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8 The Role of Tax Policy in Korea's Economic Growth

Irene Trela and John Whalley

8.1 Introduction

This paper both summarizes and expands on our earlier work (Trela and Whalley 1991), which seeks to investigate the contribution of outward-oriented policies to Korean growth, through induced intersectoral resource transfers and impacts on effort and labor supply in both the agricultural (rural) and manufacturing (urban) sectors. Our earlier paper focused on the role tax policies played in Korean growth in stimulating intersectoral resource transfers toward export-oriented industries in a general equilibrium model with endogenous effort determination. The expansion described here involves disaggregating the manufacturing sector into two subindustries—import substituting and export promoting. This allows us to capture the resource reallocation effects not only between agriculture and manufacturing but also between import-substituting and export-oriented manufacturing.

The themes that emerge from the model calculations are similar to those from earlier work—that one should look beyond tax policy for the main factors underlying strong Korean growth. Model calculations portray the tax component of outward-oriented policies as accounting for 3.0 to 4.2 percent of Korean growth between 1962 and 1982, and only 3.6 percent between 1962 and 1972. These are less than half of those reported from the earlier model. The divergence stems from the additional resource reallocation effects within

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manufacturing that are captured in the expanded model. Since marginal product pricing is used in both manufacturing sectors, this generates a common effort level in the two sectors. A reallocation of labor within manufacturing and from agriculture to manufacturing, encouraged through the promotion of export-oriented manufactures, thereby has a less stimulative effect on growth than if labor were transferred only from the low-effort agricultural sector to the high-effort manufacturing sector, as is the case in the two-sector model.

The relatively modest role for taxes in Korean growth our model projects mirrors what we portray as the robustness of Korean growth performance to various policy regime switches, including tax policy. High savings rates (amounting to almost 38 percent of GDP in 1988 [Park 1989, table 3]) and high investment rates have both been central to Korean growth performance, as have significant transfers of labor from rural to urban sectors, especially in the early phases of growth. What the paper suggests, therefore, is that tax policy in Korea should be seen as accommodating high growth in Korea, rather than being one of the key factors driving it.

8.2 Korean Policy Regimes and Their Incentive Effects for Exports

Existing literature attributes much of the success of Korea's economic growth to a policy shift in the 1960s away from import substitution toward export promotion.[1] This is not to say that Korea's growth rates can be explained solely by changes in trade policy. In fact, the policy structure in Korea is substantially more complex than this, and there have been three distinct regime switches since the early 1960s. Growth in Korea has been remarkably resilient to these switches in policy regime and the changes in tax policy that were part of them.

Taxes played their role as part of the early outward-oriented phase of economic expansion (1961–72) through the rebating of cascading sales and excise taxes, and the rebating of a portion of corporate taxes to export industries. In the second phase (1973–79), when the growth of heavy and chemical industries (primary metals, shipbuilding, machinery, chemicals, and electronics) was being promoted, the tax system was used to facilitate sector-specific capital accumulation. As protection has come down in the trade liberalization and structural adjustment phase (1979 onward), duty remissions have become progressively less important. A number of the tax rebate schemes linked to exports have also been eliminated over the last ten to fifteen years. In the process, the Korean tax system has matured from a relatively narrowly based system, focused on traditional excisables, trade, and other taxes, to a system

1. See Brown (1973), Hasan and Rao (1979), Krueger (1979), Kwack (1988), and Scitovsky (1985). The results from Chenery, Robinson, and Syrquin (1986, table 11–3) are opposite to the conclusions from these studies and seem to indicate that outward-oriented policies have been relatively unimportant to Korean growth.

with a broadly based value-added tax (VAT) accounting for a major portion of revenues, along with income and corporate taxes with much wider coverage and more sophisticated administration than in most other developing countries.[2]

Establishing the effects of these measures and how they have changed over time is difficult. For the model analyses we report here, we draw heavily on a recent study by Kim (1988) that estimated the export subsidy effect of a range of tax and nontax policies in Korea over the period 1958–83 (see table 8.1). We use these estimates in our subsequent model calculations of the effects of Korean tax policies on outward orientation and growth. Kim includes only those policies for which consistent time-series data were available and which are quantitatively significant. These include direct cash subsidies, exchange rate premiums, interest subsidies, indirect tax exemptions, tariff exemptions, and direct tax reductions (exclusive of accelerated depreciation provisions and reserve funds both for developing export markets and for covering export losses).

The export subsidy effect of direct tax exemptions is the difference between tax liabilities in the absence of any such exemptions and actual direct tax payments. The incentive effect of different interest rates can be determined in an analogous fashion. The interest subsidy is the difference between the interest rate paid at the nonpreferential commercial bank lending rate and the interest actually paid. Similar calculations can be made for the various other tax and nontax export incentives.

Several interesting observations flow from table 8.1. Exchange rate policy, via the foreign exchange premiums, played an important role in stimulating exports during the late 1950s and early 1960s, before being changed in 1965. Furthermore, the largest export incentives were during the 1960s and early 1970s, during which time the effects of export promotion schemes notably increased. Beginning in the early 1970s, however, the government tried to reduce the scope of export incentives. Kim's estimates clearly show fluctuations in these subsidies from 29.6 percent in 1971 to a low of 16.7 percent in 1975 and, with subsequent rises, to a high of 21.3 percent in 1980. Gross export subsidies in this data declined from 136.2 percent of the official exchange rate in 1960 to 18.1 percent in 1961, mainly because of the substantial depreciation of the won and the resulting rapid increase in exports. Net export subsidies per U.S. dollar declined from 23 percent of the official exchange rate in 1964 to about 4–7 percent during 1965–67, mainly because of the abolition of the export-import link system.

