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Impacts of TRAIN fuel excise taxes on employment and poverty

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The first package of the Tax Reform for Accelerated Inclusion (TRAIN 1) Law took effect in January 2018. This package focuses on adjustments in income brackets and personal income tax rates, excise tax rates, and value-added tax coverage, among others. In general, personal income taxes are lowered for most taxpayers and raised for the higher income individuals. Meanwhile, among the commodities covered by excise tax adjustments are fossil fuels and petroleum products, automobiles, and sugar-sweetened beverages.

This *Policy Note* discusses the impacts of the increase in excise tax rates for fossil fuels and other policy shocks under TRAIN 1 on poverty and employment. Employment and poverty are among the most important development issues and keeping track of how these indicators react to economic shocks is imperative in policy discussions.

Objectives of TRAIN

Although the primary goal of the tax reform initiative is to generate revenue for the government's big-ticket infrastructure projects and social programs, its other objectives are equally compelling. For instance, TRAIN 1 attempts to make taxation more progressive by reducing the tax rates for low-income earners and raising the tax rate for the rich. Meanwhile, the increase in excise tax on fossil fuels and petroleum products aims to reduce carbon footprint in the Philippines. The rest of TRAIN 1 is expected to make tax collection more efficient and increase revenue.

The intended effects identified above are only among the immediate effects of the TRAIN. Because activities in the economy are interrelated, the effects of the tax reform package will not be confined in specific aspects of the economy, such as household incomes and prices of goods affected by tax adjustments.

For instance, reduced tax rates imply higher take-home pay for workers. Due to income effect, those who experienced increase in disposable income due to tax cut will likely have increase in demand for some goods. Because the tax cut has a wide coverage of taxpayers, changes in demand will have impact on market prices and economic activities. Similarly, increase in excise tax of some commodities, such as petroleum products, will lead to an increase not only in the prices of such commodities but also in the prices of commodities that use the taxed commodities as intermediate inputs in their production.

Analyzing the impact of economic policies is straightforward when one is only concerned about how the equilibrium point in specific markets will be affected. The task becomes daunting when the interest shifts to determining the impact on all markets, a general equilibrium. Analytical approach may work for general equilibrium problems that involve only a handful of sectors. For instance, when sectors are aggregated into either agriculture, industry, or services. But even in this case, finding an analytical solution to a general equilibrium problem may already be exhausting. However, focusing on few aggregated sectors will entail loss of some information that may be useful for policy evaluation.

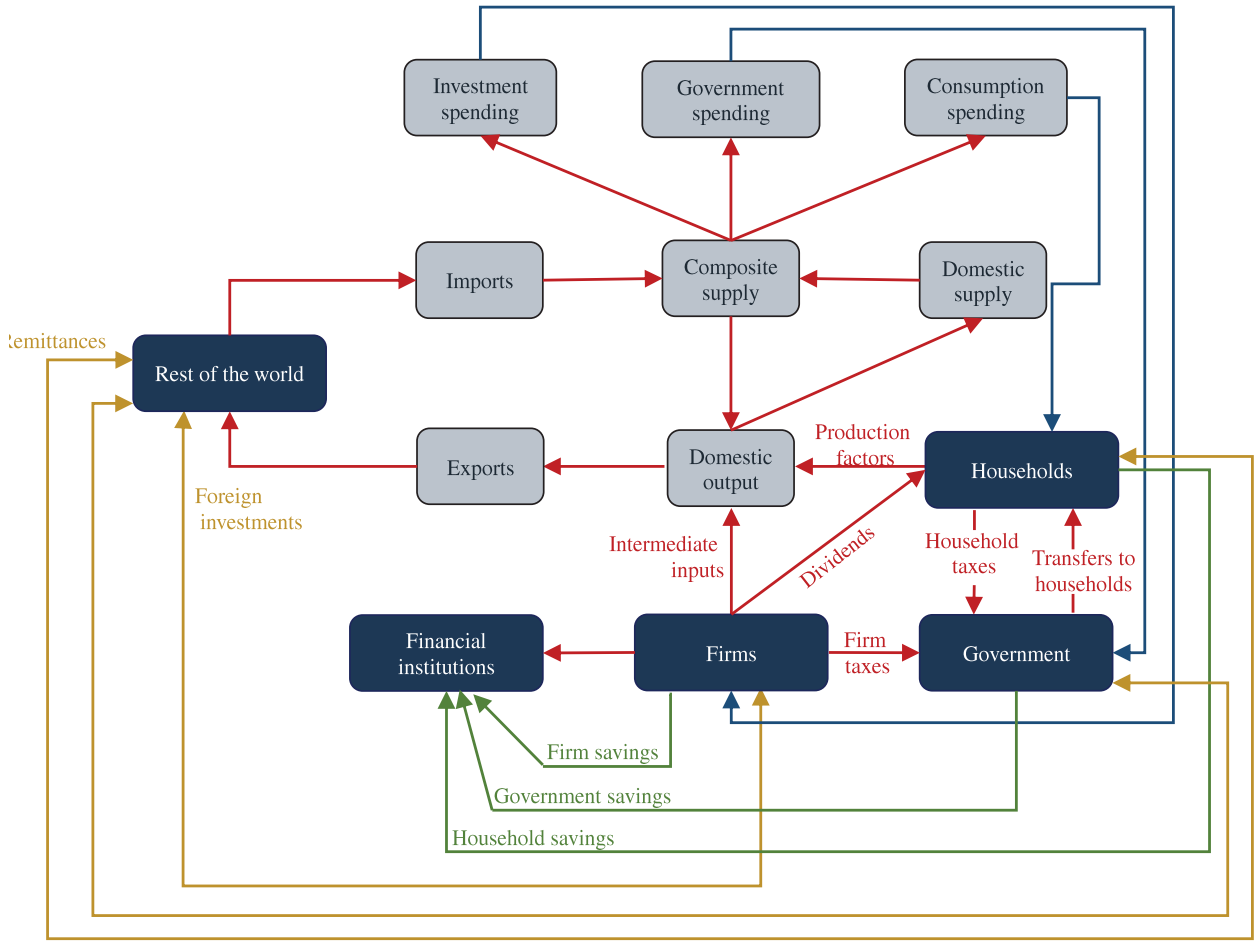
Computable general equilibrium and microsimulation

