

APPENDIX 1: THE COMPLETE EQUATIONS OF THE DETAILED MODEL

Variable	Equation	Unit	Description
Capital per Employment	Fixed Capital/Employment	currency/person	Capital per employment is the ratio between fixed capital and employment
Capital per employment coef		Dmnl	The coefficient of capital per employment
change in non-workforce	"Non-workforce"*"Non-workforce growth ratio"	person/year	Number of additional non-workforce annually
Constant coef		Dmnl	Constant coefficient for multiplicative factor
Country productivity	Multiplicative factor*unit adjustment*(Capital per Employment/unit adjustment)^Capital per employment coef	currency/(person*year)	The productivity of local firms is calculated from multiplicative factor and capital per employment

Variable	Equation	Unit	Description
depreciation	Fixed Capital*Depreciation ratio	currency/year	The amount of fixed capital depreciate each year
Depreciation ratio		1/year	The depreciation ratio of fixed capital
Employment	INTEG (hiring rate, Initial employment)	person	Number of employment
employment function	$((-1,0)-(-2,1)],(-1,0),(-0.2,0),(-0.0733945,0.0175439),(0,0.05),(0.100917,0.109649),(0.2,0.2),(0.8,0.8),(0.892966,0.877193),(1.00917,0.934211),(1.12538,0.973684),(1.26605,0.991228),(1.5,1),(2,1))$	Dmnl	When worker demand is almost reach the unemployment, not all unemployment will be hired. There is a margin by an unqualified unemployment or unemployment who does not actually want to work
FDI	SMOOTH3(Target FDI, FDI investment delay time)	currency/year	Actual FDI is delayed from target FDI because firms' strategy to reduce risk of investment

Variable	Equation	Unit	Description
FDI constant coef		currency/year	The constant coefficient for Target FDI
FDI investment delay time		year	Average time that foreign firms take to make an investment decision
FINAL TIME	2008	year	The final time for the simulation
Fixed Capital	INTEG (GFCF- depreciation, Initial fixed capital)	currency	Accumulated fixed capital in country
Foreign fixed capital investment	FDI*foreign fixed capital investment ratio	currency/year	Foreign fixed capital investment is the ratio of FDI
foreign fixed capital investment ratio		Dmnl	The ratio of fixed capital investment by foreign firms compared to FDI
foreign hiring ratio		person/currenc y	How many new workers are required for each unit of FDI

Variable	Equation	Unit	Description
foreign productivity growth	foreign productivity growth rate*Productivity of foreign firms	currency/(person*year*year)	Increase in foreign productivity
foreign productivity growth rate		1/year	The growth rate of productivity of foreign firms
GDP growth	$(\text{Real GDP}/\text{GDP}(t-1) - 1)/\text{Growth duration}$	1/year	GDP growth
GDP per capita	Real GDP/Population	currency/(person*year)	Real GDP per capita is the real GDP per population
GDP per capita coef		person	Coefficient for GDP per capita
GDP(t-1)	DELAY FIXED(Real GDP, 1, "Initial GDP(t-1)")	currency/year	The one year GDP delay
GFCF	Foreign fixed capital investment+Local fixed capital investment+GFCF constant	currency/year	Amount of fixed capital investment each year

Variable	Equation	Unit	Description
GFCF constant		currency/year	The constant coefficient of GFCF
Growth duration		year	Duration to calculate the GDP growth rate
hiring rate	hiring ratio*Unemployment/Hiring time	person/year	number of people being hired
hiring ratio	IF THEN ELSE("Worker on demand - unemployment ratio">2, employment function(2), employment function("Worker on demand - unemployment ratio"))	Dmnl	The ratio of unemployment that is hired from the business investment
Hiring time		year	Time duration to hire worker
Initial employment		person	Number of employment in the starting year
Initial fixed capital		currency	The fixed capital in the starting year

Variable	Equation	Unit	Description
Initial foreign productivity		currency/(person*year)	Productivity of foreign firm at the starting year
Initial GDP(t-1)		currency/year	Real GDP in the year before the starting year
Initial non-workforce		person	Number of non-workforce in the starting year
Initial perceived technology gap		currency/(person*year)	Technology gap in the starting year
INITIAL TIME	1988	year	The initial time for the simulation
Initial unemployment	Initial workforce-Initial employment	person	Number of employment is the difference between workforce and employment
Initial workforce		person	Number of workforce in the starting year
Investment decision time		year	Time delay that local firms take to make an investment decision

