IMPACT OF DIFFERENT MODES OF TRANSPORT INFRASTRUCTURE FINANCING IN A DEVELOPING ECONOMY

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ABSTRACT

Almost half of funds used for transport infrastructure investment in the Philippines comes from the national government. It relies on tax collection as a major source of funds for transport infrastructure. Indirect taxes like the value added tax remain the most popular way of harnessing funds due to relative ease in collection and dampening effect on consumption of transport services with negative externalities like pollution and congestion. On the other hand, the national government also relies on foreign aid to finance mega transportation projects. A third type of financial mode , imposition of higher direct tax on households across regional income groups, is also a major source of tax revenues These three financing modes of the national government are alternatively used to fund an equal amount of land transport infrastructure improvements across five different regions in the Philiipines

This paper introduces a system-wide approach in impact analysis of three different modes of financing utilized in developing countries like the Philippines – (1) availment of foreign transfer as in official development assistance funds from donor countries (2) imposition of additional value-added tax on transport services and (3) imposition of higher income tax on households. They represent extreme types of financing in terms of reallocation effects. The first creates minimal price distortion effects since it is a unilateral transfer of funds from the rest of the world to the home country. On the other hand, the second impacts strongly on resource reallocation as it affects pricing of transport services The third mode looks into the impact of lowering purchasing power of households via higher personal income taxes. The amount of funds generated from these alternative scenarios will be used for major transport infrastructure projects across the Philippines. The effect of each financing scheme on output and welfare will be analyzed per regional transport mode - land, water and air; per regional production sector namely - agriculture, industry, water transport services, air transport services, land transport services, other services and government services ; and per regional household income groups – low, middle and high. The analytical tool used is a transport-oriented spatial general equilibrium (SCGE) model with a five region social accounting matrix as database. An SCGE calibrates equilibrium values of production and consumption after an exogenous financing shock is introduced in the system .The model is composed of thirty-four production sectors, fifteen household income groups, two primary inputs – capital and labor, and four institutions.

Based on the results, the more efficient and equitable financing mode will be identified. Efficiency is measured by increments in regional gross output due to higher levels of financing of urban transport infrastructure. Equity is measured by relative welfare gains of the low income households as compared to the high and middle income households.

Keywords: taxes, foreign transfers, output, welfare, general equilibrium

INTRODUCTION

For developing countries with twin problems of huge budget deficit and trade deficit, sourcing funds for transport infrastructure investment is a major concern among policy makers.

Several studies in the past have documented the fact that transport infrastructure investments have extensive output and employment multiplier effects. Many argue that transport infrastructure expenditure alleviates poverty and helps in the attainment of millennium development goals. Economic rates of return on road projects for example have averaged around 80% across low-income countries (Briceno et al, 2004). According to World Bank estimates, 90% of loan commitments released by the bank between 1999 and 2003 generated average economic return of 35% , with transport projects generating 43%.return compared to water and sanitation projects which generated 19% (Estache, 2004). There is a unanimous consensus, given the strong macroeconomic and microeconomic evidence, that socio-economic benefits of transport projects are large.

A large amount of resources are involved in financing transport infrastructure projects .Constraints of relatively tight fiscal position of developing countries like the Philippines, have forced governments to seek foreign aid and encourage private sector participation in funding transport projects.

With these in mind, this study seeks to look into the impact on gross output and relative welfare of different types of financing with seemingly opposite reallocative effects. The first one has distortionary effects on prices since it takes the form of a value-added tax on land transport services. Its main purpose is revenue enhancement and is mainly characterized by relative ease in collection. The second has minimal distortionary effect on prices since it involves foreign transfers or official development assistance (ODA). The third one has redistributive effects since it takes the form of an increase in direct tax of household income which is a progressive tax. This study tries to fill in the research gap of identifying spatial distribution of benefits of transport financing policy in terms of its welfare effects among fifteen household income groups and output effects across thirty-four regional production sectors in a spatial computable general equilibrium model.

The succeeding sections give a brief overview of studies on transport financing studies and a quick situationer of infrastructure financing in the Philippines. The theoretical part presents a spatial computable general equilibrium model with a five region social accounting matrix as database. The empirical part presents the simulation results of alternative modes of financing transport infrastructure investment in the Philippines. The paper concludes with some insights for policy makers regarding choice of financing mode for transport infrastructure in the Philippines.

OVERVIEW OF STUDIES ON TRANSPORT INFRASTRUCTURE FINANCING IN DEVELOPING COUNTRIES

This section elaborates on current issues involved in transport infrastructure financing. This will put in place the previously mentioned objective of this paper.

The current literature on financing for transport infrastructure focuses on four major issues as delineated by Estache (2004): (1) financing needs of infrastructure; (2) scope for private participation in infrastructure financing; (3) fiscal position of governments in developing countries to meet infrastructure needs and (4) new types of financing mechanisms. Ballpark figures from a World Bank study by Briceno et al (2004) indicated that for developing countries; general infrastructure needs have an average total need of 6.5% - 7.7% of GDP; with breakdown of 3.3 % - 3.5% of GDP utilized for operational and maintenance expenditures and the residual of 3.2- 4.2% of GDP used for investment needs..

Two traditional sources of funding are government tax revenues and foreign transfers like official development assistance during the 1990s. For many low income and middle income countries, government revenues provide 70% of funding, whereas the private sector provide 20-25% and official development assistance (ODA) filled in 5%-10% of total financing (UK Department for International Development, 2002) ; (Briceno et al, 2004). However, at the onset of the 21st century, it seems the private sector now provides more funds than foreign sources. The International Monetary Fund estimated that around 2.1% of GDP in upper-middle income countries to 3.2% in low-income countries goes to infrastructure spending.

In terms of private sector participation, the following trends were established based on a world-wide data base for 1990-2002 collated by Estache (2004). Committed funds by the private sector in developing countries amounted to $805 billion or $62 billion a year. However, after the Asian financial crisis in 1997, private commitments were on a decline. The main reasons are higher cost of doing business and private sector wariness towards risks of infrastructure investment. In 2002, for example, private commitments totaled only $47 billion, the lowest since 1994. This covers only around 10-15% of investment needs. In terms of sectors, priority was given to funding energy and telecommunications projects in regions like Latin America, East Asia and Eastern Europe..

As far as foreign transfers are concerned, an interesting finding by Chatterjee et al (2003) showed that pure transfers for infrastructure investment have no growth or dynamic consequences but always resulted to increases in welfare. In other words, transfers are quite short-term. They contrasted the effects of a transfer tied to investment in public infrastructure with those of a traditional pure transfer. Chatterjee et al (2003) showed that a temporary pure transfer has only modest short-run growth effects and leads to a permanent deterioration in the current account. On the other hand, a productive infrastructure-related transfer has significant impacts on short-run growth, which redounds to permanent improvement in key economic variables. Estache (2004) argued that welfare and output effects take place when transfers are tied to infrastructure. He believes that long-run growth welfare effects depend on the initial stock of infrastructure as well as co-financing arrangements. These findings highlight the usage of economic and not political critieria in determining optimal allocation of scarce international aid funds for developing countries. Another concern of foreign donors is the intertemporal allocation funds. The basic dilemma is whether they should be used for current operating expenditures or for capital expenditures. Kalaitzidakis and Kalyvitis (2004) answerd this concern by creating an infrastructure-led growth model where the durability of public capital was endogenous and varied according to its usage and the level of maintenance

In terms of the relationship between fiscal position of developing countries and transport infrastructure funding are concerned, belt-tightening measures adopted by foreign-debt strapped, developing countries, have limited the extent of public funding of transport infrastructure. Easterly and Serven (2003) argue that macroeconomic policies which adopt intensive fiscal adjustment programs, must not suppress implementation of infrastructure projects and avoid wasteful, unnecessary construction of useless structures.. Standard IMF adjustment programs advocate short-term aggregate balance, medium-term debt sustainability, cutting down excessive and inefficient public expenditures and the promotion of private participation in infrastructure.

In the end, Estache and Pinglo (2004) identified four major directions where the literature on infrastructure financing is heading: (1) technical literature on the desirability and conditions of efficient public-private partnerships; (2) need to develop financial markets in developing countries; (3) search for new and improved risk mitigation products that will help strengthen the connection between infrastructure development and private financial markets; and (4) subsovereign issues or capability of local governments in attracting funds for transport infrastructure development.