Table 8.1 also clearly indicates the growing importance of tax policy as part of the outward-oriented strategy of the 1970s. Direct tax reductions for exporters were consistently small and had disappeared by the early 1970s. But indirect tax exemptions for exporters grew from approximately one-third of

2. See the discussion in Han (1986).

Table 8.1 **Estimates of Net and Gross Exports Subsidies per Dollar of Export for Korea, 1958–83 (annual averages)**

		Various Export Subsidies Calculated per U.S. Dollar of Export (won)								Ratio to Exchange Rate (%)	
Year	Official Exchange Rate (won/$) (1)	Direct Cash Subsidies (2)	Export Dollar Premium (3)	Direct Tax Reductions for Exporters (4)	Interest Rate Preference for Exporters (5)	Net Export Subsidies[a] (6=2+3+4+5)	Indirect Tax Exemptions for Exporters (7)	Tariff Rebates for Exporters (8)	Gross Export Subsidies[a] (9=6+7+8)	Net Export Subsidies (10=6/1)	Gross Export Subsidies (11=9/1)
1958	50.0	0.0	64.0	—	1.2	65.2	—	—	65.2	130.4	130.4
1959	50.0	0.0	84.7	—	1.3	86.0	—	—	86.0	172.0	172.0
1960	62.5	0.0	83.9	—	1.2	85.1	—	—	85.1	136.2	136.2
1961	127.5	7.5	14.6	—	1.0	23.1	—	—	23.1	18.1	18.1
1962	130.0	10.3	—	0.6	0.9	11.8	5.1	4.7	21.6	9.1	16.6
1963	130.0	4.1	39.8	0.8	2.9	47.6	5.3	6.6	59.5	36.6	48.8
1964	214.3	2.9	39.7	0.7	6.0	49.3	7.6	10.1	67.0	23.0	31.3
1965	265.4	—	—	2.3	7.6	9.9	13.9	15.4	39.2	3.7	14.8
1966	271.3	—	—	2.3	10.3	12.5	17.8	21.3	51.6	4.6	19.0
1967	270.7	—	—	5.2	14.7	20.0	17.8	24.6	62.4	7.4	23.1
1968	276.6	—	—	3.0	15.2	18.2	19.9	39.6	77.7	6.6	28.1
1969	288.2	—	—	3.7	14.7	18.4	27.4	34.3	80.1	6.4	27.8
1970	310.7	—	—	3.5	17.3	20.8	27.0	40.4	38.1	6.7	28.4
1971	347.7	—	—	4.8	18.1	22.8	32.2	48.0	103.0	6.6	29.6
1972	391.8	—	—	1.9	10.5	12.5	26.4	66.3	105.2	3.2	26.9
1973	398.3	—	—	1.4	7.4	8.7	21.0	64.4	94.2	2.2	23.7
1974	407.0	—	—	—	8.6	8.6	22.5	55.1	86.3	2.1	21.2
1975	484.0	—	—	—	12.9	12.9	33.8	34.3	81.0	2.7	16.7
1976	484.0	—	—	—	12.3	12.3	33.6	35.9	81.8	2.5	16.9
1977	484.0	—	—	—	9.4	9.4	53.1	30.6	93.1	1.9	19.2
1978	484.0	—	—	—	11.0	11.0	53.6	30.0	94.6	2.3	19.5
1979	484.0	—	—	—	11.0	11.0	56.6	30.3	97.9	2.3	20.2
1980	618.5	—	—	—	20.6	20.6	74.6	36.4	131.6	3.3	21.3
1981	686.0	—	—	—	15.0	15.0	n.a.	n.a.	n.a.	2.2	n.a.
1982	737.7	—	—	—	3.0	3.0	n.a.	n.a.	n.a.	0.4	n.a.
1983	781.2	—	—	—	0.0	0.0	n.a.	n.a.	n.a.	0.0	n.a.

Source: Kim (1988, table 3.1).

Note: n.a. = not available.

[a]Totals may not add up due to rounding errors.

gross export subsidies in 1965 to approximately one-half by 1980. Adoption of the destination basis VAT system in 1977, under which exports are zero rated, which increased the border tax rebates on exports is included by Kim (1988) as part of his export subsidy measure.

8.3 Using a General Equilibrium Model to Evaluate the Tax Contribution to Outward Orientation and Growth in the Early Growth Phase

Evaluating the effects of the tax policy component of outward-oriented policy on Korean growth over the last three decades in a single consistent model framework is difficult, because of the regime switches and the changes that have occurred in the economy. Savings rates have risen sharply, there has been substantial human capital accumulation, resources have transferred from the rural to the urban sector, and so on. Therefore, the incentive effects of the various tax schemes used over the years have come into play on several different margins, all of which ought ideally to be captured in any assessment of the contribution of taxes to growth. These include the effects of tax changes on export performance, savings, investment, and sectoral structure, among others.

Our approach has been to expand on a model we developed earlier (Trela and Whalley 1991) to analyze the contribution made by intersectoral resource transfers and by tax incentives to outward orientation and to growth in the early growth phase in Korea. The structure of the new model is basically the same as the earlier one except there are now three sectors rather than two. This three-sector model, like its two-sector counterpart, does not include the effects of such general factors as savings and human capital, but it does capture the effects of export promotion on manufacturing, the effect of tax policies on rural/urban migration, and, importantly, the endogenous determination of effort in both manufacturing and nonmanufacturing sectors.

In contrast to other multisectoral modeling efforts that have looked at growth in Korea and other Asian NICs (see Chenery, Robinson, and Syrquin 1986), this model uses average product pricing of labor in agriculture, reflecting traditional family farming arrangements. Decisions regarding effort in all sectors are endogenously determined through utility-maximizing behavior. Average product pricing of labor in agriculture, in contrast to marginal product pricing in manufacturing sectors, generates lower effort in agriculture than in manufacturing, which is matched by a correspondingly lower wage rate in agriculture. Promoting manufacturing through exports thus transfers labor both from the low-effort agricultural sector to the high-effort manufacturing sector, and from import-substituting to export-oriented manufacturing, thereby fueling growth.

We have used this model here to assess the importance of tax polices for Korean growth, especially in the earlier phase (1962–72). As we emphasize above, the second and third phases of this growth sharply curtailed some of the key features of the outward-oriented policies of the early years. In addition, many of the features that fostered high Korean growth are not captured by the model, such as high savings rates and rapid human capital accumulation, to mention but two.