CGE model

A computable general equilibrium (CGE) model is a tool that determines the overall impact of shocks to an economy. A CGE model is composed of equations that represent how the economy works as described by the basic circular flow of values in an economy (Figure 1)

A typical CGE model has blocks of equations to represent consumption decision of households, production decision of firms in different sectors, and commodities and factor markets that are in equilibrium. Many CGE models also

Figure 1. Economic flows in a computable general equilibrium model



Source: Modified from Markusen and Rutherford (2004)

incorporate the behavior of government entity and an economy's transactions with the rest of the world. Although commonly used in modeling international trade, any economic policy that mainly affects the real economy can be analyzed using CGE.

A CGE model is numerically solved by calibrating the parameters of the CGE model using data in a social accounting matrix (SAM). SAM can be thought of as an extended input-output matrix that summarizes the transactions among sectors, households, government, financial institution, and rest of the world.[1] However, unlike an input-output matrix, the SAM is a square matrix and is balanced, that is, the sum of rows (total income) equates to the sum of the corresponding columns (total spending). The balanced nature of the SAM represents the assumption that supply equals demand.[2]

Economic shocks, such as public policies, change the equilibrium point of an economy. In a CGE model, this change is observed as the movement in the level of economic activities, such as level of production and consumption, as well as changes in prices of commodities and factors of production. Thus, a CGE model is extremely useful in tracking the changes in economic indicators of interest, such as growth in the gross domestic product, overall inflation, and aggregate welfare, as the economy moves from one equilibrium point to another in the presence of an economic shock.

This paper used the standard static neoclassical model calibrated to a 2015 SAM to model the economic impacts of raising the excise tax on fossil fuels and the other tax policies in TRAIN 1. Two policy scenarios were considered. First, excise tax rates for coal and petroleum products are changed based on TRAIN 1 package. The changes in excise taxes were used as policy shock. Second, the other features of TRAIN were used as policy shock. The CGE is modeled as a mixed complementarity problem and is solved numerically using mathematical programming system for general equilibrium analysis (MPSGE) subsystem of General Algebraic Modeling System (GAMS), a software used in CGE modeling. Given that the model is static, the changes in equilibrium point are the instantaneous reaction of the economy to the shocks. The time frame by which the change occurs is of little relevance because the purpose of the modeling exercise is to get a general picture of the economy in the presence of the shock.

Microsimulation

The CGE model has limited heterogeneity in households (and firms), i.e., instead of modeling the behavior of each household and firm in the Philippines, the study used 10 representative households corresponding to income deciles to capture the behavior of households in each income decile, and one representative agent to capture the behavior of all firms. The use of representative firms does not impose limitations, at least, in computing the poverty effects of the shocks, however, the use of representative households does. To address the limitation resulting from using representative households, the study employed microsimulation to determine the impact of the economic shocks on poverty. Households mainly earn income from returns to factors of production. In the CGE model, there are three factors of production, namely, unskilled labor, skilled labor, and capital. The changes in factor income resulting from policy shocks are captured by changes in factor prices. The change in income of households are computed by inflating household income from each factor of production using the computed factor prices from the CGE.

