Corporate Tax Integration in the United States: A Dynamic General Equilibrium Analysis

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A DYNAMIC GENERAL EQUILIBRIUM ANALYSIS

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ABSTRACT

The objective of this paper is to study empirically the inter-industry and intertemporal efficiency and distribution effects of integrating corporate and personal income taxes. This paper develops a dynamic general equilibrium model of the U.S. economy. The model accommodates optimal intertemporal investment decisions and optimal allocation of investment across sectors, intertemporal household consumption/leisure decisions, and government deficits and financial crowding out.

Simulation results suggest that the elimination of the corporate income tax and its replacement by increased personal income tax rates would yield long-run benefits which are at best 17% of the present value of future consumption and leisure. Also, the average long-run gains are more than three times as large as the average short-run gains: it takes time for the efficiency gains of integration to show up. Finally, integration is shown not to be a Pareto improvement the lowest income groups are worse off after integration.
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1. Introduction

The objective of this paper is to study numerically the intertemporal and interindustry efficiency and distribution effects of integrating corporate and personal income taxes. The corporate income tax has long been criticized for its distortionary effects on the economy. In particular, the corporate income tax introduces a differential among the rates of return of capital in different industries according to their degree of incorporation. Thus, the allocation of investment in the economy is distorted in favor of lowly incorporated sectors. Furthermore, the existence of differentiated investment tax credits and depreciation allowances creates a wide variety of marginal corporate taxes across incorporated industries. Finally, the corporate income tax represents a 'double' taxation of income at both the personal and corporate levels; corporate earnings are subject to the corporate tax, and the after-tax earnings are either distributed as dividends and taxed at the personal level or retained and potentially taxed as capital gains.

The public finance literature has often proposed to eliminate or reduce the distortions created by the taxation of corporate income by integrating the corporate and the personal income tax systems. Empirical evidence on the issue of corporate tax integration indicates that integration may have substantial effects. In the path-breaking work of Fullerton-King-Shoven-Whalley (FKSW) (1981, 1985), total integration was found to yield gains that could be as large as $695 billion of 1973 dollars, or about 1.4% of the present value of consumption and leisure in the U.S. economy. Also, corporate tax integration is shown to be a Pareto improvement. Corporate tax integration leads to a U-shaped pattern of gains for the different consumer classes, with the lowest and highest income groups reaping most of the benefits.
The gains reported by FKSW result primarily from interindustry re-allocations of investment after accounting for the additional distortions in labor-leisure decisions. However, there are reasons to believe that FKSW's results may be severely biased upwards. First, FKSW postulate government yearly balanced budgets. No deficits are allowed to occur. It is true that resource crowding out is still captured, but financial crowding out induced by government spending is not. Therefore, the effects of corporate tax integration upon government deficits are ignored. However, inasmuch as increased government deficits are generated under integration, private investment will face less favorable conditions. Secondly, in FKSW investment behavior passively accommodates endogenous savings decisions. Investment is not derived from industry's optimization behavior. As a consequence, the differential impacts of policies in the incentives to save and to invest are not captured. Furthermore, the very nature of the effects of corporate income tax and corporate tax integration on inter-industry allocation of investment requires the consideration of a meaningful investment behavior. Thirdly, FKSW assume full capital mobility across sectors. Instantaneous and costless adjustments in the capital stock are also assumed. However, full capital mobility and costless adjustments rule out the possibility of different costs of capital across sectors and therefore of differentiated reactions to tax policy changes. Finally, the economy in FKSW is characterized by a sequencing of otherwise static models. The transitions between adjacent periods are to a large extent exogenous.

Like FKSW, this paper focuses on the effect of corporate tax integration on interindustry re-allocations of investment. However, this paper attempts to address the modeling problems referred to above. The modeling of both government deficits and of optimal investment decisions necessitates the consideration of a dynamic framework. In turn, a dynamic framework highlights the efficiency effects of integration on the optimal intertemporal decisions of the different agents in the economy. This paper develops a dynamic general equilibrium model of the U.S. economy. The economy is characterized by a sequential market structure. The model accommodates optimal
intertemporal investment decisions and optimal allocation of investment across sectors, intertemporal household consumption/leisure decisions, and government deficits and financial crowding out.