Our modeling strategy is to construct a microconsistent data set for a given base year to which the model is calibrated. We then compute counterfactuals, in which a new equilibrium for the model is found in which outward-oriented policies (including tax elements of outward orientation) are removed. Comparing the two equilibria gives an assessment of the contribution of outward-oriented policies to GDP during the year. Because of the work involved in constructing base year data sets for each of a series of years, we use two alternative base years and sequentially introduce the policy variable characteristics of earlier or later years for comparison to the policy neutral equilibrium.

Thus, using what we term the 1962 base year model, we compute a policy neutral equilibrium and then compare sequentially the 1962 model with 1962 policies, with 1963 policies, 1964 policies, and so on. The policy contribution to GDP from each year's policy regime is assessed and the combined effect over ten (or twenty) years evaluated. We also use a 1982 base year model in which earlier year policies (1981, 1980, . . .) can be sequentially introduced in the same way. This procedure allows us to evaluate the contribution of the tax component of outward-oriented policies to growth through induced intersectoral resource transfers. We are also able to evaluate the contribution of outward-oriented policies in general, the specific indirect tax component of policies, and the specific direct tax component of policies.

In the model, Korea is treated as a small, open, price-taking economy. The resource endowment of the economy comprises three primary factors—capital, labor, and land. Only two of these appear as inputs for any sector. The rural sector uses only land and labor, while the urban sector uses capital and labor. The supply of workers is endogenous; rural/urban and urban/urban migration proceeds in response to differences in worker utility across sectors.

Utility is assumed to be a positive function of consumption and a negative function of effort, with individuals trading off differences in effort against differences in income. We induce both rural/urban and urban/urban migration in the model by introducing policy incentives to promote exports, including tax policies.

8.3.1 Production

The three production sectors that appear in the model are distinguished by the types of goods they produce. The rural sector specializes in the production of a single agricultural good (sector/good 1), while the urban sector produces two types of manufactured goods—import-substituting (sector/good 2) and export-oriented (sector/good 3). The output of each good is produced according to a constant elasticity of substitution (CES) production function:

$$(1)\quad Q_j = F\,\gamma_j\left[\alpha_j L^{(\sigma_j-1)/\sigma_j} + (1-\alpha_j)(\sum_{q=1}^{N_j} \varepsilon_j^q)^{(\sigma_j-1)/\sigma_j}\right]^{\sigma_j/(\sigma_j-1)},\quad j = 1;$$

$$(2)\quad Q_j = \gamma_j\left[\alpha_j K_j^{(\sigma_j-1)/\sigma_j} + (1-\alpha_j)\,(\sum_{q=1}^{N_j} \varepsilon_j^q)^{(\sigma_j-1)/\sigma_j}\right]^{\sigma_j/(\sigma_j-1)},\quad j = 2, 3,$$

where Q_j represents the output of sector j, γ_j is a constant defining units of measurement, α_j is a share parameter, F denotes the number of farms, ε_j^q is the effort of a typical worker in sector j, L denotes land used per farm in agriculture, K_j and N_j are capital and labor,[3] and σ_j is the elasticity of substitution between factor inputs.

On the factor side, land and capital are assumed to be sector specific while labor is intersectorally mobile, although because of the differential effort decision across rural/urban sectors, wage rates are not equalized across these sectors. In equilibrium factors are fully employed:

$$(3)\qquad \bar{L} = L,$$

$$(4)\qquad \bar{K} = K_2 + K_3,$$

and

$$(5)\qquad \bar{N} = FN_1 + N_2 + N_3,$$

where $\bar{L}$, $\bar{K}$, and $\bar{N}$ define the economy's fixed factor endowments.

Assuming that urban producers in both the import-substituting and export-oriented industries wish to minimize their costs and given that capital supply is fixed, producers in each urban sector choose the labor input that minimizes their costs:

$$(6)\qquad \min \mathcal{L} = w_j \sum_{q=1}^{N_j} \varepsilon_j^q + \lambda_j\left[Q_j - \gamma_j\left[\alpha_j K_j^{(\sigma_j-1)/\sigma_j} + (1-\alpha_j)\,(\sum_{q=1}^{N_j} \varepsilon_j^q)^{(\sigma_j-1)/\sigma_j}\right]^{\sigma_j/(\sigma_j-1)}\right],\quad j = 2, 3,$$

where w_j is the price of labor in urban sector j measured in efficiency units. This leads to the first-order condition

$$(7)\qquad w_j = \frac{P_j\,\gamma_j\left[\alpha_j K_j^{(\sigma_j-1)/\sigma_j} + (1-\alpha_j)(\sum_{q=1}^{N_j} \varepsilon_j^q)^{\sigma_j/(\sigma_j-1)}\right]^{1/(\sigma_j-1)}(1-\alpha_j)}{(\sum_{q=1}^{N_j} \varepsilon_j^q)^{1/\sigma_j}},\quad j = 2, 3,$$

where P_j is the price of good j produced in urban sector j.

The optimal amount of labor in the rural sector is determined using the average product pricing rule for labor:

3. In the agricultural sector, N_j is labor per farm.

$$(8)\quad w_j = \frac{P_j\,\gamma_j\left[\alpha_j K^{(\sigma_j-1)/\sigma_j} + (1-\alpha_j)(\sum_{q=1}^{N_j}\varepsilon_j^q)^{\sigma_j/(\sigma_j-1)}\right]^{\sigma_j/(\sigma_j-1)}}{N_j}, \quad j = 1,$$

where w_j is the return to labor in the rural sector.

The return to capital in each urban sector is derived by residual:

$$(9)\quad r_j = \frac{P_j\,\gamma_j\left[\alpha_j K_j^{(\sigma_j-1)/\sigma_j} + (1-\alpha_j)\,(\sum_{q=1}^{N_j}\varepsilon_j^q)^{(\sigma_j-1)/\sigma_j}\right]^{\sigma_j/(\sigma_j-1)} - w_j\sum_{q=1}^{N_j}\varepsilon_j^q}{K_j}$$

$$j = 2, 3.$$

8.3.2 Consumption

Consumers are differentiated according to their sector of residence, although their utility functions defined over goods and effort (leisure) are the same. We assume an augmented CES form:

$$(10)\quad U = \left[\sum_{j=1}^{3}\beta_j X_j^{(\theta-1)/\theta}\right]^{\theta/(\theta-1)} - \frac{\varepsilon^z}{z\delta},$$

where X_j defines consumption of good j, β_j is a share parameter, θ is an elasticity parameter, and $z > 1$ and $\delta > 0$ are constants, with z measuring the curvature of the disutility of effort function and δ defined as a units term in this subfunction.

