

The Impacts of Direct Tax Reform on Taiwan's Economy

-A Computable General Equilibrium Analysis

Yu-Hui Lin,

Lecturer, Department of International Trade, Technology and Science Institute of Northern Taiwan,

E-mail address: yhlin@tsint.edu.tw

Dickens Chen,

Ph.D. Student, Department of Agricultural Economics, National Taiwan University,

E-mail address: d95627005@ntu.edu.tw

Ching-Cheng Chang,

Research Fellow, Institute of Economics, Academia Sinica, and Professor, Department of Agricultural Economics, National Taiwan University,

E-mail address: emily@econ.sinica.edu.tw

Shih-Hsun Hsu,

Professor, Department of Agricultural Economics, National Taiwan University,

E-mail address: m577@ntu.edu.tw

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Abstract

In view of the expiration of the SUI (Statute for Upgrading Industries) at the end of 2009, the Ministry of Finance (MOF) is considering various revenue-neutral tax reform acts while abolishing the code comprehensively. The business income tax rate will be lowered by an appropriate amount so as to strengthen the international competitiveness of Taiwan's industries. In addition, individual income tax rates and various deductions will be adjusted suitably. Besides, MOF also actively consider the tax base expanding proposals such as elimination of the tax exemption on the salaries of educators and military personnel.

This study concerns about the impacts of abolishing SUI on Taiwan's economy. Specifically, we will focus on the effects of the following reforms: (1) the reduction in tax revenues resulting from the lowering of business income taxes; (2) the raising of deductions and the lowering of individual income taxes, (3) the retention of four functional tax incentive measures from the SUI, (4) the evaluation of other direct tax reform policy simulations.

Keywords: Direct Tax, TAIGEM, Computable General Equilibrium Model

1. Introduction and background

For the recent years, it has been serious in Taiwan that the high-income class enjoyed tax cuts by way of various kind of tax-deduction rules. According to the 2003 data, among the top 40 high-income earners with an annual income of over 300 million NT dollars (approximately 9.5 million US dollars), 8 of them did not pay tax, 7 paid less than 1% of total income for tax, and only 4 of them paid tax properly as required.

Besides, Taiwan's high-tech manufacturing sector had enjoyed unprecedented tax breaks under the Statute for Upgrading Industries (SUI). The tax concessions totaled nearly NT\$590 billion (US\$18.44 billion) between 2004 and 2008, according to tallies compiled by the Ministry of Economic Affairs (MOEA) tallies.

In order to prevent tax basis from being corroded and tax system from becoming deteriorated, the Legislative Yuan promulgated "The Income Basic Tax Act" on December 2005 in the first place; thus the alternative minimum tax (AMT) system begins to enforce since 2006. Besides, the SUI also expired at the end of 2009, hoping to make the income taxation system of Taiwan to be health and fairness.

Due to the expiration of the SUI at the end of 2009, the Ministry of Finance is considering various revenue-neutral tax reform acts while abolishing the code comprehensively. The business income tax rate will be lowered by an appropriate amount so as to strengthen the international competitiveness of Taiwan's industries. In addition, individual consolidated income tax rates and various deductions will be adjusted suitably so as to lighten the burden on ordinary wage earners and disadvantaged groups.

According to Minister of Finance (MOF) tallies, the expiration of SUI at the end of 2009 will boost tax receipts for the national treasury by NT\$148.3 billion annually, and that this revenue source can be used to make up for the reduction in tax revenues resulting from the lowering of business and individual income taxes, the raising of deductions on the individual income tax, and the retention of four functional tax incentive measures from the SUI. Furthermore, MOF also actively consider the tax base expanding proposals such as elimination of the tax exemption on the salaries of

educators and military personnel.

In regard to the concern that tax exemptions and reductions might reduce national tax revenues, many scholars and officials argue that the country's already deteriorating finances will take a turn for the worse. However, some scholars and officials contend that while they may cause a shortage of receipts in the short term, the feedback and stimulation that they produce over the long term will benefit the healthy development of public finance, and lower taxes will promote the growth of taxable income eventually.

This study concerns about the impacts of abolishing SUI on Taiwan's economy. Specifically, we will focus on the effects of the following reforms: (1) reducing business tax rate to a level of 20% or 17.5%; (2) retention of four functional tax incentive measures preserved; (3) canceling surtax on undistributed earnings; (4) introducing partial-dividend-exemption system in replacement of existing imputation system, and (5) removing the tax-free privilege of teachers and forces on their wage income

2. Methodology and policy scenarios

To serve our purposes, we employ the TAIGEM-SAM model by incorporating the income-expenditure equation into the Social Accounting Matrix (SAM) according to the CGE model and DMR model (Devis, Melo and Robinson, 1982) of the World Bank. TAIGEM-SAM is a multi-sectoral computable general equilibrium (CGE) model of the Taiwan economy, which is derived from ORANI (Dixon, Parmenter, Sutton and Vincent, 1982). It consists of equations describing, for some time period: producers' demands for produced inputs and primary factors; producers' supplies of commodities; demands for inputs to capital formation; household demands; export demands; government demands; the relationship of basic values to production costs and to purchasers' prices; market-clearing conditions for commodities and primary factors; and numerous macroeconomic variables and price indices. Demand and supply equations for private-sector agents are derived from the solutions to the optimization problems (cost minimization, utility maximization, etc.) which are assumed to underline the behavior of the agents in conventional neoclassical microeconomics. The agents are assumed to be price takers, with producers operating in competitive markets.

Like ORANI, TAIGEM-SAM was designed for comparative static policy analysis, i.e., for projecting the difference between the initial equilibrium and the new equilibrium—where an economic policy is imposed—over a certain period of time.

The database for TAIGEM-SAM was compiled from the 2004 Taiwan's Input-Output Tables, which cover 39 sectors, 39 commodities, 5 types of labor, 5 types of margins commodities. Besides, 5 income quintile households is also introduced into the model so that we can evaluate the policy impacts on income distribution.

In order to realize the effects of various income tax reform proposed by legislators and MOF, this study designs and simulates five alternative policy scenarios to reflect the potential impact of tax reform on macro-economy, industrial sectors, labor market and welfare distribution. All of the policy scenarios are based on revenue-neutral principle considered by MOF; thus the tax revenues sourced from repealed SUI will be used to make up for the reduction in tax revenues resulting from the lowering of business and individual income tax rate, the raising of deductions on the consolidated income tax, the retention of four functional tax incentive measures, or the abolishment of surtax on undistributed earnings.