Simulation results suggest strikingly that the elimination of the corporate income tax and its replacement by increased personal income tax rates would yield long-run benefits which are at best 1.17% of the present value of future consumption and leisure. In fact, the welfare gains from integration in this paper are much lower than those reported in FKSW is to be attributed to the optimality of investment behavior with adjustment costs and imperfect capital mobility. In particular, financial crowding out effects are of secondary importance. Another striking feature of the simulation results is that the average long-run gains from integration are more than three times as large as the average short-run gains: it takes time for the efficiency gains of integration to show up. This new intertemporal pattern of efficiency effects reflects an adjustment lag in the interindustry investment decisions due to the existence of costs of adjustment. Finally, unlike suggested in FKSW, integration is shown not to be a Pareto improvement. In terms of the value of current consumption and leisure, the lowest income groups are worse off after the policy implementation.

This paper is organized as follows. Section 2 develops the dynamic general equilibrium model model. It discusses the foundations of economic behavior as well as the nature of economic equilibrium. Section 3 presents the design of the policy experiments and the empirical evidence on corporate tax integration under different policy scenarios. Finally, Section 4 summarizes the results in the paper and provides some concluding remarks.

2. A Dynamic General Equilibrium Model of the US Economy

This section provides a description of the dynamic general equilibrium model in this paper.
The first subsection gives a general overview of the model. Given the specific nature of this paper, focusing on corporate income tax integration, an in-depth description of producers' real and financial decision mechanisms is given in the second subsection. For a detailed description of this model see Pereira (1988a).

2.1 A General Overview

In this model the U.S. economy is characterized by an incomplete, sequential market structure in a finite horizon and discrete time frame. It is an incomplete market structure in that all current markets are open, but there are no future markets. At any time, several markets are open for the different consumption goods, and for physical capital, labor and financial assets. In this economy there are three types of agents: consumer groups, industries, and government. Agents face a dynamic environment. Economic behavior of every agent in this economy is derived from an intertemporal specification of the agents' objectives and constraints.

The model considers four industrial sectors with different degrees of incorporation: sector one includes agriculture, mining and energy; sector two includes food, textiles, paper, chemicals, lumber and metals; sector three includes trade, finance, real estate and services; and sector four includes capital goods such as construction, transportation and machinery. Industries maximize the present value of the net cash flow in a technology with adjustment costs, to determine endogenously optimal supplies and optimal demands for the different production inputs. In particular, investment decisions are forward looking. Real investment is financed by retained earnings and issuance of new debt and equity according to exogenously defined rules.

Government engages in several economic activities. First, it collects taxes - on the use of labor by the different industries, on both corporate and personal income including capital gains, and on sales - according to an exogenously given tax regime. The taxation system in the model
reflects the situation in the United States before the Tax Reform Act of 1986. Second, it transfers discretionary lump-sum amounts to the private sector. Finally, it purchases consumption goods and primary inputs to accomplish general government activities through the production of a public good. Government intertemporal behavior is obtained from the maximization of a social welfare function defined over the domain of the public good. General government activities are constrained by a recursive set of budget constraints so that government is allowed to run yearly deficits. Government engages in the sale of public bonds to finance such imbalances.

The model considers three income classes: lower class with yearly income below six thousand of 1973 dollars; middle class with income between six and fifteen thousand of 1973 dollars; and upper class with income above fifteen thousand of 1973 dollars. Optimal household behavior follows a intertemporal optimization model generating endogenous savings and labor-leisure decisions. Household savings are invested in financial assets—public and private bonds, and equity. In the absence of uncertainty, the composition of the asset portfolio is a matter of indifference for the households. Portfolio decisions accommodate the composition of the demand for the funds households are supplying.

To make their real and financial decisions at each t, the economic agents use several types of information. They observe current prices. However, economic decisions are formulated in a context of imperfect information about future prices and interest rates. Intertemporal consistency is not imposed in the model, in that agents are allowed to commit mistakes due to incorrect expectations.

Atomistic competition in each and every market is assumed. Even though the number of agents on each side of the market is finite, it is assumed that enough agents are involved to render their actions negligible in terms of the overall equilibrium outcomes. The concept of Temporary Wairasian Equilibrium is adopted to capture the incomplete and sequential aspects of real world trading, and the limitations of foresight into the future which we want to capture in this model. All
current markets are assumed to clear, hence the Walrasian nature of equilibrium. Also, equilibrium in the short-run is parametric on the expectations of future prices held by the different agents as well as future taxation parameters, hence the temporary or sequential nature of equilibrium. The link between adjacent periods is endogenously provided by the recursive transitions of the stock variables in the economy.