Each consumer owns labor and an equal proportion of the economy's capital endowment which, along with transfers, yields consumer incomes. If T^q denotes transfers (recycled tax revenues) received by individual $q(\sum_{q=1}^{\bar{N}} T^q = T)$, $\bar{K}^q$ denotes capital owned by individual $q(\sum_{q=1}^{\bar{N}}\bar{K}^q = \bar{K})$, and X_j^q are purchases of good j by individual q, then individual budget constraints can be written as follows:

for workers in the rural sector

$$(11)\quad \sum_{j=1}^{3} P_j X_j^q = w_1 + r\bar{K}^q + T^q;$$

for workers in the urban import-substituting sector

$$(12)\quad \sum_{j=1}^{3} P_j X_j^q = w_2\varepsilon_2 + r\bar{K}^q + T^q;$$

and for workers in the urban outward-oriented sector

(13) $$\sum_{j=1}^{3} P_j X_j^q = w_3\varepsilon_3 + r\bar{K}^q + T^q.$$

Maximizing (10) subject to (11), (12), and (13) yields the demand functions:

(14) $$X_j^q = \frac{I_j^q \beta_j^\theta}{P_j^\theta \left[\sum_{j=1}^{3} P_j^{1-\theta} \beta_j^\theta\right]}, \quad j = 1, \ldots 3,$$

where I represents consumer income.

Substituting (14) into (10) yields the indirect utility function

(15) $$U = IC - \frac{\varepsilon^z}{z\delta},$$

where

(16) $$C = \left[\sum_{j=1}^{3} \left(\frac{\beta_j^\theta}{P_j^{\theta_j - 1} \left(\sum_{k=1}^{3} P_k^{1-\theta} \beta_k^\theta\right)^{(\theta-1)/\theta}} \right)\right]^{\theta/(\theta-1)}$$

Substituting (7) and (12) into (15), and (7) and (13) into (15), and optimizing with respect to ε_2 and ε_3, respectively, implies the optimal effort of a typical individual in the urban sector satisfies

(17) $$\varepsilon_j = [w_j C\delta]^{1/z-1}, \quad j = 2, 3.$$

Substituting (8) and (11) into (15) and optimizing with respect to ε_1 implies that the optimal effort of a typical individual in the rural sector satisfies

(18) $$\gamma P_1(1 - \alpha_1)\delta C = \frac{\varepsilon_1^{z-1+(1/\theta)} N_1^{(\theta+1)/\theta}}{\left[\alpha_j L^{(\theta-1)/\theta} + (1 - \alpha_1)(\sum_{q=1}^{N_j} \varepsilon_1^q)^{(\theta-1)/\theta}\right]^{1/(\theta-1)}}.$$

8.3.3 Government

Government interventions in taxes, subsidies, and transfers are also incorporated in the model. The government collects net revenues from the tax subsidy system and is assumed to distribute them on an equal per capita basis. In the model, we only capture those components of government revenues that are affected by taxing imports and subsidizing exports.

Revenue raised is thus given by

(19) $$R = \sum_{j=1}^{3} t_j P_j^w \max(X_j - Q_j, 0),$$

where X_j and Q_j are consumption and production, respectively, and t_j is the ad valorem tariff rate applied to imports of good j evaluated at world prices P_j^w. Subsidies paid are thus given by

(20) $$S = \sum_{j=1}^{3} \frac{s_j}{(1 - s_j)} P_j^w Q_j ,$$

where s_j is the subsidy rate applied to production of good j.

In setting the parameters of the model, we use estimates of effective subsidy rates in Korea. Thus rebates of indirect or direct taxes on exports and import duty remissions on exports are not directly modeled but are captured through the parameter values used to represent trade taxes and export subsidies. These are modeled in ad valorem form.

The government net revenue T is, therefore, given by

(21) $$T = R - S.$$

The expenditure side of the government budget consists only of transfers to households, as the government makes no real expenditures on goods. The government collects tariff revenues, pays export subsidies, and transfers its net revenues to individuals such that in equilibrium its budget is balanced. If transfers are made in lump-sum form and are distributed on an equal per capita basis, then transfers received by each individual are

(22) $$T^q = \frac{T}{\bar{N}}, \quad q = 1, \ldots, \bar{N}.$$

8.3.4 Foreign Sector

A specification of the external sector (rest of the world, ROW) completes our model. The ROW produces the same number of goods as the domestic Korean economy and both imports and exports so that, in equilibrium, it meets Korean desired net trades. Foreign and domestically produced goods are treated in the model as homogeneous commodities; commodities are treated as importables if net imports by Korea are positive, and as exportables if net imports are negative.

The model incorporates an external balance condition which requires that the value of imports equal the value of exports, evaluated at world prices:

(23) $$\sum_{j=1}^{3} P_j^w (X_j - Q_i) = 0.$$

Korea is modeled as a taker of prices on world markets for all tradeables where P_j^w denotes the fixed world prices. The relationship between Korean domestic producer prices and world prices for importables is

(24) $$P_j = P_j^w (1 + t_j), \quad j = 1, 2,$$

and for exportables is

$$P_j = \frac{P_j^w}{(1 - s_j)}, \quad j = 3. \tag{25}$$

8.3.5 Equilibrium

We use an iterative search procedure to solve for the equilibrium combination of rural to urban employment in the model. From this, commodity demand and supplies are determined as well as net trades. Because of the small, open economy assumption, equilibrium in the model involves factor market clearing and government budget balance, with trade balance a property of such an equilibrium. We begin by making an initial estimate of a common wage rate in the two urban sectors and of the return to labor in the rural sector. We then vary the parameters until an equilibrium is found that produces a set of factor prices that clears goods and factor markets, holds external balance conditions, and equalizes utility across the three sectors.

