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# The Impacts of Direct Tax Reform on Taiwan's Economy

## -A Computable General Equilibrium Analysis

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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% or17.5%; (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 date 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 billion[1] 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 billion[2] 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 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 1and 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$15 billion[3], and that this revenue amounts would be used to improve the welfare of teachers and military servicemen. According to Government Research Bulletin, salaries of military personnel is at the average of NT$ 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 9$^{th}$ 10 percent of households when ranked according to income).Thus, the effective tax rate of the highest 5$^{th}$ 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-metalic | 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 due to SUI | | | 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) | (10)=(4)+(7) |
| 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 |

Souce: 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 SIU | +136,449 | +106,449 | +136,449 | +136,449 | +136,449 |
| | 2. tax increment assessed on undistributed earnings if abolishing SIU | +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 to20% (-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)×33.33%= -49,249

➔Imputation credit increase due to the reduction of business tax rate
= 462,209×[(25%-17.5%)/25%]×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 $5^{th}$ 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 scenario1, 2 and 4, the deteriorating degree of Government tax revenues and financial deficit in scenario 3 is the most.

Under scenario3 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 scenario2 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:

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

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-metalic | 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-metalic | -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-metalic | -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.