The underlying data structure for the model is the CGE database benchmarked for 2004 and covering 39 sectors and 5 income quintile households, which was compiled referring to input-output tables, manpower survey, and Family Income/Expenditure Survey Metadata offered by Directorate General of Budget, Accounting and Statistics (DGBAS). In addition to DGBAS statistical data, we also collected tax revenue data retrieved from MOF database 2004 verified by Taxation Agency and Yearbook of Finance Statistics edited by MOF, so as to calculate the tax changes for individual industry and for each income quintile.

2.1 Calibrating the CGE database 2004 to AMT scenarios

As the above mentioned, AMT system is enforced since 2006 and until now AMT is still being implemented, while the CGE database employed in this study is the 2004 edition. For this reason, we calibrate the baseline database by simulating an AMT scenario enforced in 2004 at first.

2.1.1. Calibrating the CGE database 2004 in respect of corporate AMT

According to MOF tallies over the years, we can figure out that the business income tax levied under AMT circumstances would increase about NT\$ 11.9 billion¹ in 2004. Assuming that the additional AMT burden on each industry is in proportional to initial business income tax burden (see table 1, column 2) respectively, we can calculate the increment and the percentage change of tax burden on each industry (see table 1, column 6) and then give a simulation of AMT experiment.

2.1.2. Imputation credit under AMT scenario

A full imputation system was introduced from 1998 applying to resident company shareholders in Taiwan. Under the full imputation system, dividends paid by a resident company out of income that has borne company tax can be passed on to resident shareholders by attaching imputation credits for company tax paid. According to MOF calculation, the average rate of the imputation credit is around 33.33%. Taking imputation system into consideration, the individual will get a refund of NT\$ 3.967 billion back (which is one third of business income tax increment NT\$ 11.9 billion under AMT scenario) in respect to the imputed dividend due to the fact a credit of 33.33% can be claimed relating to this. The NT\$ 3.967 billion increment in individual income tax is also introduced into AMT scenario when simulating the above NT\$ 11.9 billion business income tax increment.

2.1.3. Calibrating the CGE database 2004 in respect of individual AMT

In light of Enforcement Rules of the Income Basic Tax Act of 2006, the individual AMT is intended to apply to only the relatively few high-income taxpayers with an annual income of over NT\$ 6 million. It is quite obvious that the individual AMT group belongs to the households in the highest 20 percent income quintile. The individual income tax would increase around NT\$ 4 billion² in 2004 suppose AMT is executed for current year, estimated according to MOF tallies over the years.

The average income tax amounts levied on the highest 20% income quintile is NT\$ 217,856 with an Effective rate of 16, 93% initially (see table 3), according to MOF

¹ http://www.cdnews.com.tw/cdnews_site/docDetail.jsp?coluid=112&docid=100368745

² http://www.cdnews.com.tw/cdnews_site/docDetail.jsp?coluid=112&docid=100368745

database 2004 verified by Taxation Agency. If an AMT incremental NT\$ 4 billion is levied on the group, each of the 1,027,110 taxpayers will face an average income tax NT\$ 221,751 with an Effective rate of 17.23%, which implies a 1.8% increment in tax burden applied to the highest fifth group.

In view of the individual AMT scenario, this study also calibrated the individual income tax value in CGE database 2004 by simulating a NT\$ 4 billion income tax increment levied on households in the fifth income quintile, which is equivalent to a 1.8% increase in tax.

All of the following tax reform experiments are evaluated under CGE database benchmarked for 2004 calibrated under AMT simulations.

2.2. Policy scenarios

To examine the economic effects of abolishing SUI under the principle of revenue neutrality proposed by MOF, we consider five alternative sets of policy experiments: i) a tax rate of 20% with surtax on undistributed earnings cancelled; ii) a tax rate of 20% with four tax breaks preserved; and iii~v) a tax rate of 17.5%.

2.2.1. Scenario 1 (a tax rate of 20% with surtax on undistributed earnings cancelled):

The package of tax reform proposals includes:

(1) Abolishing the tax breaks under SUI comprehensively :

According to MOF tallies, the exempted business income tax due to SUI is NT\$ 148.349 billion in 2004, which would become Government tax receipts when abolishing SUI. However, the incremental business income tax receipts would be reduced to NT\$ 136.449 billion under AMT scenario for current year (see table 1, column 7). In addition, the exemption to tax assessed on undistributed surplus is up to NT\$ 11.313 billion settled current year (see table 1 column 4 and table 2 column 7). Assume that the tax benefits obtained under SUI is abolished comprehensively with all tax benefits scrapped, Government revenues from corporate income tax receipts will grow by totaling NT\$ 147.762 billion, while the industries would face a rise in business income

tax and surtax on undistributed earnings. The increasing tax burden of each industry is listed in Table 1 (column 4 & 7).

(2) Exempting from additional 10% surtax on undistributed earnings levied on listed companies:

In order to achieve revenue-neutral principle, scenario 1 assumes that the additional 10% surtax on undistributed earnings levied on listed companies is exempted after the expiration of the SUI. According to MOF tallies, this exempting policy would generate an amount of NT\$12.143 billion reduction in surtax on undistributed surplus levied on listed companies in 2004 baseline year. The reducing tax amounts of each industry are listed in table 2 (column 8).

(3) Reducing business income tax rate to 20% :

This will get a tax reduction of 20% if business income tax rate lowers from 25% to 20%.

(4) Lowering tax burdens for individual taxpayers:

The tax rates of 6 percent, 13 percent, and 21 percent are cut by one percentage point to 5 percent, 12 percent and 20 percent, respectively, while the highest marginal tax rates of 30 percent and 40 percent remain intact.

In addition to that, special deduction of income from salaries raises NT\$ 220 thousand, special deduction for the disabled or handicapped raises NT\$ 230 thousand, and standard deduction raises NT\$ 160 thousand. Various deductions is adjusted so as to lighten the burden on ordinary wage earners and disadvantaged groups.