Variable	Equation	Unit	Description
Local fixed capital investment	local investment growth*local fixed capital investment ratio	currency/year	Local fixed capital investment is the ratio of local investment
local fixed capital investment ratio		currency	How much local fixed capital investment will be if the local investment index increase by 1 point
local hiring ratio		person	How many new workers are required for each increase in local investment index
local investment growth	Local investment index*Local investment growth ratio	1/year	How much local investment change each year
Local investment growth ratio	SMOOTH3(GDP growth, Investment decision time)	1/year	The ratio of local investment is the decision delay after the gdp growth
Local investment index	INTEG (local investment growth,100)	Dmnl	The index of local investment

Variable	Equation	Unit	Description
Multiplicative factor	EXP(Constant coef+Time coef*Time+technology gap coef*Perceived technology gap)	1/year	The multiplicative factor is calculated from time, technology gap, FDI-GDP ratio, and multiplicative of technology gap and FDI-GDP ratio
Non-workforce growth ratio		1/year	Growth rate of non-workforce
Non-workforce	INTEG ("change in non-workforce", "Initial non-workforce")	person	Number of people who are not considered as workforce
Perceived country productivity	SMOOTH(Country productivity, Time to perceive productivity)	currency/(person*year)	Productivity cannot be known immediately. It takes some time to be perceived
Perceived technology gap	SMOOTH(Technology Gap, Time to perceived technology gap, Initial perceived technology gap)	currency/(person*year)	The technology gap that is perceived

Variable	Equation	Unit	Description
Population	Workforce+"Non-workforce"	person	Total population is the sum between workforce and non-workforce
Productivity of foreign firms	INTEG (foreign productivity growth, Initial foreign productivity)	currency/(person*year)	Foreign productivity
Real GDP	Perceived country productivity*Employment	currency/year	Real GDP is the multiplication of country productivity and employment
SAVEPER	TIME STEP	year	The frequency with which output is stored
Target FDI	FDI constant coef+GDP per capita coef*GDP per capita	currency/year	Target FDI is acquired from the perceived GDP per capita
Technology Gap	Productivity of foreign firms-Country productivity	currency/(person*year)	The technology gap is the difference between productivity of foreign firms and local firms

Variable	Equation	Unit	Description
technology gap coef		1/(currency/(person*year))	coefficient for technology gap for multiplicative factor
Time coef		1/year	Time coefficient for multiplicative factor
TIME STEP	0.0625	year	The time step for the simulation
Time to measure worker demand		year	Duration to compare the worker need and unemployment
Time to perceive productivity		year	Time delay between actual productivity and the productivity that is acknowledged by public
Time to perceived technology gap		year	Time delay to perceive the technology gap
Unemployment	INTEG (workforce growth-hiring rate,Initial unemployment)	person	Number of unemployment
unit adjustment	1	currency/person	To solve the power of the unit question

Variable	Equation	Unit	Description
Worker on demand - unemployment ratio	$(\text{Workers to support foreign investment} + \text{Workers to support local investment}) * \text{Time to measure worker demand} / \text{Unemployment}$	Dmnl	The ratio between workers that is required by new investment for a period of time and number of unemployment
Workers to support foreign investment	$\text{FDI} * \text{foreign hiring ratio}$	person/year	Foreign hiring is a ratio of FDI
Workers to support local investment	$\text{local hiring ratio} * \text{local investment growth}$	person/year	Demanded worker for local firms as a ratio of local investment
Workforce	$\text{Unemployment} + \text{Employment}$	person	Total workforce is the sum of unemployment and employment
workforce growth	$\text{Workforce} * \text{Workforce growth ratio}$	person/year	The number of additional workforce every year
Workforce growth ratio		1/year	Growth rate of workforce