CURRENT INFRASTRUCTURE DEVELOPMENT PLAN OF PHILIPPINE GOVERNMENT AND ITS FINANCING

To put into context the financing issues discussed within Philippine setting, a brief situationer on infrastructure development plan of the Philippines is presented together with its funding scheme.

The current administration under President Gloria Macapagal-Arroyo has embarked on the implementation of a comprehensive infrastructure development plan with transport projects as a major component. This is included in a Medium Term Development Plan (MTDP), which is a six year plan that coincides with the term of the incumbent president. It defines the macroeconomic and sectoral targets and the general thrust of economic policies in the Philippines. Part of the Plan is a Medium Term Public Investment Plan (MTPIP), which contains the projects that must be undertaken to achieve the numerical targets. The current administration has identified strategically important transport infrastructure projects in the so-called “super-regions.” In 2006, the National Economic Development Authority (NEDA), the economic planning body, has put forth a super-region scheme which aims to connect major islands in the Philippines through an intermodal transport infrastructure scheme. Emphasis was placed on those transport infrastructure projects which enhance connectivity and spatial cohesiveness among the Philippine regions The five regions are; (1) Luzon Urban Beltway – heartland of industry, trade and commerce and contributes the most to national economy, (2) Central Philippines – envisioned to be the premier tourist destination with its beautiful and scenic spots, (3) North Luzon Agribusiness Quadrangle – has comparative advantage in agricultural and food productivity, (4) Mindanao Agribusiness Region – has competitive edge in agribusiness and (5) Cyber Corridor – an ICT channel running from Northern to Southern

Philippines..Instead of emphasizing homogeneity in structure of each region in terms of economic performance, super-regions are meant to complement each other in terms of resource availability and comparative advantage... The priority given to infrastructure is manifested in 27% increase in budget allocation to the Department of Transportation & Communication and the 20.2% increase to funds given to the Department of Public Works and Highways this fiscal year of 2008. To get an idea of the spatial distribution of transport infrastructure funds across the country, the table below is presented. A striking feature is that the bigger allocation goes to the socio-economic-political center region ,National Capital Region, and its adjacent regions namely Northern Luzon and Southern Luzon. These fall under the category of Luzon Urban Beltway, with the nearby regions falling the category of Luzon Urban Beltway and Central Philippines.

	ALLOCATION OF FUNDS ACROSS SUPER-REGIONS		
Super Region	**No. of Projects**	**Amount (Billion Pesos)**	**Percentage Share (%)**
Luzon Urban Beltway	283	826.50	40.79 %
Central Philippines	361	412.39	20.35 %
North Luzon Agribusiness Quadrangle	207	368.82	18.21 %
Agribusiness Mindanao	316	325.91	16.09 %
Cyber Corridor	30	63.07	3.11 %
Across All Super Regions	31	29.45	1.45 %

Source : National Economic Development Authority, Public Information Division, 2008

Prior to world-wide increase in the price of oil and global shortage in rice supply, it it was planned that the budget would be balanced by this end of this year 2008. To achieve this goal, domestic sources will be tapped which is around 64% and the residual from foreign sources . However, the reverse seems to happen, based on the current sourcing of funds as reported by NEDA. Maybe the reason is that ODA or foreign-funded projects cut across political boundaries within domestic economy. Revenue growth for 2008 is projected to be 10.5% and total revenues are estimated to be 17% of GDP. It is also forecasted that national government debt will drop to 54% of GDP. (Dept. of Finance : 2007).

Briefly, the plan aims to spend around 1.904 trillion pesos over the remaining years of the Arroyo administration from 2007 to 2010 on infrastructure projects; 37% of which will go to the transport sector. This magnifies the importance attributed to higher mobility of persons and commodities across regions in the Philippines and strong linkage with the rest-of-the world.

UPDATED COMPREHENSIVE AND INTEGRATED INFRASTRUCTURE PROGRAM - FOR FISCAL YEARS 2007-2010 (as of Jan. 24, 2008)		
Type of Infrastructure	**Billion Pesos**	**Percent Share (%)**
Transport	753.24	37.1
Power	527.05	26.01
Water	425.66	21.01

Social Infrastructure	203.97	10.07
Communication	63.07	3.11
Relending	27.73	1.37
Support for CARP (Comprehensive Agrarian Reform Program)	25.47	1.36

Source : National Economic Development Authority, Public Information Division, 2008

The profile of source of funding shows that more than half of funding infrastructure projects will come from national government funds and around one third will come from the private sector.

Source of Financing of Infrastructure -- Years 2007-2010	
	Percentage Share (%)
National Government	53.86
Private Sector	31.68
GOCCs (Government-Owned & Controlled Corporations)	5.68
GFIs (Government Financial Institutions)	1.33
LGUs (Local Government Units)	1.12
Other Sources	6.33

Source : National Economic Development Authority, Public Information Division, 2008

Within the national government funds, 76% comes from foreign transfers in the form of official development assistance and the rest from local sources. This seems to reflect a coping strategy as the government aims to balance the budget and improve its fiscal position through higher tax collection . It looks to the foreign sector as a potential source of financial resources while it puts its fiscal house in order.

Source of Infrastructure Funds of National Government		
	Million Pesos	Percentage Share(%)
Local Financing	261.17	23.93
Official Development Assistance (ODA)	830.17	76.07

Source : National Economic Development Authority, Public Information Division, 2008

PRESENTATION OF FIVE-REGION MODEL

This is the first spatial computable general equilibrium with a disaggregated transport sector for the Philippines. Policy simulations are undertaken using data from a five-region social accounting matrix constructed by the author, using secondary data, as basis. A social accounting matrix shows the linkage among production and consumption sectors in an economy and captures their interaction among institutions in the macroeconomy as in households, firms, government sector and foreign sector.

The main limitation of this model is that it is a static model and hence captures only the short-run impact of different financing modes. While it is recognized that financing has intertemporal component, a system-wide simulation of policy impact is undertaken to assess the short-run gains and costs. These can be compared with a dynamic general equilibrium model which captures long-run benefits and costs. However dynamic SCGE imposes huge data requirements and investments in time and resources, and will be done in future studies Moreover, availability of secondary data for dynamic general equilibrium modeling is fairly limited for the Philippines at this stage.

As a pioneering undertaking for the Philippines, the study adopts the simplest assumption for market structure of product and factor markets in the Philippines, i.e. perfect competition. The accounting period used which is 1994 is justified by the availability of consistent and reliable data for the tremendously large data requirements of a five-region social accounting matrix. (SAM). It must be pointed out though that the direction and magnitude of interregional flows in the SAM were verified and checked against primary data collected by an origin-destination freight and passenger flow survey conducted by the Philippines Department of Transportation & Communication (DOTC) and Japan International Cooperation Agency (JICA).

DATABASE

The benchmark data are taken from a five-region social accounting matrix constructed by the authors for the Philippines, using 1994 Philippine interregional input-output data (Mizokami & Dakila, 2005). The delineation of regions is based on the archipelagic geography of the Philippines. This differs slightly from that of the government's "super-region" categories since primary consideration was given to the availability of secondary data, which are compiled based on administrative groupings of provinces into regions. The disaggregation into seven sectors (with three transport sectors – water, air, and land mode) is done to enable the researcher to look into the impact of a change in transport capacity on alternative modes of transport and non-transport sectors. Households are divided into three income groups; namely low-income households, middle-income households and high-income households. Low income households are all those who earn below the regional poverty threshold as determined by the National Statistical Coordination Board. The high income households are those who earn 250,000 pesos and above annually. All the households earning income between the regional poverty threshold and the highest income bracket in the Family Income and Expenditure Survey (250,000 pesos and above) are classified as middle income households. The delineation of low, middle and high income groups are depicted in Appendix 2

Production sectors	Regions	Households
Agriculture (AG) Industry (IND) Water transport (WTRSRV) Land transport (LNDTR) Air transport (AIRTR) Other services (OTSRV) Government (GOV)	National Capital Region (NCR) NorthernLuzon (NOL) Southern Luzon (SOL) Visayas (VIS) Mindanao (MIN)	Low income (Low) Middle Income(Mid) High income (High)