However, shocks also simultaneously change prices of commodities. The real change in household income is hence computed by deflating the factor-income-inflated household incomes using the weighted average of commodity prices. To compute the income deflator, the study used each household's share to total consumption of each consumed commodity as weights. Simultaneously inflating and deflating households' income will yield

[1] The basic structure of a SAM is discussed in Cororaton (2003) and Hosoe et al. (2010).
[2] A balanced SAM satisfies Walras Law.

their real value due to the shocks, with 2015 serving as the base year.

In identifying the poor households, the study used poverty thresholds from Philippine Statistics Authority (PSA) for each province and for both urban and rural areas. As a rule of thumb, if the real per capita income of a household falls below the threshold, the said household is considered poor.

Meanwhile, to determine the impact of the policy shocks on employment, the study used the changes in activity levels across sector and related them to the level of output reported in 2015 National Income Accounts and employment per output ratio computed using 2015 data from the National Income Accounts and the merged Family Income and Expenditure Survey-Labor Force Survey (FIES-LFS) from PSA.[3] The total change in employment is computed as the product of the sectoral employment-output ratio, sectoral output, and sectoral growth rate (obtained from the CGE solution).

Results

Impact on poverty

Table 1 presents changes in poverty incidence by scenarios simulated using the CGE. The column "computed baseline" shows baseline poverty incidence rates in percentage. The baseline rates are the poverty incidence rates without the shocks and these are computed using the data from the merged 2015 FIES-LFS (PSA 2015). Meanwhile, the columns under the label "change from baseline" present the percentage point changes in poverty incidence rate due to the shocks. There are three scenarios simulated in the study. For the first scenario, the effects of the first shock which was increase in excise taxes on petroleum products are presented in the column "PCEX". For the second scenario, the impact of shocks under TRAIN 1, apart from excise tax on fossil fuels, is presented in the column labeled "TRAIN 1". For the third scenario, the column "TRAIN 1 + UCT" presents the results when tax adjustments under TRAIN 1 and unconditional cash transfer (UCT) under the TRAIN law is implemented. Besides households and individuals, the study was also interested in changes in poverty incidence among women, fisherfolk, transport workers, and farmers, who are deemed the most vulnerable to increases in price of fuel.

Table 1. Poverty incidence, by scenarios

Sector	Computed Baseline	Change from baseline		
		PCEX	TRAIN 1	TRAIN 1+ UCT
Households	16.48	+0.16	+1.72	+0.26
Individuals	21.59	+0.20	+2.03	+0.65
Women	21.24	+0.19	+1.87	+0.57
Fisherfolk	32.47	+0.17	+3.20	+1.35
Transport workers	8.29	+0.26	+2.06	-8.16
Farmers	34.51	+0.32	+2.33	+0.06

PCEX = petroleum and coal excise tax; TRAIN = Tax Reform for Acceleration and Inclusion; UCT = unconditional cash transfer
Souce: Authors' calculations

Based on the results, the general price increase resulting from new excise tax rates on fuels slightly increased poverty incidence in all sectors (Table 1, under the column "PCEX"). However, the most affected were the farmers and transport workers whose poverty incidence rates increased by 0.26- and 0.32-percentage points, respectively. One explanation for this is that although the excise tax increased prices of petroleum, oil-generated energy, and mining, it did not lead to more than 2 percent increase in prices of other commodities. Thus, despite declining price of unskilled labor and capital, the real incomes of households did not fall greatly.

This modest effect on poverty, however, disappeared when other shocks from TRAIN were incorporated into the model. Under the TRAIN 1 scenario, prices increased faster due to increase in demand caused by higher disposable income of households because of tax cuts. The increase in commodity prices offset the increase in factor prices causing losses in the real value of household incomes. This resulted in more members

[3] Under the assumption of constant returns to scale, the percentage change in employment is equal to the percentage change in economic activities.

of the sectors falling into poverty, although the most affected were the fisherfolk and farmers as poverty incidence increased by 3.2-percentage points for fisherfolk and 2.33-percentage points for farmers.

TRAIN 1 provides for UCT to the bottom 50 percent of households. The study implemented this in the microsimulation as an exogenous increase in incomes of households by PHP 3,600.[4] However, this amount was also deflated using the price index constructed based on CGE commodity price output and consumption shares of households for each commodity. The changes in poverty incidence across sectors are shown in the last column of Table 1.

Although poverty incidence still increased in all sectors except for transport workers, the transfer was able to mitigate the poverty-inducing impact of TRAIN 1. Meanwhile, the cash transfer was effective in reducing poverty among transport workers because on the average, they require less income to cross the poverty threshold unlike other sectors.[5]

Impact on employment

Table 2 presents the changes in employment across sectors. Values in parenthesis mean that employment level fell. At the aggregate level, employment fell under the first scenario (PCEX) because of reduced economic activities in most agricultural and industrial activities.