APPENDIX 2: RAW DATA

Thailand

Year	GDP (Real)	Employ ment	Unemplo yment	Work force	Population	IFDI	GFCF
Unit	Billion Baht	Thousand people	Thousand people	Thousand people	Million people	Million USD	Billion Baht
1987	1376.8	27639	1722	29361	54.32	352	359.3
1988	1559.8	29464	929	30393	55.13	1105	478.5
1989	1750	30669	433	31102	55.91	1775	642.9
1990	1945.4	30842	710	31552	56.67	2444	881.8
1991	2111.9	31137	869	32006	57.43	2014	1043.5
1992	2282.6	32383	456	32839	58.19	2113	1111.3
1993	2470.908	32150	494	32644	58.91	1804	1252.9
1994	2692.973	32093	423	32516	59.56	1366	1450.2
1995	2941.736	32512	375	32887	60.14	2068	1719.1
1996	3115.338	32232	354	32586	60.62	2336	1892.9
1997	3072.615	33162	293	33455	61.02	3895	1598.6
1998	2749.684	32138	1138	33276	61.4	7315	1035.4

Year	GDP (Real)	Employ ment	Unemplo yment	Work force	Population	IFDI	GFCF
Unit	Billion Baht	Thousand people	Thousand people	Thousand people	Million people	Million USD	Billion Baht
1999	2871.98	32087	986	33073	61.82	6103	965.9
2000	3008.401	33001	813	33814	62.35	3366	1081.4
2001	3073.601	32110	1119	33229	62.99	5067	1181.3
2002	3237.042	33026	826	33852	63.73	3342	1243.2
2003	3468.166	33818	761	34579	64.52	5232	1423.9
2004	3688.189	34717	741	35458	65.28	5860	1686.8
2005	3858.019	35170	673	35843	65.95	8055	2057
2006	4056.55	35700	561	36261	66.51	9453	2204
2007	4256.563	36270	508	36778	66.98	11233	2249.9
2008	4361.395	36973	514	37487	67.39	9835	2488.9

Malaysia

Year	GDP (Real)	Employ ment	Unemplo yment	Work force	Popu lation	IFDI	GFCF
Unit	Billion Ringgits	Thousand people	Thousand people	Thousand people	Million people	Million USD	Million Ringgit
1987	137.25	5984	473	6457	16.61	423	17904
1988	150.889	6176	482	6658	17.1	719	22726

Year	GDP (Real)	Employ ment	Unemplo yment	Work force	Popu lation	IFDI	GFCF
Unit	Billion Ringgits	Thousand people	Thousand people	Thousand people	Million people	Million USD	Million Ringgit
1989	164.559	6391	389	6780	17.6	1668	30599
1990	179.383	6685	315	7000	18.1	2332	39348
1991	196.506	6891	310	7201	18.6	3998	49126
1992	213.965	7048	271	7319	19.09	5183	55191
1993	235.137	7383	317	7700	19.58	5006	66937
1994	256.798	7618	228	7846	20.08	4342	78664
1995	282.039	7645	248	7893	20.59	4178	96967
1996	310.251	8400	217	8617	21.13	5078	107825
1997	332.97	8569	215	8784	21.67	5137	121494
1998	308.465	8603	287	8890	22.22	2163	75982
1999	327.397	8831	314	9145	22.75	3895	65841
2000	356.401	9291	299	9590	23.27	3788	90141
2001	358.246	9357	342	9699	23.77	554	88580
2002	377.559	9543	344	9887	24.25	3203	89995
2003	399.414	9870	370	10240	24.71	2473	93864
2004	426.508	9987	370	10357	25.17	4624	99336
2005	449.25	10065	372	10437	25.63	3966	107185
2006	475.526	10328	353	10681	26.09	6076	119213
2007	504.92	10514	91	10605	26.56	8454	138703

Year	GDP (Real)	Employ ment	Unemplo yment	Work force	Popu lation	IFDI	GFCF
Unit	Billion Ringgits	Thousand people	Thousand people	Thousand people	Million people	Million USD	Million Ringgit
2008	528.311	10715	165	10880	27.01	7376	145041

Vietnam

Year	GDP (Real)	Unemployment (% of labor force)	Labor force	Population	IFDI	GFCF
Unit	Billion Dong	%	Million people	Million people	Million USD	Billion Dong
1995	195567	6.4	35.374	72.96	#NA	58187
1996	213833	5.9	36.034	74.18	2395	71597
1997	231264	6	36.72	75.34	2220	83734
1998	244596	6.9	36.9	76.46	1671	97551
1999	256272	6.7	37.7	77.56	1412	102799
2000	273666	6.4	38.5	78.66	1298	122101
2001	292535	6.3	39.5	79.76	1300	140301
2002	313247	6	40.4	80.86	1400	166828
2003	336243	5.8	41.4	81.95	1450	204608
2004	362435	5.6	42.5	83.02	1610	237868