Table 1 - Disaggregation of Model

The calibration of the SCGE model utilized a special five-region social accounting matrix (SAM) that was used as the benchmark for deriving the baseline values of the SCGE model. A SAM represents transactions in a complete economic system during an accounting period, usually one year. It integrates, within a macroeconomic framework, several detailed accounts for factors of production and institutions—especially households. Round (2003) elaborated on the main features of a SAM, which are threefold: (1) The accounts are in a SAM are represented as a square matrix, in which the incomings and outgoings for each account are shown in corresponding matrix rows and columns. The transactions are shown in the cells, so the matrix displays the interconnections between agents in an explicit way. The corresponding row and column totals in the SAM must be equal to each other. (2) The SAM is comprehensive: it portrays all the economic activities of the system (consumption, production, accumulation and distribution), although not necessarily in equivalent detail. (3) The SAM is flexible, in that, although it is usually set up in a standard, basic framework, there is a large measure of discretion both in the degree of disaggregation and in the emphasis placed on different parts of the economic system. When a national SAM is split into regional SAMs (RSAM), the flow of income from production units to consuming units is given a spatial dimension. In line with this objective, a five-region SAM was constructed in order to analyze spatial effects of particular shocks, particularly on regional income and output disparity and other aspects of the regional economies. This RSAM is presented in detail in Dakila, C. and Mizokami, S. (2006).

The main data source for the study is the 1994 five-region Philippine inter-regional input-output (PIRIO) table, which regrouped the 15 administrative regions of the country in 1994 (now 17) into five greater regions according to geographic proximity (Secretario, 2002). This regional classification is carried over to the present paper. This regional disaggregation preceded the “super-region” infrastructure plan of the current government. Moreover, the regional delineation adopted in this study is based on concept of regions as “centers of economic interest “ which is different from that of the government.

As described in Dakila and Mizokami (2006), there were three major activities undertaken to derive the multi regional SAM (RSAM). First, the coverage of the 1994 PIRIO was expanded. In particular, the personal consumption expenditures component in the final demands columns was further disaggregated according to income class; greater attention was paid to the components of value added across sectors, and import transactions were broken down into CIF values and tariffs and import taxes. Second, the PIRIO was transformed from an open-type input-output model (i.e., one with an exogenous household sector) into a closed input-output model, with the household sector endogenized within the production system of regional economies. This closed I-O framework accounted for the balance between the different sources of incomes of households, For this, the Philippine Family Income Expenditures Survey (FIES) was the primary data source. Finally, the multi-region SAM was compiled based on the expanded PIRIO.

ASSUMPTIONS

- Regions: The Philippines is subdivided into five administrative regions – National Capital Region, Northern Luzon, Southern Luzon, Visayas and Mindanao.
- Factors: The data set specifies two primary factors of production, namely: capital and labor.
- Sectors: There are seven production sectors delineated for each of the five regions – namely agriculture, industry, other services, water transport services, air transport services, land transport services and government services’ except for the National Capital Region which has only six production sectors due to the exclusion of a very small insignificant agricultural sector.

- Institutions: There are four institutions included namely: household, firm, government and the rest-of-the-world.

(1) All product and factor markets operate under perfectly competitive conditions. (2) Economic agents like households and firms maximize an objective function subject to constraints. Households maximize utility whereas firms maximize profit. (3) Equilibrium is defined as a state where the actions of all agents are mutually consistent and can be executed simultaneously. Quantities adjust in the model and prices follow to equate the notional and effective demand for labor. (4) In this model, adjustment to equilibrium is implemented by specifying that markets adjust to minimize the sum of excess supplies. (5) Among the seven production sectors, three belong to the transport sector, namely, water transport services sector, air transport services sector, land transport services sector. The demand for services of each type of transport mode is a derived demand associated with the demand of intermediate goods. (5) Between the two factors of production, capital is immobile and labor is mobile among the five regions. (6) The economy has thirty-four product markets. This is composed of thirty-four product markets within the five regions, one capital market and one labor market. NCR has an insignificant agricultural sector. (7) The exogenous shock in the model takes the form of a technological improvement which is capital enhancement of land transport infrastructure services sector across all delineated regions in the Philippines. (8) The national government finances the technological improvement. (9) Government funds for this purpose are derived from three alternative sources namely – (9a) indirect taxes like value-added tax (VAT) on land transport services sector ; (9b) foreign transfers in the form of official development assistance (ODA) and (9c) direct taxes like personal income tax on households. (10) The magnitude of government spending on capital enhancement exactly equals the amount of taxes or foreign transfers used to finance the exogenous shock.

DESCRIPTION OF THE MODEL

The framework takes off from Mizokami model of two-region economy in the Philippines with four production sectors including transport. (Mizokami, Itose, Dakila: 2005). However, there are variations in specification of the production function. A three- nested production function is estimated. The transport sector intermediate input is isolated in the second level of production function. A more detailed disaggregation of transport sector is delineated – namely water transport services sector, air transport services sector and land transport services sector. Furthermore, another point of difference is that households in each region are decomposed into three income levels - low, middle and high. Finally, the rest-of-the-Philippines region is divided into four regions namely Northern Luzon, Southern Luzon, Visayas and Mindanao vis-à-vis National Capital Region.

Household Sector

The model distinguishes between 15 representative households, with 3 household types (representing the low, middle, and high income classes) for each of the six regional groupings distinguished in this paper. The preferences of each household type are summarized by a corresponding Cobb-Douglas utility function:

$$U_h = \prod_i C_{ih}{}^{\delta_{ih}} \qquad (1)$$

Where δ_{ih} is the elasticity of the utility of the h^{th} household with respect to consumption of the i^{th} good. Each representative household maximizes its utility subject to its income constraint, which we describe below.

For each region, household labor income is assumed to be equal to the sum of the labor incomes that each household income group earns from supplying labor within the region. The endowments of labor of different income classes within a region are taken to be a constant; this then determines how labor income is distributed within each region.

Since capital is fixed, then each household income group is assumed to own a fixed share of total capital, and this ratio is maintained through the policy experiments. Household income is calculated as the sum of labor income ($w_i L_i$) plus that portion of capital income that accrues to the households ($\lambda_h \Sigma_i r_i K_i$), plus transfers from government and from the rest of the world. The latter two are exogenously determined. Thus, if we partition the indices h and i so that the r^{th} partition belongs to the r^{th} region, then we obtain total income per household type as:

$$Y_{h,r} = \omega_{h,r} \sum\nolimits_{i \in r} w_i L_i + \lambda_{h,r} \sum\nolimits_i r_i K_i + Tr_{GOV,h,r} + Tr_{ROW,h,r} \qquad (2)$$

where the ω's are the labor income distribution parameters, and, as indicated, the summation is for industries belonging to the r^{th} region. Total disposable income is found by subtracting direct taxes imposed on the household from the foregoing quantity:

$$Yd_h = Y_h \left(1 - \tau_h\right) \qquad (3)$$

where Y_d is disposable income and τ_h is the direct tax rate imposed on household h. Note that the summation now runs within each household type, so that we have dropped the subscript r referring to the partitioning across regions.

Each household type is assumed to consume a constant proportion of its disposable income. Thus, households maximize utility subject to the budget constraint

$$\sum\nolimits_i pd_i C_{ih} = c_h Yd_h \qquad (4)$$

where pd_i is the domestic price of the good and c_h is the average propensity to consume of household h. Given the Cobb-Douglas utility function, the first order conditions yield the following consumption demands for each commodity by each household type in each region:

$$C_{i,h,r} = \delta_i c_{h,r} \left[\omega_{h,r} \sum\nolimits_{i \in r} w_i L_i + \lambda_{h,r} \sum\nolimits_i r_i K_i + Tr_{GOV,h,r} + Tr_{ROW,h,r} \right] \left(1 - \tau_{h,r}\right) / p_i \qquad (5)$$

Production Sector

Production is modeled assuming a three-stage production function. At the first stage, capital and labor are combined to produce value-added, using a Cobb-Douglas production technology.

$$V_i = A_i K_i^{\alpha_i} L_i^{1-\alpha_i} \qquad (6)$$

where for sector i and region r, V = value added, K = capital, L = labor, α = share of capital in value-added, and 1-α = share of labor in value-added. This specification of the Cobb-Douglas function assumes constant returns to scale. Capital is assumed to be immobile across sectors while labor is mobile.