Under the TRAIN 1 scenario, although employment in some industrial activities fell because of the decline in level of economic activities, these were offset by increase in employment in agricultural activities. The net effect of TRAIN 1 scenario on employment was positive, i.e., total employment still grew, and this was also true when cash transfers were included in the CGE simulation along with TRAIN 1 scenario.

[4] A PHP 3,600 transfer is the end-game scenario under TRAIN 1.
[5] Income gap measures how far the income of a poor household is from the poverty threshold. In general, households with lower income gap require less money to cross the poverty threshold. Based on the 2015 FIES-LFS (PSA 2015), transport workers have the lowest income gap among the sectors considered in this paper.

Table 2. Change in employment, various scenarios, by number of workers

Sector	PCEX	TRAIN 1	TRAIN 1+ UCT
Paddy rice	(5,061)	91,093	98,684
Corn	(1,421)	22,744	24,165
Other crops	(2,388)	121,808	128,973
Sugarcane	(1,231)	12,721	13,542
Banana	-	14,114	14,820
Livestock and other animal products	(2,538)	14,383	15,229
Forestry	223	6,677	7,567
Fishery	(1,331)	30,605	34,597
Mining and quarrying	(217)	(11,067)	(10,850)
Oil and gas	(13)	(25)	(25)
Food manufactures	(2,396)	23,158	25,554
Manufacture of sugar	(74)	501	557
Beverage and tobacco	-	(25,165)	(25,068)
Textile and garments, tanneries and leather	(4,872)	31,665	33,492
Wood and wood products	(1,377)	(18,938)	(18,594)
Paper and printing	(1,545)	3,091	2,576
Petroleum and other fuel products	(392)	(118)	(109)
Chemicals, cosmetics, rubber and plastic products	(920)	(22,082)	(21,775)
Nonmetallic mineral products	(638)	(2,641)	(2,641)
Metals (except for Iron and steel)	(7,039)	(11,463)	(11,262)
Iron and steel	(129)	(419)	(419)
Computer, electronic and optical products	(3,463)	(23,086)	(22,701)
Machineries and equipment (except for engine and turbines, etc.)	762	(5,261)	(5,261)
Manufacture of engines and turbines, except aircraft, vehicle and cycle engines	(121)	(3,504)	(3,504)
Transport equipment	(1,146)	(2,604)	(2,500)
Other manufactured goods	(1,779)	(21,347)	(21,124)
Utilities	(341)	2,636	2,899

Table 2. Continuation

Sector	PCEX	TRAIN 1	TRAIN 1+ UCT
Construction	(12,186)	(27,418)	(24,372)
Wholesale and retail trade and maintenance and repair of motor vehicles	7,686	(15,372)	(15,372)
Transport services and storage	(52,949)	14,708	20,591
Telephone and communications	597	(671)	(895)
Financial services	5,845	(19,972)	(22,407)
Public administration, education, and health	45,578	(20,717)	(33,147)
Other services, including business services, and tourism	8,619	206,863	215,482
Total	(36,256)	364,898	396,702

PCEX = petroleum and coal excise tax; TRAIN = Tax Reform for Acceleration and Inclusion; UCT = unconditional cash transfer
Note: Coal, natural gas, and crude oil have all been integrated into the oil and gas sector while electricity transmission, the electricity generation sectors (coal, hydroelectric, geothermal, etc.) and other utilities have been integrated into the utilities sector, as the Labor Force Survey does not have disaggregated information in the different industrial and service subsectors. A figure without parentheses shows an increase in the number of workers compared to the baseline while a decrease is shown by figures with parentheses; the basis of the figures is the number of workers in each sector in 2015.
Source of basic data: 2015 FIES-LFS (PSA 2015)

Conclusion and policy implications

This study analyzed the poverty and employment impacts of excise taxes on fuel products as well as other tax reform policies under the TRAIN 1 using CGE modeling and microsimulation. The results show that although excise taxes on fuel products entailed minimal increase in poverty incidence, the first package of TRAIN increased poverty among households and individuals and across, all sectors considered. This was due to the increase in commodity prices that offset increase in factor incomes. Nonetheless, the UCT for households at the bottom 50 percent provided by the TRAIN mitigated the increase in poverty.

Based on the results of the CGE simulation, employment in some sectors suffered from reduced level of economic activities due to the shocks from the TRAIN 1. Although overall employment may still increase, the transition from one work to another may become costly for some workers. This makes active labor market policies, such as direct employment creation, as in infrastructure, and passive labor market policies especially those that link workers to available work useful in minimizing the welfare loss of workers.

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