Year	GDP (Real)	Unemployment (% of labor force)	Labor force	Population	IFDI	GFCF
Unit	Billion Dong	%	Million people	Million people	Million USD	Billion Dong
2005	392989	5.3	43.6	84.07	1954	275841
2006	425373	4.82	45.488	85.1	2400	324949
2007	461344	4.6	46.4	86.11	6700	437702
2008	489833	4.7	47.413	87.1	9579	531987

Japan

Year	GDP (Real)	Employ ment	Unemplo yment	Work force	Popu lation	IFDI	GFCF
Unit	Trillion Yen	Thousand people	Thousand people	Thousand people	Million people	Billion USD	Billion Yen
1987	375.143	59110	1730	60840	121.95	1.16	101865
1988	400.744	60110	1550	61660	122.37	-0.48	114488
1989	421.919	61280	1420	62700	122.77	-1.04	126850
1990	444.129	62490	1340	63830	123.19	1.78	142239
1991	458.939	63690	1360	65050	123.65	1.29	149057
1992	463.307	64360	1420	65780	124.12	2.76	146782
1993	464.233	64500	1656	66156	124.6	0.12	142008

Year	GDP (Real)	Employ ment	Unemplo yment	Work force	Popula tion	IFDI	GFCF
Unit	Trillion Yen	Thousand people	Thousand people	Thousand people	Million people	Billion USD	Billion Yen
1994	471.544	64530	1920	66450	125.05	0.91	138670
1995	480.237	64570	2098	66668	125.44	0.04	138090
1996	493.268	64860	2250	67110	125.77	0.21	142907
1997	500.884	65570	2303	67873	126.05	3.2	142903
1998	490.081	65140	2787	67927	126.29	3.27	130559
1999	489.992	64623	3171	67794	126.5	12.31	126792
2000	503.889	64464	3198	67662	126.71	8.23	126634
2001	504.694	64121	3395	67516	126.91	6.19	122805
2002	506.011	63303	3588	66891	127.1	9.09	114334
2003	513.41	63189	3504	66693	127.26	6.24	111783
2004	527.377	63286	3134	66420	127.38	7.8	113159
2005	537.477	63502	2944	66446	127.45	3.21	116885
2006	548.372	63836	2751	66587	127.45	-6.78	118467
2007	561.049	64120	2570	66690	127.4	22.18	120670
2008	554.432	63922	2646	66568	127.29	24.55	117050

APPENDIX 3: LIST OF SYMBOLS

Symbol	Variable	Symbol	Variable
D	Local investment	α	Multiplicative factor
FDI	Foreign Direct Investment	β_{FDI}	FDI constant coefficient
H	Hiring rate	β_k	Capital per employment coefficient
H_F	Hiring rate from foreign firms	β_t	Time coefficient
H_L	Hiring rate from local firms	β_y	GDP per capita coefficient
K	Fixed capital	β_α	Multiplicative constant coefficient
K_F	Fixed capital from FDI	β_σ	GFCF constant coefficient
K_L	Fixed capital from local investment	β_Λ	Technology gap coefficient
k	Fixed capital per labor	δ	Depreciation ratio
L	Labor	γ_F	Foreign fixed capital investment ratio
N	Population	γ_L	Local fixed capital investment ratio
O	Non-workforce	λ_F	Foreign hiring ratio

Symbol	Variable	Symbol	Variable
P	Output	λ_L	Local hiring ratio
p	Productivity	σ	Gross Fixed Capital Formation
t	Time	σ_F	Foreign fixed capital investment
U	Unemployment	σ_L	Local fixed capital investment
W	Workforce	Λ	Technology gap
w	Workforce growth	Ξ	Worker demand–unemployment ratio
Y	Real GDP	\bar{a}	The perceived value of variable a
y	Real GDP per capita	\hat{a}	Target value of variable a
t_D	Local investment decision duration	%D	Local investment growth ratio
t_{FDI}	FDI delay time	%Y	Real GDP growth
t_H	Hiring duration	g_O	Non-workforce growth ratio
t_L	Unemployment coverage duration	g_{pF}	Foreign productivity growth rate
t_p	Duration to perceive the productivity	g_w	Workforce growth ratio
t_Λ	Duration to perceive technology gap		