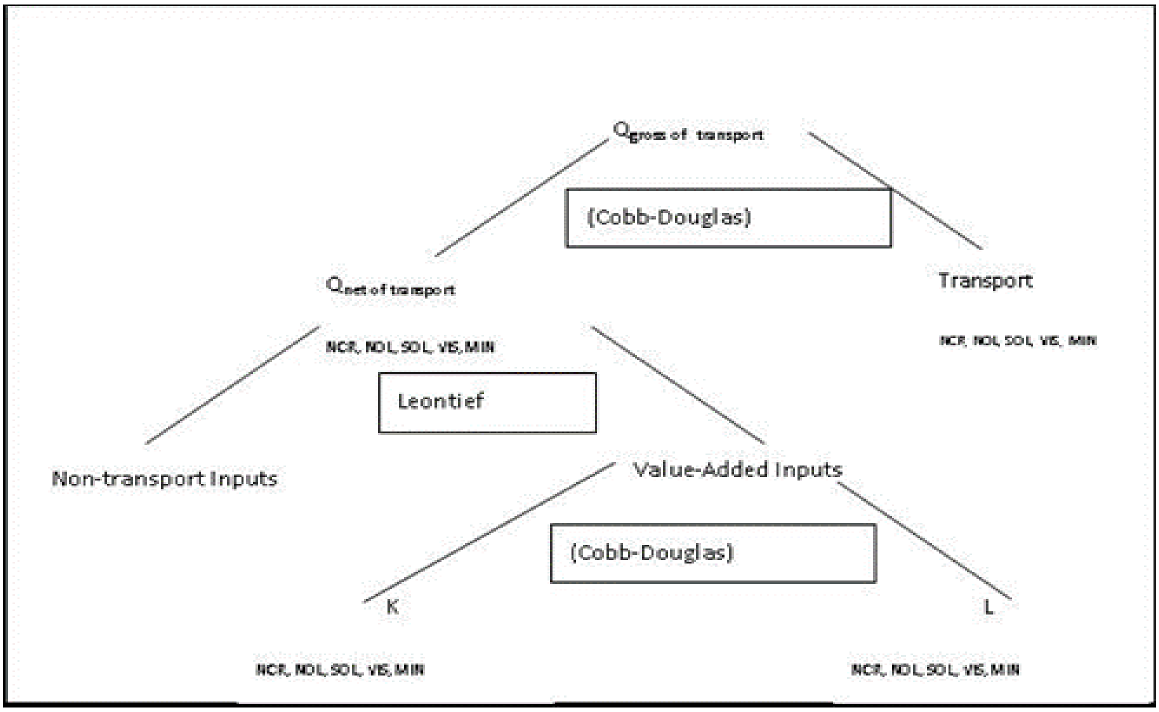

Figure 1 - Three-Stage Production Function

In stage 2 of the production process, value-added is combined with non-transport intermediate inputs under a Leontief technology, to produce a composite good, which is output net of transport.

$$X_i^{NT} = \min\left[X_{1i}/a_{1i},\ X_{2i}/a_{2i}, \ldots,\ X_{NTi}/a_{NTi},\ V_i/a_{V,i} \right] \tag{7}$$

where X_{ji} = non-transport intermediate input coming from sector j in origin to sector i in destination region, with corresponding Leontief coefficient a_{ji} in the second level production function; V_i represents value-added of output in destination region.

Finally, stage 3 combines output net of transport with transport intermediate inputs under a Cobb-Douglas production function to yield total output gross of transport of commodity i ($X_{T,i}$).

$$X_{T,i} = B_i \left(X_i^{NT} \right)^{\beta_{1i}} W_i^{\beta_{2i}} A_i^{\beta_{3i}} La_i^{\beta_{4i}} \tag{8}$$

where W, A and La represent the different transport intermediate inputs that go into sector i, namely, water, air and land transport. This specification allows substitutability between the various transport modes. Total output of sector i (X_i) is found by summing together total output gross of transport of commodity i ($X_{T,i}$), indirect taxes on i ($T_{indirect,i}$), direct taxes imposed on firms in sector i ($T_{direct,i}$), imports of i (M_i), tariffs imposed on i (Tar_i), and net dividends from the foreign sector into sector i ($Div_{For,i}$).

$$X_i = X_{T,i} + T_{Indirect,i} + T_{Direct,i} + M_i + Tar_i + Div_{For,i} \tag{9}$$

The firm is assumed to maximize profits. Because of the nature of the production function, profit maximization can be described in three stages. The bottom stage entails choosing the optimum levels of capital and labor so as to maximize the contribution of value added to profits. At the second stage, as noted above, value-added is combined with other intermediate non-transport inputs in a fixed coefficients (Leontief) technology to produce output net of transport. Finally, the top stage determines the optimal combination of transport inputs to deliver output to the region of destination. Then for commodity j, the optimization problem is

Maximize

$$\Pi_j = \mathrm{pd}_j \mathrm{X}_j - \sum_i \mathrm{pd}_j \mathrm{Mat}_{i,j} - \mathrm{pva}_j \mathrm{V}_j \tag{10}$$

subject to

$$\mathrm{X_j} = \mathrm{B}_j {\mathrm{X}_j^{NT}}^{\beta_{1j}} {\mathrm{W}_j}^{\beta_{2j}} {\mathrm{A}_j}^{\beta_{3j}} {\mathrm{La}_j}^{\beta_{4j}}$$

$$\mathrm{X}_j^{NT} = \min\left[\mathrm{X_{1j}}/\mathrm{a_{1j}}, \ldots \mathrm{X_{NTj}}/\mathrm{a_{NTj}}, \mathrm{V_j}/\mathrm{a_{V,j}} \right] \tag{11}$$

$$\mathrm{V_j} = \mathrm{A_j} {\mathrm{K_j}}^{\alpha_j} {\mathrm{L_j}}^{1-\alpha_j}$$

where Π is total profits, Mat_{ij} is the matrix of intermediate inputs of each commodity into commodity j, V represents value added, and pva is its corresponding price.

At the top production level, the corresponding first order conditions (FOCs) for profit maximization are

$$\mathrm{pd_i} * \frac{\partial \mathrm{X_i}}{\partial \mathrm{X^{NT}}_i} = \mathrm{p_{NT}} \text{ Or } \mathrm{pd_i} \beta_{1i} \frac{\mathrm{X_i}}{\mathrm{X^{NT}}_i} = \mathrm{p_{NT}} \tag{12}$$

$$\mathrm{pd_i} * \frac{\partial \mathrm{X_i}}{\partial \mathrm{W_i}} = \mathrm{p_w} \text{ Or } \mathrm{pd_i} \beta_{2i} \frac{\mathrm{X_i}}{\mathrm{W_i}} = \mathrm{p_W}$$

$$\mathrm{pd_i} * \frac{\partial \mathrm{X_i}}{\partial \mathrm{A_i}} = \mathrm{p_A} \text{ Or } \mathrm{pd_i} \beta_{3i} \frac{\mathrm{X_i}}{\mathrm{A_i}} = \mathrm{p_A}$$

$$\mathrm{pd_i} * \frac{\partial \mathrm{X_i}}{\partial \mathrm{La_i}} = \mathrm{p_L} \text{ Or } \mathrm{pd_i} \beta_{4i} \frac{\mathrm{X_i}}{\mathrm{La_i}} = \mathrm{p_{La}}$$

There are no corresponding FOCs for the second level production stage, since this is characterized by fixed coefficients technology, and marginal conditions are not defined. However, once output net of transport is determined, the different non-transport inputs as well as total value added can be derived using the fixed coefficients technology in Eqn (7).

At the bottom level, profit maximization entails choosing the least cost combination of labor and capital to produce the required value-added. Since capital is immobile, of particular interest is the first-order condition for labor, which is

$$\mathrm{pva_i} * \frac{\partial \mathrm{V_i}}{\partial \mathrm{L_i}} = \mathrm{w_i}$$

$$\mathrm{pva_i} \left(1 - \alpha_i\right) \frac{\mathrm{V_i}}{\mathrm{L_i}} = \mathrm{w_i} \tag{13}$$

Government and the External Sector

The model incorporates a national government sector, i.e., the behavior of local government units is not considered. Government enters the economy in several ways: it purchases output from each sector, imposes indirect taxes on production and tariffs on imported goods, and direct taxes on income of each household type. Government expenditures on each commodity are taken as exogenous in the model, while taxes are endogenous.