2.2.2. Scenario 2 (a tax rate of 20% with four tax breaks preserved)

The second package of tax reform proposals includes:

(1) Abolishing the tax breaks under SUI with four functional tax incentives retained:

Just as scenario 1 mentioned, the incremental business income tax amounts

and incremental surtax on undistributed surplus after repealing SUI are respectively NT\$ 136.449 billion and NT\$ 11.313 billion under AMT scenario in 2004 baseline year. Instead of exempting from surtax on undistributed earnings to achieve tax neutrality, however, scenario 2 retains four types of functional tax incentives: research and development (R&D), manpower training, operations headquarters, and international logistics and distribution centers. According to MOF tallies, the four functional tax incentive measures provided in SIU is approximately NT\$ 30 billion in 2004 base year.

Assume that the tax benefits obtained under SUI is abolished mostly with four tax benefits preserved, Government revenues from corporate income tax receipts would grow by NT\$ 106,449 billion (see Table 1, column 9) rather than NT\$ 136.449 billion calculated previously in scenario 1. The increasing tax burden of each industry is also shown in Table 1 (column 9).

(2) Reducing business income tax rate to 20% :

This will get a tax reduction of 20% if business income tax rate lowers from 25% to 20%, just as the same with scenario 1.

(3) Lowering tax burdens for individual taxpayers:

The downward adjustment of tax rates and the higher exemptions and deductions are identical to scenario 1.

2.2.3. Scenario 3~5 (a tax rate of 17.5%) :

The packages of tax reform proposals include:

(1) Abolishing the tax breaks under SUI comprehensively :

Under AMT scenario in 2004 baseline year, the incremental business income tax amounts and incremental tax assessed on undistributed surplus after repealing SUI are NT\$ 136.449 billion and NT\$ 11.313 billion respectively, just as scenario 1 mentioned.

(2) Reducing business income tax rate to 17.5% :

In order to achieve revenue-neutral principle, this scenario proposes a huge decrease in tax rate instead of preserving four tax breaks(scenario 2) and exempting from surtax on undistributed earnings(scenario 1). This will get a tax reduction of 30% if business income tax rate lowers from 25% to 17.5%.

(3) Lowering tax burdens for individual taxpayers:

The downward adjustment of tax rates and the higher exemptions and deductions are mostly the same with scenario 1 and 2. However, the experiments are evaluated under three different circumstances:

(a) Scenario 3 is identical to scenario 1 and 2 regarding to this part.

(b) Scenario 4 is simulated under the assumptions that partial-dividend-exemption system is introduced into tax reform in replacement of existing imputation system.

(c) Scenario 5 is simulated under the similar circumstances with Scenario 3; moreover, it also revokes the income tax exemption for military servicemen and public school teachers in the meantime. In light of official statistics, removing the tax-free privilege of teachers and forces on their wage income would increase the tax amount about NT\$15 billion³, and that this revenue amounts would be used to improve the welfare of teachers and military servicemen. According to Government Research Bulletin, salaries of military personnel is at the average of NT\$ 712 thousand, while the average salaries of teachers is NT\$ 970 thousand (see table 4). This group belongs to the households in the highest 20 percent income quintile (and belongs to the 9th 10 percent of households when ranked according to income). Thus, the effective tax rate of the highest 5th households would be different from that of scenario 3. Besides, government welfare expenditure of NT\$15 billion on servicemen and teachers is also considered in scenario 5.

The calibrated simulation of 2004 AMT baseline and these policy experiments are listed in table 5.

³ <http://news.chinatimes.com/focus/0,5243,50104880x122010040200118,00.html>

Table 1 Business income tax payable of verified and tax reductions due to SUI in 2004

unit: NT\$ million

Industries	Business income tax	Settlement of the surtax on undistributed earnings	Exemption to tax assessed on undistributed earnings due to SUI	Exempted business income tax due to SUI	Incremental tax burden if under AMT for current year	Incremental income tax when repealing SUI under AMT for current year	four types of functional tax incentives due to SUI	Incremental business income tax when repealing SUI under AMT with four functional tax incentives preserved for current year
(1)	(2)	(3)	(4)	(5)	(6)	(7)=(5)-(6)	(8)	(9)=(5)-(6)-(8)
Agr. & livestock	418	29	1	21	0	21	6	15
forest	17	1	0	1	0	1	0	1
fishery	4	0	0	0	0	0	0	0
minerals	318	15	0	15	0	15	0	15
process foods	2,447	205	84	257	9	248	37	211
beverages	318	27	11	33	1	32	5	27
tobacco	0	0	0	0	0	0	0	0
textile	1,868	381	168	983	72	911	133	778
apparel	1,503	129	56	833	66	767	21	746
wood & bamboo	1,182	68	7	54	1	53	2	51
paper & printing	2,499	116	34	508	30	478	71	407
chemical	6,358	481	728	10,200	905	9,295	3,048	6,247
fiber	211	16	24	339	30	309	101	208
plastic	1,638	124	188	2,628	237	2,391	785	1,606
plastic Prod.	4,534	406	454	6,036	526	5,510	1,736	3,774
misc. chemical	5,346	350	166	1,299	48	1,251	301	950
petroleum	857	14	124	12,963	1,237	11,726	4,020	7,706
non-metallic	3,668	344	254	1,945	101	1,844	169	1,676
steel & iron	23,518	609	233	2,044	8	2,036	322	1,714
misc. metal	4,963	129	49	431	2	429	68	361
metallic	10,273	397	154	1,436	27	1,409	82	1,327
machinery	7,676	316	128	1,293	27	1,266	236	1,031
domestic	346	19	55	918	57	861	171	691
electronic	29,472	1,659	4,703	78,208	7,150	71,058	14,544	56,514
electrical	4,267	670	275	2,135	70	2,065	480	1,585
Transp. Equip.	6,567	612	565	2,653	119	2,534	709	1,826
misc. Prod.	4,559	271	94	1,775	44	1,731	416	1,315
construction	15,293	731	41	632	60	572	170	402
electricity	305	4	134	546	68	478	0	478
gas & water	412	6	181	738	92	646	0	646
transport	24,770	508	1,163	7,844	104	7,740	1,316	6,424
wholesale	65,444	4,554	256	2,372	123	2,249	584	1,665
finance	27,621	7,597	465	739	116	623	37	586
real estate	3,862	1,404	44	16	8	8	1	6
eating & hotel	2,232	117	12	34	4	30	1	29

business	7,639	701	408	6,148	536	5,612	406	5,206
Public Serv.	0	0	0	0	0	0	0	0
Educ. & Med.	18	0	0	2	0	2	1	1
Other	6,560	553	55	266	25	241	20	221
TOTAL	278,985	23,562	11,313	148,349	11,900	136,449	30,000	106,449

