

**Comments on
Economic evaluation of transportation projects: An application
of Financial Computable General Equilibrium model**

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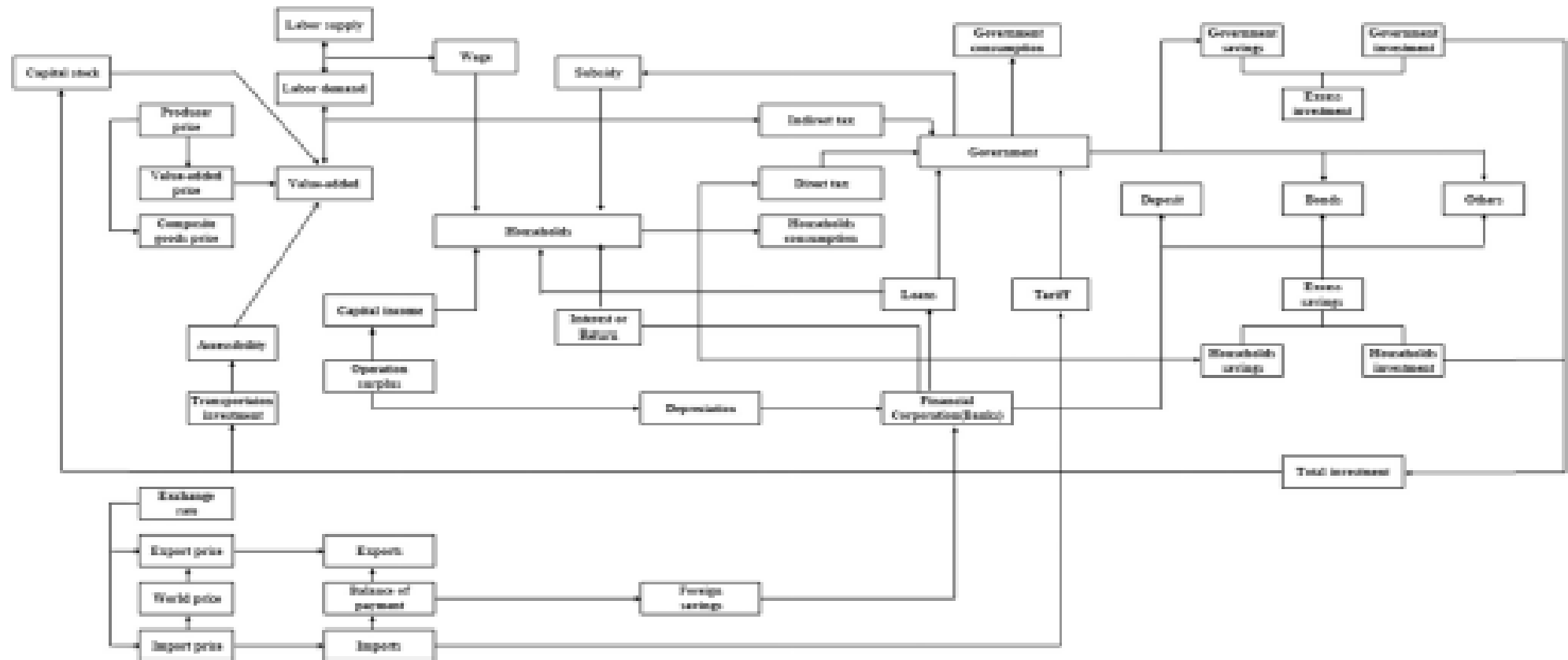
INTRODUCTION

- Paper seeks to develop a Financial Computable General Equilibrium (FCGE) model that analyzes the economic impacts of infrastructure investment projects and their financing options on growth.
- Characteristics:
The model is designed to analyze the economic effects of fiscal policies such as the transportation investment expenditures on economic growth, linking the investment expenditures with specific financial resources.
- Application to the Indonesian economy.

MODEL

The FCGE model in this paper is an integrated model combining the real side of the economy with (1) financial asset choices and (2) an accessibility module to address the impacts of changes in transportation networks.

Fig. 3. Schematic structure of FCGE model.