Tariff revenues per commodity equal the product of the tariff rates and import values:

$$\mathrm{Tar}_i = \mathrm{tar}_i\left(\mathrm{m}_i\right) \tag{14}$$

Where Tar_i and tar_i are total tariff collections from i and the tariff rate on commodity i, respectively. Indirect tax collections are given by the product of the indirect tax rate imposed on domestic production and the rate imposed on imports of the product:

$$\mathrm{T}_{\mathrm{Indirect},i} = \mathrm{tind}_i\left(\mathrm{d}_i + \mathrm{m}_i\left(1+\mathrm{tar}_i\right)\right) \tag{15}$$

Direct tax collections per household type in the model are computed as:

$$\mathrm{T}_{\mathrm{Direct},h} = \mathrm{Y}_h - \mathrm{Yd}_h \tag{16}$$

At this stage of model specification, imports and exports are taken as exogenous.

Investment-Saving Balance

Total household savings in the model are given by the aggregate difference between household disposable income and consumption expenditures:

$$\mathrm{S}_h = \Sigma_h\left(\mathrm{Yd}_h - \mathrm{C}_h\right) \tag{17}$$

Thus, we introduce a balancing factor (ϕ) to account for any discrepancies between measured savings and investments.

Total government savings are the sum of the various revenue sources minus total government purchases of the outputs of the various sectors, total government transfers to households, and total net transfers of the government to the foreign sector:

$$\mathrm{S}_G = \Sigma_i\mathrm{Tar}_i + \Sigma_i\mathrm{T}_{\mathrm{Indirect},i} + \Sigma_h\mathrm{T}_{\mathrm{Direct},h} - \Sigma_i\mathrm{G}_i - \Sigma_h\mathrm{Tr}_{\mathrm{GOV},h} - \mathrm{Tr}_{\mathrm{GOV,FOR}} \tag{18}$$

Total foreign savings, S_{FOR}, are given by the current account deficit minus net dividends to foreigners. Therefore, total savings are

$$\mathrm{S}_{\mathrm{TOTAL}} = \mathrm{S}_h + \mathrm{S}_{\mathrm{GOV}} + \mathrm{S}_{\mathrm{FOR}} \tag{19}$$

Conceptually, total savings should equal total investment. As noted previously, our framework allows for statistical discrepancy by introducing a factor ϕ, which transforms savings to investments. Investment distribution per sector is then modeled as constant proportion of total investment, with the distribution coefficients γ_i calibrated according to the sectoral distribution of investment in 1994:

$$\mathrm{I}_i = \gamma_i\phi\left(\mathrm{S}_{\mathrm{TOTAL}}\right) \tag{20}$$

Demand

Total intermediate demand for commodities by the firm arises from its maximization of profits subject to the three-level production function. At the first level, the first order condition for profit maximization entails equating the marginal product to the marginal cost of labor.

$$\mathrm{pva_i} * \frac{\partial \mathrm{V_i}}{\partial \mathrm{L_i}} = \mathrm{w_i}$$

$$\mathrm{pva_i}\left(1-\alpha_i\right)\frac{\mathrm{V_i}}{\mathrm{L_i}} = \mathrm{w_i} \tag{11}$$

where the marginal product of labor for each production sector is evaluated assuming that capital is immobile across sectors. For any given employment, equilibrium entails that the corresponding level of production equal the demand forthcoming at the employment level. Similar equations hold for the choice between output net of transport and the various transport inputs, at the third level of the production function. This equilibrium condition together with (11) determines pva. We turn to this in greater detail in the section on prices.

At the second level, each production sector combines value-added and every non-transport intermediate input according to a fixed proportions technology:

$$\mathrm{Mat_{i,j}} = \mathrm{a_{ij}} \mathrm{X_j^{NT}} \tag{21}$$

where i runs through all the non-transport intermediate inputs and value added for each sector, j runs through all the production sectors in the economy, Mat_{ij} is the matrix of interindustry flows in the economy, a_{ij} represents the fixed coefficients technology, and, as before X_j^{NT} is output net of transport for the jth sector.

Final demand in the economy originates from households (consumption demand), firms (investment demand), government spending, and the foreign sector (export demand). Consumption demand by households originates from the maximization of the utility function, as described previously. Although, for simplicity, firms' investment demand are not described explicitly in terms of optimization, the level of investment is determined by the transformation of savings into such, as described in earlier section. Government and export expenditures are taken to be exogenously determined.

The domestic demand for commodity i consists of the total intermediate demand, plus the total final demands for consumption, investment, and government purchases, while the total composite demand, represented by Q_i, is the sum of the domestic demand and exports:

$$\mathrm{Q}_i = \sum_j \mathrm{Mat}_{i,j} + \sum_h \mathrm{C}_{h,i} + \mathrm{I}_i + \mathrm{G}_i + \mathrm{Exports}_i \tag{22}$$

Prices and Equilibrium

For any given employment level, equilibrium entails that the corresponding level of production should equal the demand forthcoming at the employment level. This requirement, together with the first order conditions for profit maximization by the firms, determines the price levels in the economy, relative to the price of labor. The labor price is assumed to be the numeraire, and is thus taken to be fixed. Since capital is a fixed factor, we take returns to capital as a residual determined by the identity:

$$\mathrm{r_i} = \frac{\left(\mathrm{pva_i} * \mathrm{V_i} - \mathrm{w_i^0 L_i}\right)}{\mathrm{k_i^0}} \tag{23}$$

The total product cost can then be built up from the components in a standard way. Thus, average cost per unit is

$$AC_i = \frac{\Sigma_j pd_j Mat_{j,i} + pva_i V_i}{X_i} \tag{24}$$

where pd_i is the domestic (tax-inclusive) price of i. In equilibrium, the average cost equals the composite price pq_i of the commodity (the composite price is the peso price of both domestically produced and imported commodities).

The excess supply for each commodity is given by:

$$ES_i = X_i - Q_i \tag{25}$$

The model treats all the foregoing relationships as constraints in a nonlinear programming problem. Markets are assumed to operate so as to minimize the value of sum of squared excess supplies for all commodities; i.e., the objective of the programming problem is to minimize the quantity

$$\Omega = \Sigma_i \left(pq_i * ES_i^{\,2} \right) \tag{26}$$

In equilibrium, therefore, the unit cost is divisible into three parts: (1) $\frac{\sum_j pd_j q_{ji}}{X_i}$, where the j's are the non-transport inputs give the cost of non transport intermediate inputs per unit of X; (2) the same formula with the j's taken to be the transport inputs yields the transport margin; and (3) $\frac{w_i L_i + r_i K_i}{X_i}$ is the cost of value added per unit of X.

Equilibrium Condition

Y = C + I +G + X – M (27)

Where Y: aggregate supply
C: total consumption expenditures of the national economy
I: total investment expenditures of the national economy
G: total government expenditures of the national economy
X: total purchases of locally made goods by foreign sector
M: total purchases of foreign-made goods by domestic residents of nation

Total consumption (C) can be represented by

$$C = \sum_h \sum_i \sum_r c_{h,r,i} \tag{27.1}$$

Where h: household income class group
r : region
i : production sector

Total disposable income (Yd) is estimated by

$$Y_d = \sum_h \sum_i \sum_r Y_{d\,h,r} \tag{27.2}$$

Savings-Investment Balance is depicted by

I = a (Y_d - C) where "a " is balancing parameter (27.3)

Distribution of investment across sectors is embodied in the equation

$I_{i,r} = w_{i,r}(I - \sum_h \sum Y_{nf})$, where Y_{nf} is income of informal sector and $I_{i,r}$ is formal investment (27.4)

EMPIRICAL RESULTS

An exogenous shock in the form of national government-revenue financed capital improvement in land transport infrastructure is introduced across all five regions. The impact on regional gross output and welfare levels of regional household income groups is estimated under different types of financing schemes : (1) foreign transfers like official development assistance to the national government, (2) indirect taxes like value added tax on land transport services disaggregated across regions and (3) direct taxes on households, The amount of government expenditures in each scenario is equal to the amount of funds raised under the three alternative funding schemes. Land transport infrastructure improvement is chosen over water and air transport modes due to a previous study's finding that transport infrastructure investment relative to other modes in the Philippines has the maximum impact on the economy.. Hence, it emits negative externalities like pollution and cause congestion which are the basis of taxation (Dakila & Mizokami, 2007).