Table 2 Surtax on undistributed earnings and tax reductions due to SUI in 2004

unit: NT\$ million

Industries	Settlement of the surtax on undistributed earnings			Exemption to tax on undistributed earnings due to SUI			assessed earnings surtax payable after abolishing the tax breaks under SUI		
	listed	unlisted	total	listed	unlisted	total	listed	unlisted	total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)=(2)+(5)	(9)=(3)+(6)
Agr. & livestock	0	29	29	0	1	1	0	30	30
forest	0	1	1	0	0	0	0	1	1
fishery	0	0	0	0	0	0	0	0	0
minerals	0	15	15	0	0	0	0	15	15
process foods	47	158	205	28	55	84	75	213	288
beverages	6	21	27	4	7	11	10	28	38
tobacco	0	0	0	0	0	0	0	0	0
textile	54	327	381	71	96	168	126	423	549
apparel	3	126	129	27	29	56	31	155	185
wood & bamboo	10	58	68	0	7	7	10	65	75
paper & printing	33	83	116	17	17	34	50	100	150
chemical	40	441	481	600	128	728	640	569	1,209
fiber	1	15	16	20	4	24	21	19	40
plastic	10	114	124	155	33	188	165	147	311
plastic Prod.	16	390	406	246	207	454	262	598	859
misc. chemical	115	235	350	85	81	166	200	316	515
petroleum	0	14	14	115	8	124	115	22	138
non-metalic	77	267	344	105	148	254	182	416	598
steel & iron	252	357	609	95	138	233	347	495	843
misc. metal	53	75	129	20	29	49	73	104	178
metallic	88	309	397	26	128	154	113	437	551
machinery	23	293	316	38	90	128	61	383	444
domestic appliances	10	10	19	50	5	55	59	15	75
electronic	811	847	1,659	4,241	462	4,703	5,053	1,309	6,362
electrical	43	627	670	194	81	275	237	708	945
Transp. Equip.	205	406	612	360	205	565	565	611	1,177
misc. Prod.	25	247	271	35	59	94	60	306	366
construction	126	605	731	35	6	41	161	611	772
electricity	1	3	4	4	130	134	5	133	138
gas & water	1	4	6	6	175	181	7	179	186
transport	85	423	508	953	210	1,163	1,038	633	1,671
wholesale	228	4,326	4,554	76	180	256	305	4,506	4,810
finance	1,458	6,139	7,597	98	367	465	1,556	6,506	8,063
real estate	167	1,237	1,404	5	39	44	172	1,276	1,448
eating & hotel	26	91	117	0	12	12	26	104	129
business	102	599	701	281	127	408	383	726	1,109
Public Serv.	0	0	0	0	0	0	0	0	0

Educ. & Medical	0	0	0	0	0	0	0	0	0
Other	27	526	553	8	47	55	35	573	608
TOTAL	4,144	19,419	23,562	8,000	3,313	11,313	12,143	22,732	34,875

Source: calculated by authors according to CGE database 2004 and MOF database verified by Taxation Agency

Table 3 Individual income tax data in 2004 before and after Individual AMT

(unit: NT\$)

Initial individual income tax data in 2004						AMT scenario in 2004	
(1) income quintile	(2) No. of Declared	(3)Average net consolidated income	(4)Average post-tax income	(5) Average income tax	(6)=(5)/(3) Effective rate	(7) Average tax payable	(8) Effective rate
Lowest 20%	1,027,110	0	185,817	0		unchanged	unchanged
Second 20%	1,027,110	23,,606	359,865	1,514	6.42%	unchanged	unchanged
Third 20%	1,027,110	137,755	529,857	8,224	5.97%	unchanged	unchanged
Fourth 20%	1,027,110	262,578	799,737	20,557	7.83%	unchanged	unchanged
Highest 20%	1,027,110	1,286,715	1,922,800	217,856	16.93%	221,751	17.23%

Source: calculations by authors using MOF database 2004 verified by Taxation Agency.

Table 4 The average salaries of educators and military personnel

(unit: NT\$)

Average salaries income	teachers	military personnel
Individual salaries	712,415	970,540
Family income	1,518,331	1,409,183

Source: http://grbsearch.stpi.org.tw/GRB/result.jsp?id=921949&plan_no=94MOF011&plan_year=94&projkey=PG9405-0414&target=plan&highStr

Table 5 Model scenarios for repealing SUI under tax-neutrality

Unit: NTD million; %

	simulation	scenario1	scenario2	scenario3	scenario4	scenario5
calibrating baseline database by simulating AMT scenario enforced in 2004	1. business income tax increment under AMT	11,900	11,900	11,900	11,900	11,900
	2. Imputation credit under AMT	-3,967	-3,967	-3,967	-3,967	-3,967
	3. individual income tax increment under AMT (levied on 5th quintile)	+4,000 (+1.8%)	+4,000 (+1.8%)	+4,000 (+1.8%)	+4,000 (+1.8%)	+4,000 (+1.8%)
Tax reform policy simulations	1. business income tax increment if abolishing SUI	+136,449	+106,449	+136,449	+136,449	+136,449
	2. tax increment assessed on undistributed earnings if abolishing SUI	+11,313	+11,313	+11,313	+11,313	+11,313
	3. exempting from 10% surtax on undistributed earnings	-12,143	...	...	...	...
	3. Business tax rate (percentage change)	Lower to 20% (-20%)	Lower to 20% (-20%)	Lower to 17.5% (-30%)	Lower to 17.5% (-30%)	Lower to 17.5% (-30%)
	5. Imputation credit	-15,201 ^a	-10,439 ^b	-3,033 ^c	...	-3,033 ^c
	6. Individual income tax					
	Lowest 20%	...	...	...	...	...
	Second 20%	-88.44%	-88.44%	-88.44%	11.93%	-88.44%
	Third 20%	-44.03%	-44.03%	-44.03%	-9.47%	-44.03%
	Fourth 20%	-32.46%	-32.46%	-32.46%	-4.61%	-32.46%
	Highest 20%	-11.42%	-11.42%	-11.42%	-6.35%	-4.63%
	7. government expenditure	...	...	...	...	+15,000

^a : Business income tax after repealing SUI with exemption from surtax on undistributed earnings levied on listed companies