8.4 Using the General Equilibrium Model to Analyze the Role of Tax Policies in Korea's Outward-oriented Growth Strategy

We have used the model described above in counterfactual equilibrium analysis to assess the contribution of tax policy to growth in Korea. As indicated above, we calibrate the model to a microconsistent data set for a given base year incorporating a number of outward-oriented growth policies, including tax policies. Because of data difficulties, we have built data sets for two years only, 1962 and 1982, representing early and recent years in Korea's growth process. This yields two alternative models, a 1962 and a 1982 base year model.

Using each base year model, we perform a series of counterfactual equilibrium calculations. First we remove the export subsidy component of the policy mix used in the base year, yielding what we term an "export policy neutral equilibrium" (in other words, tariffs remain present). This enables us to assess the contribution to Korean growth of policies pursued in the base year. The contribution to growth of policies pursued in other years is evaluated by introducing the policies of the alternative year into the model in place of the base year policies and computing a new equilibrium in the presence of each. Comparison between each of the equilibria and the policy neutral equilibrium then provides the model estimate of the year's policy contribution to growth in the year. The effects of policies over a number of years are evaluated as the sum of the individual year's effects.

We have performed these calculations using both the 1962 and 1982 base year models; different results are obtained in each case, depending on the choice of base year model. We also perform calculations for different types of policy evaluation, for a removal of all export subsidies, for the tax component alone and for the direct (or indirect) tax component.

Parameter values for the production and demand functions in the model are determined using calibration techniques. Calibration procedures widely used in other applied general equilibrium models are followed (see Mansur and Whalley 1984). The requirement set for parameter values chosen in this way is that they be capable of replicating the base year microconsistent data set as an equilibrium solution to the model, given extraneous estimates of elasticities of substitution, policy parameters, endowments, and other data.

The first step in calibration is to break down the base year microconsistent data, constructed in value terms, into separate price and quantity data. For this purpose, a unit's convention is adopted (also see Mansur and Whalley 1984) that defines physical units for commodities as those amounts that sell for one currency unit (U.S. \$1.00).[4] For factors, base year equilibrium data on the price of capital, labor employment, and rural/urban wage differentials are used to decompose capital and labor payments into separate price and quantity observations.

The share parameters for the demand and production functions can then be determined by calibration, dependent on the choice of elasticity values for the production and utility functions in the model. In the rural sector, the values of the share parameter α_j are taken from the average product pricing rule for labor and from the first-order condition from producer cost minimization in the urban sector. These are

$$(26)\qquad \alpha_j = \frac{\left((w_jN_j)/(\gamma_jP_j)\right)^{(\sigma_j-1)/\sigma_j} - \left(\sum_{q=1}^{N_j} \varepsilon_j^q\right)^{(\sigma_j-1)/\sigma_j}}{L_j^{(\sigma_j-1)/\sigma_j} - \left(\sum_{q=1}^{N_j} \varepsilon_j^q\right)^{(\sigma_j-1)/\sigma_j}}, \quad j = 1;$$

$$(27)\qquad \alpha_j = \frac{1}{1 + \dfrac{w_j}{r_j}\left(\dfrac{\sum_{q=1}^{N_j} \varepsilon_j^q}{K_j}\right)^{1/\sigma_j}}, \quad j = 2, 3.$$

γ_1, the units term in the production function, is arbitrarily set equal to 1, allowing equation (26) to be solved for α_1. The values for γ_2 and γ_3 are then derived by residual, using equation (9), given the units' definition for output.

Demand-side parameters are determined in an analogous fashion using calibration techniques, except that first-order conditions for utility maximization are used. Taking the derivative of (10) with respect to X_j yields

4. The 1962 and 1982 benchmark data on production and labor income in won are converted into U.S. dollars using official exchange rates from Economic Planning Board (1964, 1984). Trade data for both years are reported in U.S. dollars.

$$\frac{\beta_j}{\beta_k} = \frac{P_j}{P_k}\left(\frac{X_j}{X_k}\right)^{1/\theta}, \quad j = 1, \ldots, 3; k = 1, \ldots, 3. \tag{28}$$

Normalizing so that $\sum_{j=1}^{3} \beta_j = 1$, individual β_j values can be obtained. Because ε_2 and ε_3 can be arbitrarily set equal to 1 in the base case data, the value for δ can be derived from (17). ε_1 can then be determined directly from the equal utility condition linking the manufacturing and agricultural sectors.

The microconsistent data sets to which we calibrate our model are built for the two years of 1962 and 1982, each chosen to reflect different stages of Korean growth. One is largely pre–outward orientation, the other post–outward orientation and for a more recent year. In constructing these data sets, different basic data sources have been used and various incompatibilities between source materials have had to be dealt with. Adjustments have been made to the data, both to resolve incompatibilities (differences in definition, and measurement differences) and to ensure that the equilibrium conditions of the model are satisfied in the data.

Data on the aggregate income of urban wage earners are from the Economic Planning Board (1964, 1984). These data are dissaggregated in order to provide estimates of labor income in the two manufacturing industries in the model using the ratios of value of production for the individual manufactured goods to total manufacturing production. The common urban wage rate (in terms of efficiency units) is calculated by dividing the aggregate urban wage bill by the product of the number of employed persons in the urban sector and the effort level of a typical worker in this sector, which is arbitrarily set equal to 1.0 in the base case equilibrium data. Data on urban employment in aggregate for both years are from the Economic Planning Board (1964, 1984). The average farm income per worker is estimated using data on urban/rural differences in earnings taken from Hong (1979). Since the data from Hong are only available up to 1976, we use the 1976 data and assume they reflect urban/rural differences in earnings in 1982. The rural wage bill is estimated as the product of average farm income per worker and the number of persons employed in the rural sector. Data on rural employment in each year are from Economic Planning Board (1982, 1986).

The income return to capital in each urban sector is estimated as the residual of the value of production less labor income in that sector. To translate these into observations on the physical quantity of capital used in determining parameters in the model, an estimate of the rate of return on capital in each manufacturing sector is needed. Assuming a common value between sectors in the base case equilibrium data, we use estimates on rates of return on capital during 1954–61 and 1972–75 (the latest period available to us) and assume them to be roughly equivalent to the rates in 1962 and 1982.