MODEL (2)

Appendix 2. List of key behavior equations and identities

(1) Domestic import price	$PM_i = PWM_i ER(1 + tm_i)$
(2) Domestic export price	$PE_i = PWE_i ER$
(3) Composite goods price	$P_i Q_i = PD_i XD_i + PM_i IM_i$
(4) Production price	$PX_i X_i = PD_i XD_i + PE_i EX_i$
(5) Value-added prices	$PVA_i VA_i = PX_i X_i - \sum_j io_{j,i} P_j X_j$
(6) Value added	$\ln(VA_i) = vac_i + val_i \ln(L_i) + vak_i \ln(K_i) + vaa_i \ln(ACC)$
(7) Output	$X_i = VA_i + \sum_j io_{j,i} X_j$
(8) Labor demand	$WA \cdot wdist_i L_i = VA_i PVA_i VAL_i$
(9) Total labor demand	$LD = \sum_i L_i$
(10) Total supply	$X_i = at_i [\gamma_i EX_i^{p_i} + (1 - \gamma_i) XD_i^{p_i}]^{\frac{1}{\alpha_i}}$
(11) Export	$\frac{EX_i}{XD_i} = \left[\frac{PE_i (1 - \gamma_i)}{PD_i \gamma_i} \right]^{\frac{1}{\alpha_i - 1}}$
(12) Total demand	$Q_i = ac_i [\delta_i IM_i^{-\alpha_i} + (1 - \delta_i) XD_i^{-\alpha_i}]^{-\frac{1}{\alpha_i}}$
(13) Import	$\frac{IM_i}{XD_i} = \left[\frac{PD_i \delta_i}{PM_i (1 - \delta_i)} \right]^{\frac{1}{\alpha_i - 1}}$
(14) Commodity market	$Q_i = \sum_j io_{i,j} X_j + \sum_e PC_{i,e} + \sum_j INVD_j IVMT_{i,j}$
(15) Wealth	$WE_e = SAVE_e + \sum_a SFA_{e,a} + SFARW_e ER$
(16) Demand for real investment	$DFAIV_e = DFAPIV_e WE_e$
(17) Demand for national bond	$DFANB_e = DFAPNB_e (1 - DFAPIV_e) WE_e$
(18) Demand for non-national bond	$DFADE_e = (1 - DFAPNB_e) (1 - DFAPIV_e) WE_e$
(19) Share of demand for national bond	$\frac{DFAPNB_e}{(1 - DFAPNB_e)} = dfapOnb_e \left(\frac{1 + PANB}{1 + PADE} \right)^{dfap2nb_e}$
(20) Share of demand for real investment	$\frac{DFAPIV_e}{(1 - DFAPIV_e)} = dfapOiv_e \left(\frac{1 + PAIV}{1 + PANBDE} \right)^{dfap2iv_e}$
(21) Average price of non-national bond	$\sum_e DFADE_e + DERW \cdot ER = \sum_e (SFADE_e + SHOCKDE_e)$
(22) Average price of national bond	$\sum_e DFANB_e + NBRW \cdot ER = \sum_e (SFANB_e + SHOCKNB_e)$
(23) Average price of national bond and non-national bond	$PANBDE \sum_e DFANB_e + \sum_e DFADE_e = PANB \sum_e DFANB_e + PADE \sum_e DFADE_e$
(24) Average price of real investment	$PAIV = \frac{YKC}{\sum_i K_i}$
(25) Labor income	$YLC = \sum_i WA \cdot L_i wdist_i + YLCRW \cdot ER$
(26) Capital income	$YKC = \sum_i (PVA_i VA_i (1 - itax_i) - WA \cdot wdist_i L_i + ISUB_i) + YKCRW \cdot ER$
(27) Total income	$Y_e = YLC \cdot ylcp_e + YKC \cdot ykcp_e + \sum_{ee} CURE_{e,ee} Y_{ee} + DTAX_e \sum_i PVA_i VA_i itax_i + CURERW_e ER$ $+ \sum_b (PA_b (CDFA_{b,e} - BCDFA_{b,e})) - \sum_a (PA_a (CSFA_{e,a} - BCFA_{e,a}))$
(28) Savings	$SAVE_e = savep_e Y_e (1 - \sum_{ee} CURE_{ee,e})$
(29) Total consumption	$PCT_e = Y_e (1 - \sum_{ee} CURE_{ee,e}) - SAVE_e - DTAX_e \sum_i ISUB_i - DTAX_e RINVD_e$
(30) Sectoral consumption	$PC_{i,e} P_i = pc_{i,e} PCT_e$
(31) Total savings	$SAVINGS = \sum_e DFAIV_e + \sum_e (DTAX_e RINVD_e) + \sum_e \sum_a SHOCK_{e,a}$
(32) Investments	$INVD_j \sum_i (P_i IVMT_{i,j}) = invdp_j INVEST + KINVD_j$
(33) Capital stock	$K_i = LK_i + INVD_i + EFF_i KINVD_i$
(34) Trade balance	$\sum_i PWM_i IM_i = \sum_i PWE_i EX_i + YLCRW + YKCRW + \sum_e CURERW_e + \sum_e SFARW_e + DERW + NBRW$
(35) Accumulation demand of financial asset	$CDFA_{b,e} = LDFA_{b,e} + DFA_{b,e}$
(36) Accumulation supply of financial asset	$CSFA_{e,a} = LSFA_{e,a} + SFA_{e,a} + SHOCK_{e,a}$