= Business income tax + surtax on undistributed earnings + AMT + increment in business tax

= 278,985 + 23,562 + 11,900 + (136,449 + 11,313 - 12,143) = 450,066

→ Imputation credit decrease due to increment in business tax

= -(136,449 + 11,313 - 12,143) × 33.33% = -45,202

→ Imputation credit increase due to the reduction of business tax rate

= 450,066 × [(25% - 20%) / 25%] × 33.33% = 30,001

→ net imputation credit = -45,202 + 30,001 = -15,201

^b : Business income tax after repealing SUI with four tax breaks preserved

= Business income tax + surtax on undistributed earnings + AMT + increment in business tax

= 278,985 + 23,562 + 11,900 + (106,449 + 11,313) = 432,209

→ Imputation credit decrease due to increment in business tax

= -(106,449 + 11,313) × 33.33% = -39,250

→ Imputation credit increase due to the reduction of business tax rate

= 432,209 × [(25% - 20%) / 25%] × 33.33% = 28,811

→ net imputation credit = -39,250 + 28,811 = -10,439

^c : Business income tax after repealing SUI

= Business income tax + surtax on undistributed earnings + AMT + increment in business tax

$= 278,985 + 23,562 + 11,900 + (136,449 + 11,313) = 462,209$
 → Imputation credit decrease due to increment in business tax
 $= - (136,449 + 11,313) \times 33.33\% = -49,249$
 → Imputation credit increase due to the reduction of business tax rate
 $= 462,209 \times [(25\% - 17.5\%) / 25\%] \times 33.33\% = 46,216$
 → net imputation credit $= -49,249 + 46,216 = -3,033$

3. Simulation and Empirical Results

The simulation of our study will proceed according to five scenarios in Table 5. Impacts of the above simulating tax reforms on macro-economy, income distribution and tax revenue will be discussed as following.

3.1 Impacts on macro-economy

Impacts of repealing tax benefits obtained under SUI on macro-economy of Taiwan are shown in Table 6.

It brings about 0.018% increment of real GDP and 0.391% increment of nominal GDP under scenario 1. The private final consumption expenditure increases 0.726% due to the abatement of individual income tax and the enhancement of disposable income. Furthermore, fixed capital formation decreases 2.295% and employment decreases 0.003%. Due to a rise in domestic price indexes (CPI increases 0.385%) and an increase of 0.108% in terms of trade (TOT), the export competitiveness deteriorates (exports decreases 0.281%) . Government tax revenue deteriorates 1.898% for the reason of reducing business income tax rate and individual income tax rates at the same time.

Compared with scenario 1, the simulation results of scenario 2 show that the declining degree of fixed capital formation is milder to reach -1.901%. On the other hand, consumption will be expected to increase 0.822% in the meantime. Although export decreases 0.359% as a result of worse trade terms, consumption keeps growing. The final result shows that real GDP increases 0.036% and employment grows up 0.025%. Government tax revenue decreases 2.24% as a result of retention

of four functional tax incentive measures. The above result is worse than that under scenario 1. Income distribution of scenario 2 is also worse than that of scenario 1 for the same reason.

If Government overall cancels tax benefits obtained under SUI and reduces business income tax to 17.5% (scenario 3), the impact of tax expansion on the fixed capital formation will be improved and it will turn to 0.476% from a negative value. Furthermore, private consumption will increase 1.128% despite export will decrease 0.747% resulting from deterioration of TOT. As a result of increasing investment and consumption, the final result shows that real GDP and employment will increase 0.16% and 0.267% respectively. Business income tax and Government revenues from taxes will reduce 30% and 2.437% respectively. The result is worse than both scenario 1 and scenario 2.

3.2 Impacts on Income Distribution

Impacts of tax reform on income distribution under alternative experiments are listed in table 6. The results show that scenario5 improves most. Revoking the income tax exemption for military servicemen and teachers would raise the average effective tax rate of the highest 5th group, thus getting the better improvement in income distribution. Lower Gini Coefficient in scenario 5 indicates more equitable distribution of wealth in a society.

In scenario 3, the simulation reveals that all of the five equal divisions of households enjoy an increase in disposable income with different extent. The effective tax rate of the households in the lowest first 20% is zero initially; therefore, this group is less affected by the tax-cutting policies. As for the variation in disposable income, the second 20% households increases the most (3.327%), the next in sequence are the third 20%, the forth 20% and then the highest 20%. Besides, the Gini coefficient of inequality drops 0.497%.

The simulation in scenario 4 shows a deterioration in income distribution (i.e. Gini's concentration coefficient is positive). This scenario is based on the assumption of partial-dividend-exemption system in replacement of existing imputation system. According to the calculation by the author, the mid-upper middle class faces a reduction

of effective tax rate, while the lowest quintile sees a rise in effective income tax rate (see table 5). Wealth is concentrated in the hands of fewer people, which deteriorates the income distribution.

Table 6 The impacts of income tax reform on macroeconomics

Unit: %

	scenario1	scenario2	scenario3	scenario4	scenario5
Real GDP	0.018	0.036	0.160	0.062	0.295
Nominal GDP	0.391	0.483	0.961	0.254	1.276
employment	-0.003	0.025	0.267	0.141	0.434
Real Household Consumption	0.726	0.822	1.128	0.156	1.282
Real fixed capital formation	-2.295	-1.901	0.476	0.193	0.751
Real exports	-0.281	-0.359	-0.747	-0.181	-0.888
Real imports	-0.426	-0.291	0.293	-0.067	0.420
Nominal wage rate	0.385	0.452	0.744	0.159	0.877
GDP price index	0.373	0.446	0.800	0.192	0.979
CPI	0.385	0.452	0.744	0.159	0.877
TOT	0.108	0.136	0.277	0.068	0.330
Gov. revenues from taxes	-1.898	-2.242	-2.437	0.378	-1.669
financial deficit	4.896	6.773	9.154	0.252	10.943
Gov. revenues	-0.987	-1.420	-1.781	0.081	-1.160
Gov. expenditures	0.219	0.259	0.460	0.116	1.321
post-tax household income	0.913	1.084	1.697	0.335	1.948
Lowest 20%	0.172	0.322	0.876	0.203	1.201
Second 20%	2.575	2.731	3.327	-0.096	3.687
Third 20%	1.464	1.616	2.205	0.495	2.567
Fourth 20%	1.302	1.451	2.039	0.384	2.405
Highest 20%	0.391	0.579	1.214	0.365	1.371
Gini Coefficient	-0.541	-0.524	-0.497	0.087	-0.584

Source: Authors simulations.