Trade in the urban import-substituting good is estimated using data on the value of imports of manufacturers, while trade in the export-oriented good is estimated using data on the value of manufacturing exports. Trade in the agricultural good, on the other hand, is estimated using data on net trade in this good. Data on the value of trade by commodity for each year are from the Economic Planning Board (1964, 1984).

Data on the value of production by commodity for each year are also from the Economic Planning Board (1964, 1984), except for data on agricultural production, which from our model definition is equal to labor income from employment in the rural sector. For each commodity, the value of consumption is determined as the residual between the value of production and trade. The value of trade evaluated at world prices must, for general equilibrium consistency, satisfy trade balance, and a scaling procedure incorporating the import data is used to ensure that condition holds.

The model also requires elasticity values for production and demand functions. We use values of 1.5 and -1.5. The unobservable parameter z, which measures the curvature of the utility function, we assume to be 1.5. Because of the potentially crucial nature of these values for model behavior, we use these values as our central set of values around which sensitivity analyses are performed.

To incorporate outward-oriented growth policies into the model, data are also required on tariffs and export subsidies. Since agriculture and import-oriented manufactures are the two goods that are imported in our model, we need tariff rates on these products. We use weighted average tariff rates on primary and manufactured products (adjusted for rebates) in 1968 (the earliest period available to us) from Westphal and Kim (1977) and assume them to be roughly equivalent to the tariff rates on these products in 1962. For tariff rates in 1982, we use simple average tariff rates on live animals and vegetable products and manufactures in 1982 from World Bank (1987).

Data on subsidy rates are taken from table 8.1, which we reproduced from Kim (1988). Since 1980 is the most recent year for which detailed information on subsidy rates from this source is available, we use the 1980 data and assume it to be roughly equivalent to the rates in both 1981 and 1982.

Table 8.2 reports some summary statistics from the two data sets we have constructed. The rapid expansion in the economy between 1962 and 1982 is evident, as is the change in the industrial composition of employment and output, and the changes in importance of trade to the economy. What remains to be established is how significant tax policies were in promoting outward orientation and how great a contribution they made to Korea's strong growth performance.

8.5 Results

We have used the general equilibrium model described above to assess the contribution of tax policies to Korean growth as part of the outward-oriented growth strategies used in recent decades. The counterfactual policy exercises

Table 8.2 **Summary Features of 1962 and 1982 Microconsistent Data Sets Used to Evaluate Inputs of Tax Policies in Korea's Outward-Oriented Growth Strategy**

	1962 Microconsistent Data Set	1982 Microconsistent Data Set
Value of GDP (in millions of U.S. dollars)	1,935.59	92,587.56
Ratio of employment in manufacturing to agriculture	1:15	1:2
Percentage of GDP		
Agricultural imports	0.18	0.81
Manufactured exports	2.39	23.60
Manufactured imports	2.21	22.79
Manufactured exports as percentage of total exports[a]	27.0	93.7
Average tariff rate		
Agricultural imports (%)	7.1	13.4
Manufactured imports (%)	11.6	14.7
Average export subsidy rate (%)	16.6	21.3

[a]These figures are based on actual data. In the model Korea exports only one good.

we have performed involved a series of counterfactual experiments in which the base year (1962 or 1982) policies are removed, and a new equilibrium for the model computed and compared to the benchmark equilibrium. This comparison yields estimates of quantitative changes in all the endogenous model variables under the policy change. Further counterfactual experiments are then performed, in which outward-oriented tax policies during each year of the specified time periods (1963–82, 1963–72, or 1981–62) are sequentially introduced. For each of these policy changes, a new counterfactual equilibrium is computed and compared with the same no policy equilibrium.

Before exploring the results that have been produced from the counterfactual experiments described above, it may help if we first restate the results from our earlier work. These are reported in tables 8.3 and 8.4.

Table 8.3 reports results for the model experiment on which the tax component (direct tax reductions and indirect tax exemptions) of outward orientation is introduced. Results indicate that the average annual increase in GDP over this period attributable to tax policies is small, only 0.54 percent using the 1982 base year model or less than 10 percent of actual average annual Korean growth in real GDP. A similar result is reached with each of the other model experiments, which use the 1962 base year model. These results suggest that tax policies played only a minor role in Korea's outward-oriented developmental process, even in the early phases of Korean growth (1962–72). These policies also clearly had the effect of inducing migration from the rural to the urban sector. The effect of removing 1982 tax policies using the 1982 base year model shows the share of labor in agriculture as increasing to 70.63

Table 8.3 **General Equilibrium Estimates of Effects of Korean Tax Policies 1962–82 (%)**

	Contribution over 20 Years of Outward-oriented Tax Policies Using 1982 Base Model	Contribution over 20 Years of Outward-oriented Tax Policies Using 1962 Base Model	Contribution over 10 Years of Outward-oriented Tax Policies Using 1962 Base Model	Actual Average Annual Growth Rate	
				1962–82	1962–72
ANNUAL AVERAGE GROWTH RATE					
GDP	0.54	0.68	0.62	8.65	9.25
Exports of manufactures using 1982 base model[a]	1.07	—[a]	—[a]	35.37	55.66
Imports of agriculture using 1982 base model[a]	1.10	—[a]	—[a]	11.94[b]	21.58[b]

	1982 Base Year Model with 1982 Policies	1982 Base Year Model with Tax Policy Neutral Mix	1962 Base Year Model with 1962 Policies	1962 Base Year Model with Tax Policy Neutral Mix	Actual Distribution[c]		
					1962[d]	1972	1982
DISTRIBUTION OF EMPLOYMENT							
Agriculture	67.35	70.63	93.73	94.16	63.1	50.6	32.1
Manufacturing	32.67	29.37	6.21	5.84	36.9	49.4	67.9

Source: Trela and Whalley (1991).

[a]Trade growth using the 1962 base model is unrealistically high because of the small manufactured export base involved, and is not reported.

[b]Figures are based on imports of food and live animals.

[c]The distribution is between agriculture and nonagriculture.

[d]Based on the 1963 distribution.