Scenario 1 : INCREASE IN INDIRECT TAXES/VALUE-ADDED TAX

IMPACT ON GROSS REGIONAL OUTPUT

A VAT-financed increase in capital of land transport services across the Philippines benefits generated increase in output across all the five regions with the highest increment experienced in the National Capital Region better known as Metro Manila. The industrial sector in adjacent regions namely, Southern Luzon and Northern Luzon benefited from this capital expansion policy in land transport sector. Southern Luzon is where the CALABARZON – a booming industrial zone and population center, adjacent to Metro Manila or NCR, is located. Northern Luzon in this study is where a logistic hub – Clark-Subic area is being developed by the government. The NCR's industrial sector had the third biggest increase in output. Complementary to all these is the boom in other services sector of the National Capital Region,, Northern Luzon and the Visayas. Interregional flow of people and commodities facilitated by enhanced land transport infrastructure contributed to the output effects in the services sector. However, the regions other than Luzon, namely Visayas and Mindanao did not register as much significant gains.

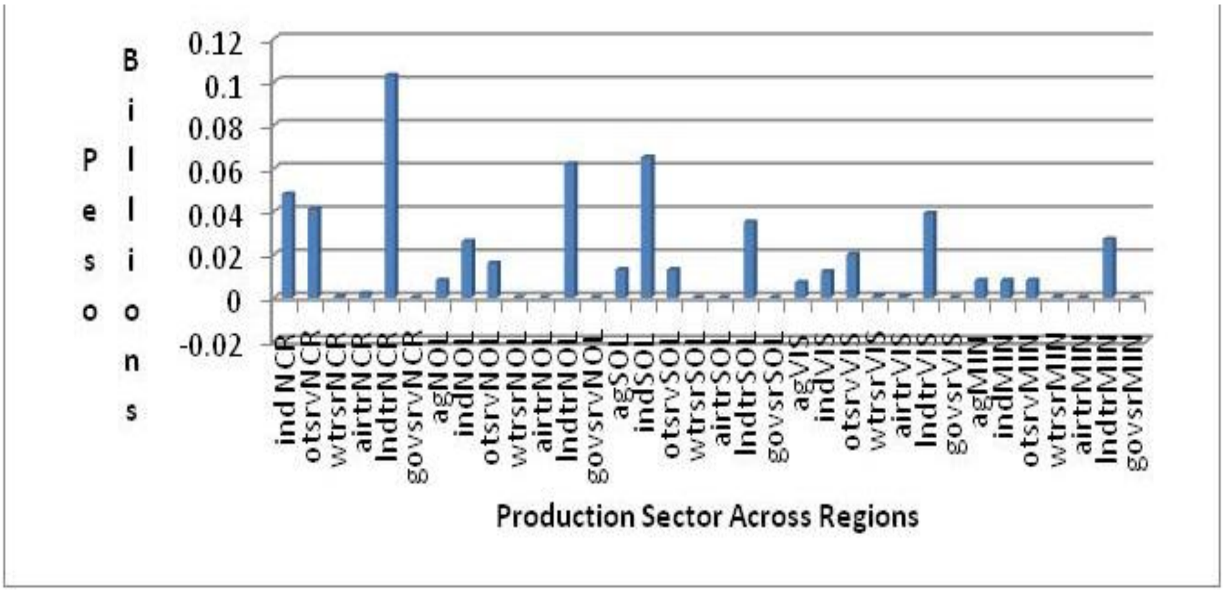

Figure 2 - Change in Output Due to VAT-Financed Land Transport Infra Improvement

IMPACT ON RELATIVE WELFARE LEVELS

Welfare is measured by changes in household income by regions after the introduction of the exogenous shock. In this scenario, the middle income classes across all regions, specially of the NCR, had the highest welfare gains. However, an important income redistributive effect is that the low income groups in four regions excluding NCR had the next highest welfare gain. In other words, while land transport infrastructure improvement via additional capital benefits the middle income groups, the low income groups do not lag far behind.

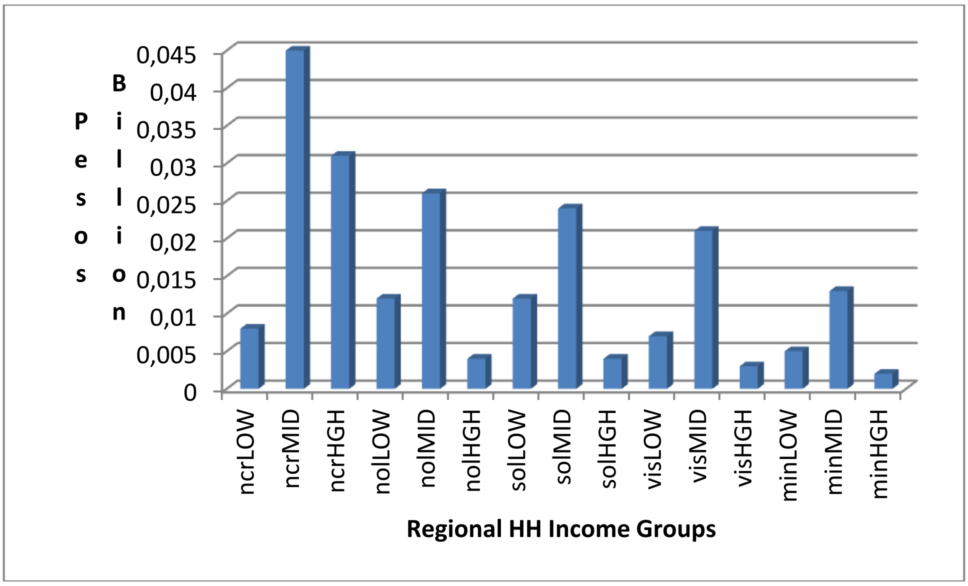

Figure 3 - Change in HH Income Due to VAT-Financed Land Transport Infra Improvement

SCENARIO 2 : INCREASES IN FOREIGN TRANSFERS / OFFICIAL DEVELOPMENT ASSISTANCE (ODA)

The following results indicate the direction and magnitude of change in strategic macroeconomic variables of the different regional economies in the Philippines, in response to additional capital provided to NCR sector of land transport services. This is funded by official development assistance.

IMPACT ON GROSS REGIONAL OUTPUT

The effect of capital improvement in land transport services funded by foreign transfers indicate that next to the land transport services sector of NCR and Northern Luzon; the industrial sector of adjacent regions to the NCR experienced the next highest increment in output; namely , those of Southern Luzon (SOL) and Northern Luzon (NOL) . The other services sector and industrial sector of the prime region which is the NCR are in the top ten sectors with highest output increase. This indicates the spatial bias in terms of distribution of benefits in favor of the most affluent region,namely, NCR. However, spillover effects in the peripheral regions of Southern and Northern Luzon are also registered in this simulation scenario.

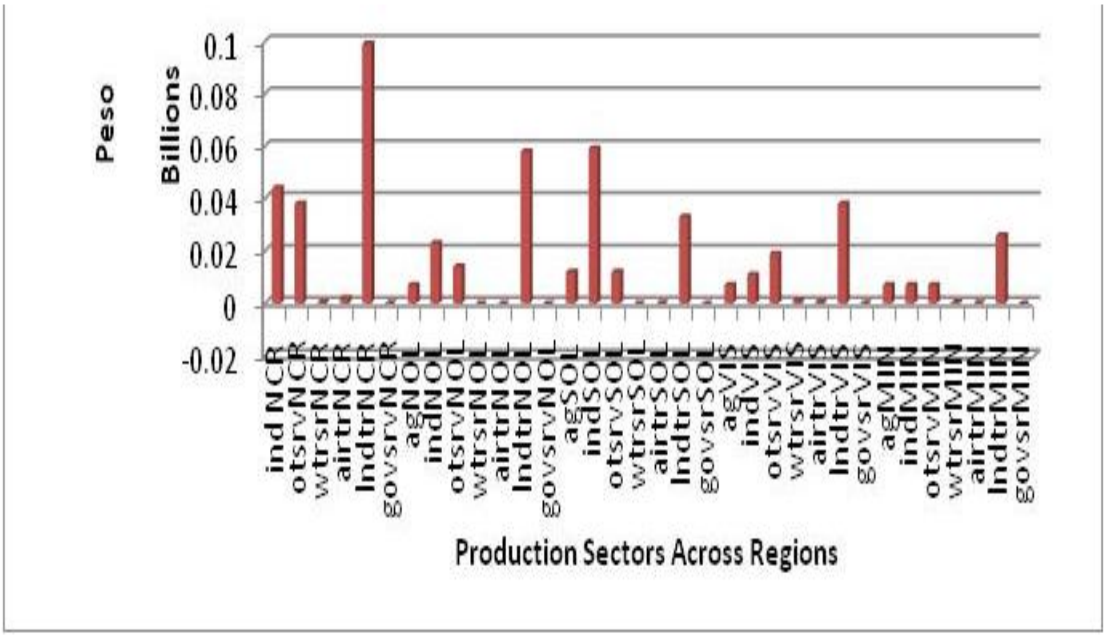

Figure 4 - Change in HH Income due to VAT-Financed Land Transport Infra Improvement