3.3 Impacts on financial revenue

Impacts of tax reform on government tax revenue and financial deficit is shown in Table 7. Compared with scenario 1, 2 and 4, the deteriorating degree of Government tax revenues and financial deficit in scenario 3 is the most.

Under scenario 3 with a tax rate of 17.5%, the direct tax revenue decreases NT\$ 43.84 billion totally, which is due to the increment of business income tax revenue NT\$9.39 billion and the decrement of individual income tax NT\$56.94 billion. The indirect tax increases NT\$ 8.8 billion totally, which is due to the increment of commodity tax NT\$1.61 billion, the increment of customs duties NT\$ 2.4 billion, and the increment of value-added business tax NT\$ 2.297 billion. The Government tax revenues, inclusive of direct and indirect tax, decreases NT\$ 35 billion (-2.437%) eventually, which induces financial deficit to increase NT\$ 45 billion (9.154%).

Under scenario 2 with a tax rate of 20%, the direct tax revenue decreases NT\$ 36.82 billion totally, which is due to the increment of business income tax revenue NT\$26 billion and the decrement of individual income tax NT\$65.3 billion. Indirect tax increases NT\$4.61 billion as a result of ascending consumption. The above increment includes NT\$ 0.73 billion of commodity tax increase, NT\$ 1.12 billion of customs duties and NT\$1.32 billion of value-added business tax. The Government tax revenues, inclusive of direct and indirect tax, decreases NT\$ 32.21 billion (-2.242%) eventually, which induces financial deficit to increase NT\$33.33 billion (6.773%).

Under the partial-dividend-exemption system in scenario 4, Government tax revenues and financial deficit are improved without imputation credit in individual income tax. This is a scenario in which financial deficit deteriorates least (0.252%). Government revenues from taxes slightly increase 0.378%.

Table 7 The impacts of income tax reform on tax revenue and national coffers

	Calibrated CGE baseline	scenario1	scenario2	scenario3	scenario4	scenario5
		(%)				
Gov. revenues from taxes	1,436,623	-1.898	-2.242	-2.437	0.378	-1.669
Indirect tax	758,834	0.493	0.608	1.163	0.277	1.398
Commodity tax	146,706	0.390	0.498	1.097	0.293	1.316
Customs duties	125,379	0.675	0.893	1.927	0.460	2.294
VAT business tax	232,831	0.478	0.567	0.987	0.225	1.191
Other indirect tax	253,919	0.478	0.567	0.987	0.225	1.191
Direct tax	677,789	-4.576	-5.433	-6.468	0.492	-5.102
Business income tax	250,574	14.879	10.411	3.749	3.125	3.990
Individual income tax	212,416	-33.107	-30.743	-26.807	-2.459	-22.991
Other direct tax	214,798	0.944	1.114	1.726	0.338	1.984
financial deficit	-492,111	4.896	6.773	9.154	0.252	10.943
Gov. revenues	1,909,040	-0.987	-1.420	-1.781	0.081	-1.160
Gov. expenditures	2,401,152	0.219	0.259	0.460	0.116	1.321
Current expenditure	1,990,158	0.232	0.272	0.448	0.095	1.468
Capital expenditure	410,993	0.154	0.195	0.518	0.218	0.608
		(NT\$ million)				
Gov. revenues from taxes	1,436,623	-27,272	-32,210	-35,014	5,433	-23,973
Indirect tax	758,834	3,743	4,612	8,828	2,100	10,605
Commodity tax	146,706	572	731	1,610	430	1,930
Customs duties	125,379	846	1,120	2,416	577	2,876
VAT business tax	232,831	1,112	1,321	2,297	523	2,774
Other indirect tax	253,919	1,213	1,440	2,505	570	3,025
Direct tax	677,789	-31,015	-36,822	-43,841	3,333	-34,578
Business income tax	250,574	37,282	26,088	9,394	7,830	9,998
Individual income tax	212,416	-70,325	-65,303	-56,942	-5,223	-48,837
Other direct tax	214,798	2,029	2,393	3,707	726	4,261
financial deficit	-492,111	-24,094	-33,330	-45,049	-1,241	-53,854
Gov. revenues	1,909,040	-18,839	-27,107	-33,999	1,546	-22,146
Gov. expenditures	2,401,152	5,255	6,223	11,050	2,788	31,708
Current expenditure	1,990,158	4,620	5,420	8,922	1,893	29,207
Capital expenditure	410,993	635	802	2,128	895	2,501

Source: Authors simulations.

3.4 Impacts on real investment

In our model, we assume that investment of industries depends on their relative rates of return which in turn rely on profitability. It is assumed that post-tax rate of return ($R1CAP_{(i)}$) is the ratio of Rental price of capital ($P1CAP_{(i)}$) to Cost of unit of capital ($P2TOT_{(i)}$) deducts depreciation ($D_{(i)}$) and average corporate tax rate ($GOSTAX_{(i)}$). We can express the formulation as follows:

$$R1CAP_{(i)} = \frac{P1CAP_{(i)}}{P2TOT_{(i)}} - D_{(i)} - GOSTAX_{(i)} \quad (1)$$

From (1) we find that the change of the average tax rate in the current period will affect post-tax rate of return within the same period. If the average tax rate descends, both post-tax rate of return and investment will increase.

Impacts on the average corporation tax rate, post-tax rates of return on fixed capital and real investment are shown in Table 8, 9 and 10.

Regarding the steel and iron industry in scenario 2 and scenario 3, if the Government cancels tax breaks under SUI and proposes a tax rate of 20% with four tax breaks preserved, it will make the effective tax rate of the steel and iron industry reduce 13.55%. If the Government proposes a lower tax rate of 30% in scenario 3, it will induce the effective tax rate to descend 23.42%.

Through the inter-industry linkage effect, the effective rate of the steel and iron industry reduces slightly in scenario 2, post-tax rates of return increases 8.944%. Regarding impacts in scenario 3, post-tax rates of return on fixed capital increase 21.276%.

Investment of the steel and iron industry increases 2.874% in scenario 2 because of the slightly descending effective tax rate and low rates of return. Investment of the above industry increases 6.65% in scenario 3 as a result of a larger descending business income tax.