Table 8.4 **Assessing the Effects of Tax Policies on Korean Growth Using the 1982 Base Model (%)**

	Contribution of Indirect Tax Component of Outward-oriented Korean Growth Strategy	Contribution of Direct Tax Component of Outward-oriented Korean Growth Strategy	Contribution of Combined Tax Component of Outward-oriented Korean Growth Strategy	Contribution of Both Tax and Nontax Components of Outward-oriented Korean Growth Strategy	Actual Average Annual Growth Rate
ANNUAL AVERAGE GROWTH RATE					
GDP	0.51	0.03	0.54	1.40	8.65
Exports of manufactures	1.01	0.07	1.07	2.64	35.37
Imports of agriculture	1.04	0.07	1.10	2.66	11.94[a]

	1982 Base Year Model with 1982 Policies	1982 Base Year Model without 1982 Indirect Tax Policies	1982 Base Year Model without 1982 Direct Tax Policies	1982 Base Year Model with Tax Policy Neutral Mix	1982 Base Year Model with Export Policy Neutral Mix	Actual Distribution[b]	
						1962[c]	1982
DISTRIBUTION OF EMPLOYMENT							
Agriculture	67.35	70.63	67.32	70.63	73.27	63.1	50.6
Manufacturing	32.67	29.37	32.68	29.37	26.73	36.9	49.4

Source: Trela and Whalley (1991).

[a]Figure is based on imports of food and live animals.

[b]The distribution is between agriculture and nonagriculture.

[c]Based on the 1963 distribution.

percent from its 1982 benchmark level of 67.35 percent, while the share of labor employed in manufacturing fell from 32.67 percent to 29.37 percent. Also, these policies caused exports of manufactures to expand by 1.07 percent on an annual basis over the twenty-year period.

Using the same modeling approach, the relatively small contribution of tax policies to growth can also be broken down into two separate effects—direct tax reductions (mainly corporate tax rebates for exporters) and indirect tax exemptions (rebates of sales and excise taxes on exports). These results are reported in table 8.4. Results indicate that indirect tax exemptions have contributed far more to Korean growth than have direct tax measures, which have been relatively inconsequential.

Table 8.4 also reports results for a model experiment in which both tax and nontax components of outward-oriented Korean growth strategies are sequentially introduced. The quantitative magnitudes involved emphasize the dominant role that nontax components (direct cash subsidies, export premiums, interest preferences, and tariff rebates) have played in Korea's development process. Overall, however, the results seem to imply that outward-oriented policies in Korea have little significance in driving growth.[5]

Results produced by the three-sector model can now be compared to those from the earlier model. Results in table 8.5 from the three-sector model portray the tax component of outward-oriented policies as accounting for 3.0 to 4.2 percent of Korean growth between 1962 and 1982, and 3.6 percent between 1962 and 1972. These results are less than half of those reported from the two-sector model. The difference stems from the additional resource reallocation effects within the urban sector that are captured in the three-sector model. In this model, labor in both import-substituting and export-oriented manufacturing sectors is paid their marginal product. This generates a common effort level in the two sectors, which is matched by a correspondingly common wage in the two sectors. A reallocation of labor within the urban sector and from the rural to urban sector, encouraged through export-oriented promotion policies, thereby fuels lower growth than if labor were only transferred from the low-effort agricultural sector to the high-effort manufacturing sector, as is the case in the two-sector model.

8.6 Conclusion

This paper both discusses and evaluates the role of tax policy in the Korean growth process from the early 1960s to the late 1980s. As such, it seeks to do

5. A recent study, Chenery, Robinson, and Syrquin (1986), also uses a multisectoral general equilibrium model for analyzing the contribution of trade policy to growth in Korea. Results of their model simulations indicate outward-oriented policies account for as much as 1 percent of output growth in Korea. Our results indicate a somewhat larger contribution to growth. However, our model provides only a very partial view of the Korean growth process, since savings, investment, human capital formation, and many other factors are missing.

Table 8.5 **Impact on Results in Table 8.3 of a Change in Model Structure From Two to Three Sectors (%)**

	Two-Sector Model			Three-Sector Model		
	Contribution over 20 Years of Outward-oriented Tax Policies Using 1982 Base Model	Contribution over 20 Years of Outward-oriented Tax Policies Using 1962 Base Model	Contribution over 10 Years of Outward-oriented Tax Policies Using 1962 Base Model	Contribution over 20 Years of Outward-oriented Tax Policies Using 1982 Base Model	Contribution over 20 Years of Outward-oriented Tax Policies Using 1962 Base Model	Contribution over 10 Years of Outward-oriented Tax Policies Using 1962 Base Model
ANNUAL AVERAGE GROWTH RATE						
GDP	0.54	0.68	0.62	0.26	0.36	0.33
Exports of manufactures using 1982 base model[a]	1.07	—[a]	—[a]	0.96	—[a]	—[a]
Imports of manufactures using 1982 base model[a]	n.a.	n.a.	n.a.	0.92	—[a]	—[a]
Imports of agriculture using 1982 base model[a]	1.10	—[a]	—[a]	2.84	—[a]	—[a]

n.a.: not applicable.

[a]Trade growth using the 1962 base model is unrealistically high because of the small manufactured export based involved, and is not reported.

two things: (1) to describe briefly the evolution of Korean tax policies over this developmental sequence, and (2) to use and expand on a general equilibrium model developed earlier by the authors to provide a comparative assessment of the role that tax policies may have played in this growth.

What emerges from the first section of the paper is a picture of a tax system in Korea that has evolved over nearly thirty years from a system raising small amounts of revenue from a series of narrowly based taxes to a more broadly based, mature system raising more revenue that relies heavily on a broadly based VAT. Throughout this period, the Korean tax system has also been remarkably adept in responding to the various swings in Korean growth policies. In the outward-oriented phase (1961–72), rebates of direct and indirect taxes on exports were used; in the heavy industry and chemical industry phase (1973–79), investment tax credits, tax holidays, and other incentives for these industries were used; and in the most recent trade liberalization and structural adjustment phase (1980–89), neutrality in tax policy has been the approach. The GDP growth rate in each of these phases has been consistently high, which implies that the changing tax system in Korea has probably facilitated rather than fueled high growth.