IMPACT ON WELFARE LEVELS

Welfare is measured by changes in household income by regions after the introduction of the exogenous shock. In this scenario, the middle income classes across all regions, specially of the NCR, had the highest welfare gains. However, an important income redistributive effect is that the low income groups in four regions excluding NCR had the next highest welfare gain. In other words, while land transport infrastructure improvement via additional capital benefits the middle income groups, the low income groups do not lag far behind.

Figure 5 - Change in HH Income due to ODA-Financed Land Transport Infra Improvement

Scenario 3 : INCREASE IN DIRECT TAXES ON HOUSEHOLDS

IMPACT ON GROSS REGIONAL OUTPUT

The figure below shows that direct tax-financed government expenditures on land transport infrastructure projects generates increases in gross output in the land transport services region across all regions. This household-financed exogenous shock enhances productivity in NCR land transport, then Northern Luzon (NOL) ladn transport services, followed byVisayas (VIS), then Southern Luzon (SOL) land transport sectors respectively. It interesting to note that the SOL (very near NCR) industrial sector registered the fifth highest increment in gross output . This could signify that a huge amount of output from this region south of Manila, is transported by land. The region north of Manila which is Northern Luzon also experienced an upsurge in output brought about by the aforementioned exogenous shock.

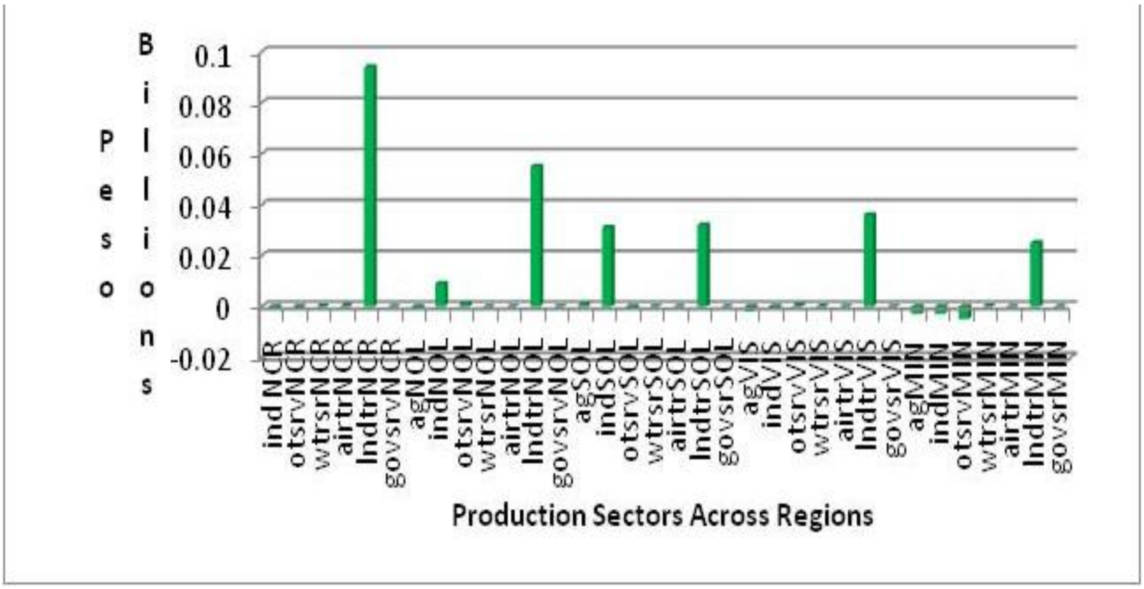

Figure 6 - Change in Output due to Direct Tax Financed Land Transport Infra Improvement

IMPACT ON RELATIVE WELFARE

Welfare is measured by changes in disposable income of households. An interesting result of this exercise is that there were positive increments in welfare of low income groups in all regions except the prime region which is NCR. The biggest decline in welfare was in high income groups across all regions except NCR. This indicates the effect of a progressive personal income taxation. So while output effects were strongly in favor of land transport services sector, the welfare effects indicated a mild income redistributive effect . Middle income groups across regions experienced the biggest decline in welfare. Low income groups, specially those in the Luzon area experienced an increase in welfare since their income fall below taxable level and therefore were relieved from sharing in the burden of this type of financing.

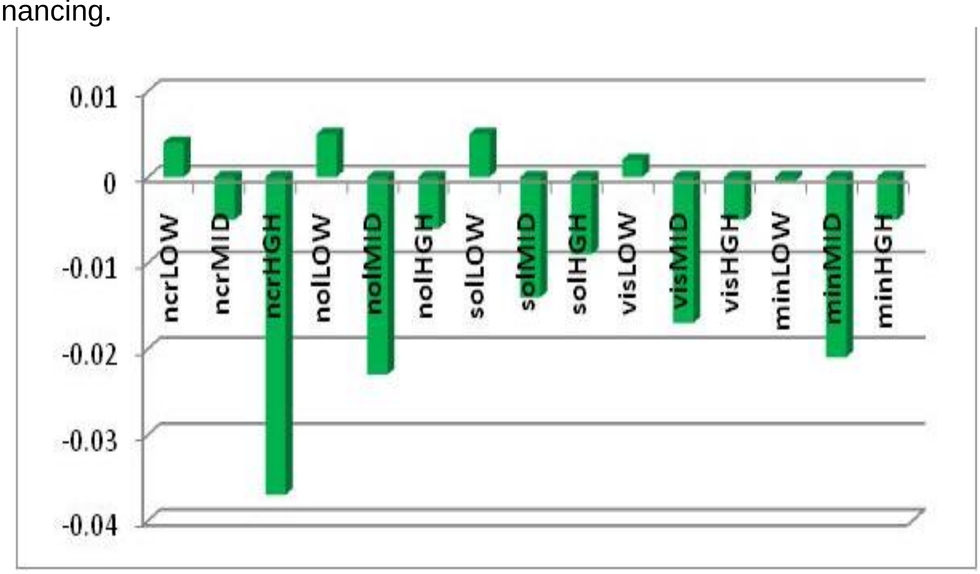

Figure 7 - Change in Welfare due to Direct Tax Financing

CONCLUSION

The foregoing discussion indicates the role of financing in influencing the spatial distribution of microeconomic benefits of a macroeconomic transport policy as in capital enhancement of land transport infrastructure investment**.**

A comparative analysis of the effects of land transport infrastructure financing via foreign transfers and via indirect taxes.indicates that in terms of direction, both financing modes affect gross regional output and income level of households across regions in the same direction. However, a critical and controversial finding is that in terms of magnitude, the impactof an indirect tax like value-added tax is greater than that of ODA funds. This maybe explained by the fac that while an indirect tax creates deadweight loss in terms of price distortions, this loss in social welfare is far outstripped by the multiplier effects generated by capital enhancement of land transport infrastructure across regions. In other words , the usage of tax revenues to finance transport infrastructure mitigate the possible adverse social losses associated with indirect taxes,

An interesting highlight of this analysis is the extremely different effect on output and welfare of direct income tax-financed land transport infrastructure..

The bottomline of the model presented below is that governments of developing countries should be aware of the efficiency effects of raising revenues via indirect taxes. They lead to higher output levels relative to other financing modes. Imposition of additional indirect tax also leads to positive redistributive effects across space in favor of the middle and low income classes across regions .