This model of the U.S. economy departs from FKSW and, for that matter from most of the numerical general equilibrium models for tax policy evaluation (see Shoven-Whalley (1984) and Pereira-Shoven (1988) for surveys of these models), in several fundamental directions directly relevant for the issue of corporate tax integration. First, the model in this paper provides a comprehensive modeling of dynamic economic behavior. In particular, government deficits are optimally determined and investment decisions are forward looking and are the result of optimizing behavior. Secondly, it encompasses an endogenous sequential equilibrium structure founded on dynamic economic behavior with flexible expectations.

Given the temporary equilibrium structure of this model the computation of a T-dimensional intertemporal equilibrium path involves the computation of a sequence of T one-year equilibria parametrically on price expectations. The optimal transitions of the stock variables between adjacent one-year equilibria are determined endogenously given the equilibrium prices and net demands. For the simulation reported in this paper the DABEM is run to produce a twenty-year equilibrium sequence in a decision time frame of one hundred years. Static expectations are maintained. This makes the results in this paper directly comparable to FKSW. Also, short-run results refer to the first ten years and long-run to the whole twenty-five year period.

2.2 Producers' Behavior

Production technology at each t is represented by a time-invariant Leontief structure of the
form:

(1) \( y_{jt} = \min \{ F_j(L_{jt}, K_{jt}), y_{jt-1}/\delta_j, ..., y_{jt-1}/\delta_j \} \).

The value-added production function, \( VA_{jt} = F_j(L_{jt}, K_{jt}) \), is twice continuously differentiable, strictly increasing in every input, and concave.

We further assume that adjusting capital stock towards its optimal level is costly. This idea is captured by sector-specific cost functions defined over gross capital stock accumulation. The adjustment cost functions can be interpreted to include both acquisition and internal, non-market adjustment costs. The twice continuously differentiable investment cost function for sector \( j \) is:

(2) \( TC_j(l_{jt}) = p_{jt}l_{jt} + C_j(l_{jt}) \).

The adjustment cost function has the following properties:

(3) \( C_j(0) = 0 \), and \( C_j(l_{jt}) > 0 \) for \( l_{jt} > 0 \).

(4) \( \alpha C_j(l_{jt})/\alpha l_{jt} > 0 \) for \( l_{jt} > 0 \).

(5) \( \alpha^2 C_j(l_{jt})/\alpha l_{jt}^2 < 0 \).

The evolution of capital stock through time, reflecting actual investment, is given by the equation of motion:

(6) \( l_{jt} = K_{jt-1} - (1 - \delta_j)K_{jt} \)

where \( \delta_j \) is the depreciation rate of capital stock installed in sector \( j \) at period \( t \).

The equation of motion of capital reflects the idea that in the short-run, capital stock is fixed, i.e., the capital stock in existence at \( t \) is not a decision variable at \( t \), but it is determined by optimal decisions in previous periods. However at \( t \), investment decisions will be made determining the capital stock at \( t+1 \). In the long run, capital stock is variable.

Each sector of production \( j \) faces ad valorem taxes on the use of labor services, which represent the employer's portion of social security taxes. Therefore, if \( T_{Lt} \) is the tax rate, assumed constant
across sectors of production, the cost for sector \(j\) of one unit of labor is given by \((1+T_{Lt})p_{Lt}\).

As a consequence of its decisions at period \(t\), the sector realizes gross profits \(\Pi_{jt}\) — payment of capital services plus economic profits, i.e., sales revenues minus non-investment expenditures:

\[
(7) \quad \Pi_{jt} = (p_{jt} - \sum_{f} f_{j}(a_{j}p_{ft}))y_{jt} - (1 + T_{Lt})p_{Lt}L_{jt}.
\]

Each sector \(j\) is subject to an ad valorem corporate tax on \(\Pi_{jt}\). The after-tax gross profits are

\[
(1 - T_{Cjt})\Pi_{jt},
\]

where \(T_{Cjt}\) is the sector-specific corporate tax rate at \(t\).

On the other hand, investment expenditures benefit from an investment tax credit which is an ad valorem subsidy. Actual investment expenditures are

\[
(1 - ITC_{jt})p_{jt}I_{jt} + C_{j}(I_{jt}).
\]

Interest payments are deductible from the corporate tax base so that the net interest paid on outstanding bonds is \((1 - T_{Cjt})r_{t}B_{jt}\).

Also, depreciation allowances \(DA_{jt}\) are to be deducted from the corporate tax base. Let \(B_{jt}\) and \(K_{jt}\) be the depreciation rates for tax purposes and capital stock for tax purposes, respectively.

The after-tax gross profits are increased by \(T_{Cjt}B_{jt}K_{jt}\).