In the second part of the paper, we have modified a general equilibrium model (Trela and Whalley 1991) we used earlier to investigate the contribution of tax policy to Korean growth, by extending it to a three-sector model with two manufacturing industries. This model, like its two-sector counterpart, provides only a very partial view of the Korean growth process, as savings, investment, human capital formulation, and many other key factors are missing. But unlike the earlier model, this captures resource reallocation effects from import-substituting to export-oriented manufacturing. As a result, export promotion policies, which stimulate manufacturing, move labor not only from the low-efficiency rural sector to the high-efficiency urban sector but also within manufacturing, thereby fueling growth that is lower than if labor moved only from the rural to urban sector, as is the case in the two-sector model.

Using these models to examine the contribution of tax-oriented policies in the earlier years of Korean growth seems to indicate a relatively modest role for taxes, accounting for less than 10 percent of actual Korean growth over the period 1962–82 and over the intensive outward-oriented phase of 1962–72.

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Comment

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Korea's growth performance has been either the best, or one of the two best (with Taiwan), in the world over the past thirty years. Because of that spectacular performance, there is great interest in assessing the contributions of various factors to it.

Irene Trela and John Whalley have made an interesting and important contribution to that discussion by focusing on the role of tax policy and its importance in affecting the rate of growth. Although the overall role of government

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and the effect of the trade regime in leading to Korea's success have been extensively analyzed, there has been little analysis of other policies. The Trela-Whalley contribution is therefore greatly to be welcomed.

To estimate the role of changes in the tax structure, Trela and Whalley construct a computable general equilibrium model and then analyze the changes in output that occur over the longer term under alternative tax structures.

The analysis is thoroughly professional, and their findings are clear: tax policy contributed probably around 0.54 percentage points to the growth rate over the period covered by them. They therefore conclude that the Korean growth rate was relatively impervious to individual policies, and especially to reforms in taxes that rendered the system more efficient.

I have two quarrels with the paper: (1) the treatment of the import-competing and exportable sectors and (2) the interpretation of their results.

Turning first to the computable general equilibrium (CGE) model's structure, there are two questions. An issue arises with regard to the prices that are used to evaluate growth rates. It is not clear from the paper which prices are used and whether it makes a difference.

The second question concerns the model's treatment of all manufacturing as an exportable industry and all agriculture as an import-competing industry. Especially given Korea's strong comparative disadvantage in agriculture, a question arises as to where resources would have gone had there not been an export-oriented trade policy. The evident answer would appear to be, into import-competing manufacturing industries. To be sure, the rate at which out-migration from agriculture would have occurred would have been lower, but the most plausible scenario is that the import-substitution drive of the 1950s would have continued, and that there would have been high walls of protection for domestic manufacturing industries. As such, I do not believe that the Trela-Whalley model provides a valid basis on which to measure the alternative uses of resources under other policies.

Turning to interpretation of the model, there are serious questions as to whether the finding that 0.54 percent points implies that the contribution was small, and whether the Korean growth performance was as robust as indicated, or whether instead it was attention to *many* policy parameters, each of which was altered to the extent possible to achieve economic efficiency, that gave Korea its excellent growth performance.

We should not regard 0.54 percentage points as small, even when the overall growth rate averages around 10 percent. For many countries (such as India over the past thirty years, or most Latin American countries over the past decade), half a percentage point on the growth rate would be a major achievement. Moreover, if one observes all developing countries, the average real rate of economic growth over the period 1965 to the early 1980s ranged from about 3 percent to Korea's 10 percent. It is a reasonable inference that a rate of growth of 3–4 percent would have been achieved with a very poor policy stance, and that it is the responsibility of the authorities to establish economic policies conducive to attaining higher levels of economic growth and welfare than the minimum. If so, the range for policy improvement is from 3–4 percent to 10 percent. On that reading, reforms in tax policy might account for as much as one-tenth of the difference between a mediocre and a spectacular growth performance. Surely, that is nothing to be dismissed as "small"!

This always seems to be a problem with estimating the impact of policies: each one alone provides a "small" estimate. Yet it must be asked, in light of the number of policies set by governments (labor market interventions, agricultural pricing policies, investment and maintenance of infrastructure, macroeconomic environment, trade policy, monetary policy, controls over the credit market, etc.) how much significance one would expect to be attached to any one of these alone.

In the Korean case, most policies appear to have been established and executed in a highly inefficient manner in the 1950s: inflation was rampant, there was rigid credit rationing at strongly negative real rates of interest, the government was incurring large fiscal deficits, the exchange rate was greatly overvalued, imports were subject to quantitative restrictions, exchange controls were in place to prevent capital flight, and infrastructure investment was often inefficient and ineffective. In this regard, it may be significant that policies had already shifted markedly away from import substitution by 1962, the year that Trela and Whalley use as their base.

Starting in 1960, policies were reformed on many fronts. Until the late 1980s, there was a fairly strong social consensus for rapid economic growth, and technocrats within the government were given a fairly free hand in establishing economic policies. The result was a concerted effort to find means of achieving more rapid growth. Not surprisingly, policies were reformed when it was deemed feasible to do so. The process of increasing the efficiency of economic activity through policy reform (and increased incentives for factor accumulation) has gone in waves since that time and still continues (although there is some question as to whether the current political structure will provide an environment conducive to "tight" economic policy as did the earlier regime).

In this environment, it is not surprising that tax policy could account for "only" 0.54 percentage points of growth. If similar analyses could be done for the effects of shifting to positive real interest rates, of unifying the exchange rate, reducing the levels of protection to import-competing industries, increasing the rate of utilization of infrastructure, and reducing the budget deficit and the rate of inflation, the total would surely be substantial. It is too much to expect, however, that any one policy instrument alone could have sufficient impact on its own to account for a major portion of Korea's growth performance.

Indeed, the relevant lesson may be that almost all policies need to be reasonably conducive to efficiency in order for rapid economic growth to occur. Governments that undertake policy reforms in the field of taxation in order to enhance economic efficiency and growth are also likely to put into place other policy reforms. Without these complementarities among policies, none of the reforms would have quite the impact they otherwise could.