Regarding the domestic appliances industry, we will compare scenario 2 with

scenario 3. If the Government proposes a tax rate of 20% with four tax breaks preserved in scenario 2, the effective tax rate of this industry will increase 121.51%. If the Government proposes to lower tax 30% in scenario 3, the effective rate of this industry will increase 122.15%. Through the inter-industry linkage effect, the rates of return will reduce 44.84% and investment reduces 18.59% in scenario 2. Investment decreases 18.263% in scenario 3.

It is obviously that tax reform measures are more beneficial to conventional industries, such as steel and iron industry. On the other hand, high-tech manufacturing sector, such as domestic appliances industry, faces more negative impacts after the expiration of SUI.

3.5. Impacts on real output of industries

The simulation regarding impacts on real output is shown in Table 11. With respect to the domestic appliances industry, we find that output decreases 0.309% and 0.262% in scenario 2 and scenario 1 respectively. However, a larger descending business income tax makes a huge contribution to output of the industry in scenario 3. Its production value reduces only 0.079%. Through the inter-industry linkage effect, outputs of industries may increase or decrease after reducing income taxes in scenario 3. Outputs of machinery 、miscellaneous products and textile industries suffer and decrease 0.757% 、0.729% and 0.638% respectively. However, the real output of the construction industry increases 2.266%. Besides, cancellation of tax benefits obtained under SUI has less impacts on departments such as beverages, tobacco, process foods, education and medical industries which burden the less business income tax rate or no business income tax. In the mean time, since reducing individual income tax will strengthen consumption, outputs of the above departments eventually increase 0.76%, 0.663%, 0.615% and 0.594% respectively.

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Table 8 The impacts of income tax reform on average corporation tax rate (%)

	scenario1	scenario2	scenario3	scenario4	scenario5
Agr. & livestock	-16.13	-17.21	-26.62	-26.62	-26.62
fishery	-19.86	-21.10	-29.88	-29.88	-29.88
minerals	-16.36	-16.36	-26.82	-26.82	-26.82
process foods	-12.28	-11.15	-21.27	-21.27	-21.27
beverages	-12.36	-11.22	-21.33	-21.33	-21.33
tobacco	0.00	0.00	0.00	0.00	0.00
textile	12.86	12.61	2.55	2.55	2.55
apparel	17.32	17.78	3.92	3.92	3.92
wood & bamboo	-16.78	-16.31	-26.63	-26.63	-26.63
paper & printing	-6.03	-6.66	-16.45	-16.45	-16.45
chemical	76.93	52.06	60.60	60.60	60.60
fiber	77.05	52.15	60.71	60.71	60.71
plastic	76.63	51.80	60.33	60.33	60.33
plastic Prod.	63.45	41.87	46.37	46.37	46.37
misc. chemical	-3.05	-4.46	-12.73	-12.73	-12.73
petroleum	425.22	277.07	363.40	363.40	363.40
non-metallic	17.27	17.53	5.72	5.72	5.72
steel & iron	-13.63	-13.55	-23.42	-23.42	-23.42
misc. metal	-13.64	-13.56	-23.43	-23.43	-23.43
metallic	-9.15	-8.92	-19.77	-19.77	-19.77
machinery	-6.70	-8.44	-17.83	-17.83	-17.83
domestic	142.64	121.51	122.15	122.15	122.15
electronic	127.77	107.93	108.54	108.54	108.54
electrical	13.59	9.72	2.71	2.71	2.71
Transp. Equip.	7.78	6.21	-0.27	-0.27	-0.27
misc. Prod.	8.97	3.13	-3.79	-3.79	-3.79
construction	-17.75	-17.80	-27.33	-27.33	-27.33
electricity	108.82	109.90	83.67	83.67	83.67
gas & water	108.72	109.80	83.58	83.58	83.58
transport	4.79	3.91	-5.45	-5.45	-5.45
wholesale	-17.49	-17.81	-27.50	-27.50	-27.50
finance	-21.06	-17.62	-27.84	-27.84	-27.84
real estate	-21.82	-19.23	-29.31	-29.31	-29.31
eating & hotel	-19.42	-18.58	-28.73	-28.73	-28.73
business	30.80	30.59	17.47	17.47	17.47
Public Serv.	0.00	0.00	0.00	0.00	0.00
Educ. & Medical	-11.11	-13.99	-22.22	-22.22	-22.22
Other	-17.07	-16.90	-27.10	-27.10	-27.10

Source: Authors simulations.

Table 9 The impacts on post-tax rates of return on fixed capital (%)

	scenario1	scenario2	scenario3	scenario4	scenario5
Agr. & livestock	17.978	19.520	32.200	28.479	32.771
fishery	20.030	21.537	32.754	31.979	32.735
minerals	14.360	14.533	33.003	32.959	33.849
process foods	14.910	14.253	27.523	21.743	28.613
beverages	16.736	16.259	30.408	22.214	31.852
tobacco	4.769	5.332	7.260	1.060	8.417
textile	-10.682	-10.819	-5.385	-2.691	-6.021
apparel	-12.306	-12.698	-4.337	-3.446	-4.611
wood & bamboo	15.310	14.920	29.266	28.950	29.541
paper & printing	5.597	6.261	16.421	15.580	16.840
chemical	-36.406	-29.081	-32.672	-31.369	-32.974
fiber	-36.381	-29.053	-32.656	-31.350	-32.970
plastic	-36.215	-28.830	-32.174	-31.115	-32.421
plastic Prod.	-31.983	-24.344	-25.981	-25.797	-26.000
misc. chemical	3.784	5.201	14.097	12.160	14.556
petroleum	-57.879	-56.508	-57.908	-57.786	-57.898
non-metallic	-12.474	-12.526	1.388	1.117	2.340
steel & iron	9.241	8.944	21.276	25.057	20.840
misc. metal	9.217	8.621	17.188	22.290	16.062
metallic	6.494	6.183	17.465	18.938	17.225
machinery	1.339	3.140	12.687	15.461	12.089
domestic	-47.897	-44.840	-44.209	-44.992	-44.001
electronic	-45.940	-42.794	-43.179	-42.733	-43.284
electrical	-10.952	-8.634	-4.575	-2.793	-4.976
Transp. Equip.	-5.798	-4.517	1.442	1.090	1.476
misc. Prod.	-8.050	-4.093	0.216	2.090	-0.228
construction	17.131	18.015	45.470	40.909	48.534
electricity	-41.263	-41.278	-34.825	-36.806	-34.327
gas & water	-40.632	-40.605	-34.173	-36.930	-33.632
transport	-2.672	-1.857	6.154	4.609	6.527
wholesale	16.841	17.601	31.371	28.953	31.847
finance	22.294	18.493	32.121	29.686	32.547
real estate	23.464	20.497	33.882	31.639	34.192
eating & hotel	21.373	20.687	34.738	31.079	35.376
business	-19.383	-19.290	-12.339	-12.155	-12.263
Public Serv.	0.532	0.591	0.490	-0.162	7.185
Educ. & Medical	12.630	16.001	26.754	22.599	28.852
Other	18.312	18.439	31.880	28.600	32.543

Source: Authors simulations.