MODEL (3) SIMULATION

Table 5

Growth impacts and income distribution of two transportation projects with government revenue financing (unit: %).

	GDP		Income ratio of high/low class			Income ratio of urban/rural class		
	NS project	BS project	Base	NS project	BS project	Base	NS project	BS project
2006	0.005	0.002	29.237	29.232	29.234	1.719	1.719	1.719
2007	0.010	0.005	29.380	29.375	29.378	1.720	1.720	1.720
2008	0.016	0.007	29.516	29.511	29.513	1.720	1.720	1.720
2009	0.022	0.010	29.645	29.640	29.642	1.721	1.721	1.721
2010	0.027	0.037	29.767	29.762	29.769	1.722	1.722	1.722
2011	0.031	0.037	29.883	29.878	29.886	1.722	1.723	1.722
2012	0.054	0.036	29.994	29.994	29.996	1.723	1.723	1.723
2013	0.053	0.036	30.099	30.099	30.102	1.724	1.724	1.724
2014	0.051	0.035	30.199	30.200	30.202	1.724	1.724	1.724
2015	0.049	0.035	30.295	30.295	30.298	1.725	1.725	1.725
2016	0.048	0.034	30.386	30.386	30.389	1.725	1.725	1.725
2017	0.046	0.033	30.472	30.473	30.475	1.725	1.726	1.725
2018	0.044	0.033	30.554	30.556	30.558	1.726	1.726	1.726
2019	0.043	0.032	30.633	30.635	30.637	1.726	1.726	1.726
2020	0.041	0.031	30.708	30.710	30.712	1.726	1.727	1.727
Average	0.038	0.028	30.157	30.156	30.159	1.724	1.724	1.724

NS: North–South Jakarta Highway.

BS: Balikpapan–Samarinda Highway in East Kalimantan.

Table 6

Impacts of financing methods for highway projects on the GDP (unit: %).

	Accessibility		NS project			BS project		
	NS project	BS project	GO	NB	PR	GO	NB	PR
2006	0.000	0.000	0.005	-0.005	-0.006	0.002	-0.002	-0.003
2007	0.000	0.000	0.010	-0.008	-0.011	0.005	-0.004	-0.005
2008	0.000	0.000	0.016	-0.010	-0.014	0.007	-0.005	-0.006
2009	0.000	0.000	0.022	-0.009	-0.016	0.010	-0.005	-0.007
2010	0.000	9.400	0.027	-0.008	-0.017	0.037	0.020	0.016
2011	0.000	9.400	0.031	-0.006	-0.017	0.037	0.022	0.018
2012	3.800	9.400	0.054	0.010	-0.004	0.036	0.023	0.019
2013	3.800	9.400	0.053	0.015	-0.001	0.036	0.025	0.020
2014	3.800	9.400	0.051	0.020	0.003	0.035	0.026	0.021
2015	3.800	9.400	0.049	0.024	0.006	0.035	0.027	0.022
2016	3.800	9.400	0.048	0.027	0.008	0.034	0.028	0.022
2017	3.800	9.400	0.046	0.030	0.011	0.033	0.029	0.023
2018	3.800	9.400	0.044	0.033	0.013	0.033	0.030	0.024
2019	3.800	9.400	0.043	0.036	0.015	0.032	0.030	0.024
2020	3.800	9.400	0.041	0.038	0.017	0.031	0.031	0.025
Average	2.280	6.893	0.038	0.015	0.000	0.028	0.020	0.015

NS: North–South Jakarta Highway.

BS: Balikpapan–Samarinda Highway in East Kalimantan.

GO: government financing with tax revenues; NB: government financing with bond; PR: private financing.

COMMENTS

- Explain the connection between financial and real sector?
Figure 3 and Appendix 2
- Option for financing option?