This means that the negative political impact of higher value added tax may be offset by the tangible output multiplier effects of transport infrastructure projects and greater benefits to those belonging to income brackets other than high income.

In terms of direct tax financing, the distribution of benefits in terms of gross output was concentrated in land transport services sector; with spillover effects in industrial sector in adjacent regions like Northern Luzon and Southern Luzon. As far as welfare welfare effects are concerned, the most heavily penalized were the middle income classes across all five regions. The equity effect can be deduced from the fact that the biggest decline in welfare occurred in high income households in National Capital Region.

So while foreign transfers like ODA, generate similar positive impact to VAT, governments of developing countries like the Philippines should not hesitate in generating infrastructure funds from indirect taxes. In the long-run, attaining a healthy fiscal balance with less reliance on foreign aid would put both developing economies and developed economies in Pareto optimal position.

Financing mode matters as far as determining the magnitude of output and welfare gains of transport infrastructure improvement across all regions in the Philippines.

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APPENDIX

LIST OF ENDOGENOUS AND EXOGENOUS VARIABLES

Endogenous variables		
Variable name	**Description**	**Size**
	Production sector	
mat_{ij}	Intermediate inputs flow from industry i to industry j	(19ntrX34)+(15trX34)=1156
$intpnt_i$	Total non-trnsport intermediate inputs into industry i	34
$intp_i$	Total Intermediate Inputs into industry i	34
$Intptr_i$	Total transport inputs into industry i	34
V_i	Total value added in i	34
X^{NT}_i	Output (net of transport) in industry i	34
X^T_i	Output (gross of transport) in industry i	34
X_i	Total output in industry i	34
ES_i	Excess supply of commodity i	34
GDP	Gross domestic product	1
Ω	Sum of Squared Supplies in the Economy	1
	Inputs	

$\mathbf{L_i}$	Labor demand in industry i	34
$\mathbf{K_i}$	Value of capital inputs in industry i	34
	Incomes	
$\mathbf{Y_{LH}}$	Labor income of household h	3X5=15
$\mathbf{Y_{LR}}$	Total labor income for the region	3X5=15
$\mathbf{Y_L}$	Total labor income	1
$\mathbf{Y_K}$	Total capital income	1
$\mathbf{HHOS_i}$	Total household share in capital income of industry i	34
HHOS	Total household share in capital income	1
$\mathbf{YD_H}$	Total disposable income of household h	3X5=15
$\mathbf{Y_H}$	Total income of household h	3X5=15
	Demand	
$\mathbf{C_{H,i}}$	Consumption by household h of commodity i	3X5X34=510
$\mathbf{C_H}$	Total consumption by household h	3X5=15
$\mathbf{U_H}$	Utility of household h	3X5=15
$\mathbf{EV_H}$	Equivalent variation for household h	3X5=15
Utot	Total utility	1
$\mathbf{D_i}$	Domestic demand for commodity i	34
$\mathbf{Q_i}$	Composite (domestic + foreign) demand for commodity i	34
	Prices	
$\mathbf{P_{VA,i}}$	Price of value added of commodity i	34
$\mathbf{P_{D,i}}$	Domestic price of commodity i including tax	34
$\mathbf{P_{M,i}}$	Domestic price of imports of commodity i	34
$\mathbf{P_{Q,i}}$	Composite (domestic + export) price of commodity i	34
$\mathbf{P_{X,i}}$	Price of output of commodity i	34
$\mathbf{r_i}$	Return on capital in industry i	34
CPI	Consumer price index	1
	Government	
$\mathbf{T_{Direct,H}}$	Direct tax collections from household h	3X5=15
$\mathbf{T_{Direct}}$	Total direct tax collections	1
$\mathbf{T_{Indirect,\ i}}$	Total indirect tax collections from industry i	34
$\mathbf{T_{Indirect}}$	Total indirect tax collections	1
$\mathbf{Tar_i}$	Tariff collections from inputs into i	34
Tar	Total tariff revenue of government	1
$\mathbf{Y_G}$	Total income of government	1
	Savings	
$\mathbf{S_h}$	Savings of household h	3X5=15
$\mathbf{S_H}$	Total savings of households	1
$\mathbf{S_G}$	Savings of government	1
$\mathbf{S_F}$	Foreign savings	1
$\mathbf{S_T}$	Total savings	1
	Total Endogenous Variable	**2,530**
Exogenous variables and parameters		
	Production sector	
$\mathbf{a_{ij}}$	Input-output coefficient	20X20=400
$\mathbf{a_{Vi}}$	Coefficient of value-added in input-output matrix	20
$\mathbf{A_i}$	Scale parameter in 1st level Cobb-Douglas production function	34
α_i	Coefficient of inputs in 1st level Cobb-Douglas production function for i	34X2=68
β_i	Coefficient of inputs in 3rd level Cobb-Douglas	34X4=136

	production function for i	
	Inputs	
KR_i	Real capital in industry i	34
	Demand	
M_i	Imports of commodity i	34
$Exports_i$	Exports of commodity i	34
C_h	Marginal Propensity to Consume of household h	3 X 5=15
δ_{ih}	Parameter in Cobb-Douglas Utility Function for Household h	34 X 15=510
	Prices	
w_i	Wage rate in industry i	34
$P_{E,i}$	World price of exports of i	34
$P_{M,i}$	World price of imports of i	34
	Incomes	
$HHOS_H$	Total household operating surplus from informal transactions	3X5=15
$YFOR_H$	Household transfer receipts from foreign sources	3 X 5=15
λ	Capital income distribution to households	34
	Government	
$Tr_{Direct,H}$	Direct tax rate on household h	3X5=15
$Tr_{Indirect, i}$	Indirect tax rate on industry i	34
$Tarr_i$	Tariff rate on imports of i	34
$Y_{GOV,H,R}$	Total government transfers to household h	3X5=15
	Total exogenous variables	**1549**

Legend for Household Sector

ncrLOW	Low-income household in the National Capital Region
ncrMID	Middle-income household in the National Capital Region
ncrHIGH	High-income household in the National Capital Region
nolLOW	Low-income household in Northern Luzon
nolMID	Middle-income household in Northern Luzon
nolHIGH	High-income household in Northern Luzon
solLOW	Low-income household in Southern Luzon
solMID	Middle-income household in Southern Luzon
solHIGH	High-income household in Southern Luzon
visLOW	Low-income household in Visayas
visMID	Middle-income household in Visayas
visHIGH	High-income household in Visayas
minLOW	Low-income household in Mindanao
minMID	Middle-income household in Mindanao
minHIGH	High-income household in Mindanao

Legend for Production Sector

indNCR	industry sector in the National Capital Region
otsrvNCR	other services sector in the National Capital Region
wtrsrvNCR	water transport services in the National Capital Region

airtrNCR	air transport services in the National Capital Region
lndtrNCR	land transport services in the National Capital Region
govsrvNCR	government services in the National Capital Region
agNOL	agriculture in Northern Luzon
indNOL	industry sector in Northern Luzon
otsrvNOL	other services sector in Northern Luzon
wtrsrvNOL	water transport services in Northern Luzon
airtrNOL	air transport services in Northern Luzon
lndtrNOL	land transport services in Northern Luzon
govsrvNOL	government services in Northern Luzon
agSOL	agriculture in Southern Luzon
indSOL	industry sector in Southern Luzon
otsrvSOL	other services sector in Southern Luzon
wtrsrvSOL	water transport services in Southern Luzon
airtrSOL	air transport services in Southern Luzon
lndtrSOL	land transport services in Southern Luzon
govsrvSOL	government services in Southern Luzon
agVIS	agriculture in Visayas
indVIS	industry sector in Visayas
otsrvVIS	other services sector in Visayas
wtrsrvVIS	water transport services in Visayas
airtrVIS	air transport services in Visayas
lndtrVIS	land transport services in Visayas
govsrvVIS	government services in Visayas
agMIN	agriculture in Mindanao
indMIN	industry sector in Mindanao
otsrvMIN	other services sector in Mindanao
wtrsrvMIN	water transport services in Mindanao
airtrMIN	air transport services in Mindanao
lndtrMIN	land transport services in Mindanao
govsrvMIN	government services in Mindanao