Table10 Impacts of tax reform on real Investment by using industry (%)

	scenario1	scenario2	scenario3	scenario4	scenario5
Agr. & livestock	5.619	6.075	9.707	8.668	9.865
fishery	6.224	6.667	9.863	9.648	9.857
minerals	4.561	4.606	9.982	9.969	10.216
process foods	4.704	4.504	8.395	6.736	8.702
beverages	5.254	5.109	9.208	6.875	9.609
tobacco	1.552	1.731	2.343	0.349	2.707
textile	-3.658	-3.708	-1.808	-0.895	-2.026
apparel	-4.244	-4.387	-1.452	-1.150	-1.545
wood & bamboo	4.831	4.710	8.903	8.814	8.980
paper & printing	1.814	2.025	5.156	4.904	5.282
chemical	-14.147	-10.831	-12.404	-11.834	-12.538
fiber	-14.136	-10.819	-12.397	-11.826	-12.536
plastic	-14.064	-10.727	-12.189	-11.727	-12.298
plastic Prod.	-12.126	-8.862	-9.538	-9.462	-9.545
misc. chemical	1.234	1.688	4.457	3.867	4.596
petroleum	-30.455	-27.141	-29.435	-29.368	-29.429
non-metalic	-4.350	-4.354	0.458	0.369	0.771
steel & iron	2.969	2.874	6.610	7.704	6.482
misc. metal	2.950	2.766	5.382	6.881	5.046
metallic	2.099	2.001	5.471	5.907	5.399
machinery	0.440	1.026	4.030	4.871	3.847
domestic	-20.407	-18.590	-18.263	-18.671	-18.155
electronic	-19.177	-17.411	-17.607	-17.381	-17.661
electrical	-3.756	-2.936	-1.533	-0.930	-1.669
Transp. Equip.	-1.954	-1.515	0.474	0.358	0.485
misc. Prod.	-2.730	-1.369	0.071	0.684	-0.075
construction	5.439	5.687	13.447	12.229	14.251
electricity	-16.679	-16.685	-13.481	-14.395	-13.255
gas & water	-16.357	-16.345	-13.178	-14.447	-12.934
transport	-0.890	-0.617	1.991	1.499	2.109
wholesale	5.288	5.513	9.488	8.811	9.620
finance	6.891	5.773	9.689	9.011	9.807
real estate	7.227	6.362	10.174	9.555	10.259
eating & hotel	6.622	6.420	10.413	9.402	10.587
business	-6.893	-6.857	-4.259	-4.193	-4.232
Public Serv.	0.175	0.195	0.161	-0.054	2.316
Educ. & Medical	4.009	5.030	8.175	6.983	8.767
Other	5.719	5.756	9.619	8.703	9.802

Source: Authors simulations.

Table11 The impacts of income tax reform on real outputs (%)

	scenario1	scenario2	scenario3	scenario4	scenario5
Agr. & livestock	0.264	0.294	0.399	0.095	0.448
fishery	0.012	0.007	-0.034	-0.027	-0.048
minerals	-0.184	-0.182	0.352	0.478	0.406
process foods	0.408	0.458	0.615	0.068	0.710
beverages	0.513	0.573	0.760	0.093	0.867
tobacco	0.454	0.503	0.663	0.094	0.761
textile	-0.356	-0.424	-0.729	-0.146	-0.866
apparel	-0.224	-0.275	-0.536	-0.139	-0.639
wood & bamboo	-0.187	-0.191	-0.034	0.106	-0.039
paper & printing	-0.044	-0.048	-0.073	-0.018	-0.057
chemical	-0.108	-0.127	-0.212	-0.046	-0.250
fiber	-0.244	-0.291	-0.502	-0.106	-0.596
plastic	-0.122	-0.142	-0.224	-0.045	-0.265
plastic Prod.	-0.139	-0.153	-0.176	-0.005	-0.209
misc. chemical	0.061	0.070	0.132	0.049	0.154
petroleum	-0.037	-0.043	-0.037	0.016	-0.041
non-metallic	-0.158	-0.149	0.466	0.543	0.540
steel & iron	-0.324	-0.353	-0.280	0.092	-0.332
misc. metal	-0.318	-0.367	-0.575	-0.116	-0.678
metallic	-0.334	-0.364	-0.427	-0.070	-0.495
machinery	-0.755	-0.731	-0.757	-0.231	-0.872
domestic	-0.309	-0.262	-0.079	-0.170	-0.047
electronic	-0.153	-0.172	-0.271	-0.079	-0.315
electrical	-0.195	-0.223	-0.347	-0.086	-0.406
Transp. Equip.	-0.099	-0.088	-0.003	0.087	-0.029
misc. Prod.	-0.351	-0.397	-0.638	-0.195	-0.740
construction	-0.019	0.085	2.266	1.803	2.643
electricity	0.074	0.089	0.151	0.032	0.183
gas & water	0.279	0.316	0.432	0.049	0.506
transport	0.058	0.070	0.119	0.023	0.150
wholesale	-0.049	-0.008	0.159	-0.015	0.193
finance	0.095	0.112	0.178	0.033	0.205
real estate	0.013	0.015	0.020	0.005	0.023
eating & hotel	0.263	0.291	0.359	0.030	0.413
business	-0.135	-0.150	-0.204	-0.037	-0.218
Public Serv.	0.000	0.000	0.000	0.000	1.180
Educ. & Medical	0.373	0.423	0.594	0.086	0.887
Other	0.260	0.302	0.439	0.071	0.523

Source: Authors simulations.