are within the confidence intervals reported in Table 4. For example, there is virtual certainty that the **forcap** scenario has a negative effect on private consumption.

*Table 3: sensitivity analysis; real private consumption in 2030
percent deviation from base
95% confidence interval under normality assumption*

Scenario	Central elast	Mean	Standard dev	Lower bound	Upper bound
pwetex	15.840	15.911	1.932	12.125	19.698
pwm	32.559	33.033	2.455	28.221	37.844
remit	6.599	6.590	0.248	6.103	7.076
forcap	-4.007	-3.933	0.304	-4.528	-3.338

Source: Author's elaboration.

References

Cicowiez, Martin and Agustin Filippo, 2018a, Government and Institutional Capacity.

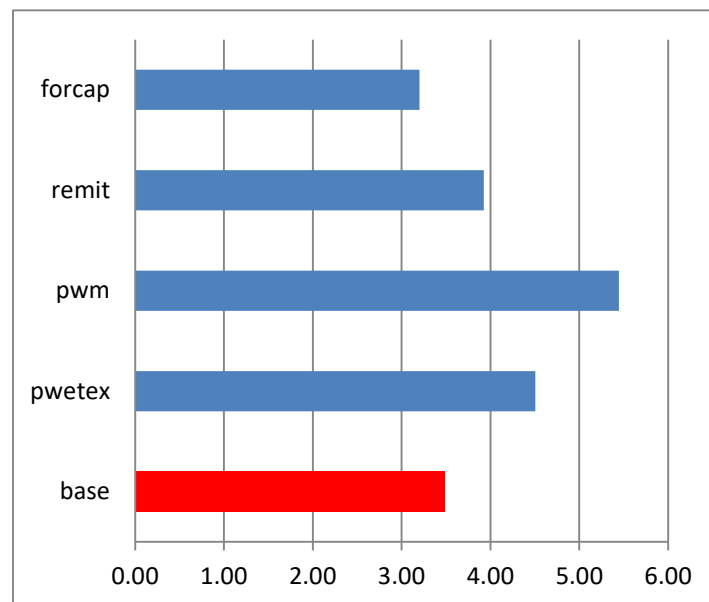
Simulations in a CGE Model for Haiti, Project Document, Inter-American Development Bank.

Cicowiez, Martin and Agustin Filippo, 2018b, A Computable General Equilibrium Analysis for Haiti, IDB Technical Note IDB-TN-1486.

Katz, Sebastian, 2018, ¿Podrá, Ayiti, volver a ser el Reino de este Mundo?, IDB Technical Note IDB-TN-1484.

Appendix: Additional Simulation Results

Figure A.1: real private consumption average annual growth rate 2014-2030; percent



*Table C.1: real macroeconomic aggregates
average annual growth rate 2014-2030; percent*

Item	base					
	2013	base	pwetex	pwm	remit	forcap
Absorption	493,643	3.58	4.38	5.26	3.96	3.23
Private consumption	352,731	3.48	4.50	5.45	3.93	3.20
Fixed investment	109,528	3.60	3.94	4.87	3.92	2.93
Private fixed investment	50,796	3.60	4.32	6.11	4.27	2.07
Government fixed investment	58,732	3.60	3.60	3.60	3.60	3.60
Government fixed inv, infra	56,624	3.60	3.60	3.60	3.60	3.60
Change in stocks	57	3.57	3.57	3.57	3.57	3.57
Government consumption	31,327	4.49	4.49	4.49	4.49	4.49
Exports	44,879	4.36	8.41	6.95	3.17	4.09
Imports	171,307	3.81	5.68	6.51	4.20	3.51
GDP at market prices	367,215	3.57	4.38	4.85	3.75	3.21
Net indirect taxes	19,907	3.80	5.40	5.95	4.02	3.47
GDP at factor cost	347,308	3.57	4.42	4.90	3.75	3.21
Real exchange rate	1.00	-0.32	-1.99	-0.78	-0.53	-0.35
Wage, average	1.00	0.23	0.86	1.07	0.22	0.16
Unemployment rate	31.72	25.49	14.00	8.99	23.24	27.61
2013 = million gourdes						