Industry \(j\)'s net cash flow at \(t\) \(NCF_{jt}\) can be written as:

\[
(8) \quad NCF_{jt} = ((1 - T_{Cjt})
\]

\[
[(p_{jt} - \sum_{f} (a_{j}p_{ft}))F_{j}(K_{jt}, L_{jt}) - (1 + T_{Lt})p_{Lt}L_{jt}) - (1 - ITC_{jt})p_{jt}I_{jt} + C_{j}(I_{jt}) + T_{Cjt}B_{jt}K_{jt}.
\]

The discounted value at \(t\) of the intertemporal sequence of net cash flows is obtained from the sequence of current and future expected market rates of return \(r_{t}\)’s.

The producers’ dynamic behavior with respect to real economic variables is determined by the maximization of the present value of net discounted cash flows at each moment \(z\), subject to strictly convex adjustment costs, the equation of motion for the capital stock, and future price expectations.
Formally, this is for \( z_{slT} \), \( z_{sT} \),

\[
(9) \quad \text{Max}_{(L, l, K)} \sum_i \left( \prod_g (1 + r_g)^{-1} \right) NCF_{jt}
\]

subject to:

i) **non-negativity constraints** for all \( z_{slT} \) and \( l_{sW} \),

\[
(10) \quad y_{jlt} \geq 0, L_{jt} \geq 0, K_{jt} \geq 0;
\]

ii) **equation of motion of capital stock** for all \( z_{slT} \) as in (6),

iii) **state end conditions**, 

\[
(11) K_{j2} = K^* j,
\]

(12) scrap value of capital at \( T+1 \) is given.

Financing its real investment, production sector \( j \) is constrained in the following way for all \( z_{slT} \):

\[
(13) \quad F^D_{jt} = (1 - IT_{Cj_t}) p_{ljt} l_{jt} + C_j(l_{jt}) + (1 - T_{Cj_t}) r W_{lj} B_{lj} - RE_{jt}
\]

with terminal condition \( F_{lj_{T+1}} = 0 \).

This means that real investment activities and the payment of interest on outstanding debt at \( t \) are financed through retained earnings, \( RE_{jt} \), and external funds, \( F^D_{jt} \), which represent the increment in the financial liabilities of the sector \( F_{lj_t} \). Financial liabilities must be liquidated by the end of the model horizon.

Dividend-retention policies are exogenously given. Corporate dividend-retention policies are represented by parameter \( \varnothing_{jlt} \), the fraction of the after-tax gross profits generated at \( t \) which is retained by industry \( j \). The remainder, \( (1 - \varnothing_{jlt}) \), represents the distributed portion of after-tax
earnings. Total dividends at t, \((1-\theta_{j1})^{1-T_{j1}}\), are distributed among the t-th period shareholders.

External funds totalling \(F_{j1}^D\) are obtained by issuing additional equity \(E_{j1+1}\) at price \(p_{Ej1}\) and additional fixed price bonds \(B_{j1}\):

\[
(14) \quad F_{j1}^D = B_{j1} + p_{Ej1}(E_{j1+1} - E_{j1}).
\]

Issuance of new bonds and equity is governed by exogenous corporate financing rules represented in this model by parameter \(\theta_{Ej1}\). Such policy rules can be described as follows:

\[
(15) \quad p_{Ej1}(E_{j1+1} - E_{j1}) = \theta_{Ej1} F_{j1},
\]

\[
(16) \quad B_{j1} = (1 - \theta_{Ej1}) F_{j1}.
\]

with end conditions,

\[
(17) \quad p_{jEz-1} E_{jz} = p_{jEz-1} E_{j} \quad \text{and} \quad p_{jE1} E_{j1+1} = 0,
\]

\[
(18) \quad B_{jz} = B_{jz} \quad \text{and} \quad B_{jT+1} = 0.
\]

Perfect capital markets are assumed such that the price of equity at z, \(p_{Ejz}\), is the present discounted value of the future expected stream of dividends per share \(\text{Div}^{Ej1}/E_{j1}\):

\[
(19) \quad p_{jEz} = \sum_t \{\Pi_{at}(1+g_a)^{-1}\} \text{Div}^{Ej1}/E_{j1}, \text{ with } z+1 \geq s \geq T.
\]

3. Corporate Tax Integration: Simulation Design and Simulation Results

Policy evaluations are carried out by contrasting a base case, reflecting the status quo, and several counterfactual, or revised case equilibria reflecting different policy scenarios. The different equilibria are made comparable by the use of the concept of equal yield (see Shoven-Whalley (1977)). In the revised cases additional expenditures plus discretionary
transfers and interest payment on debt, may be financed via increased tax revenues - tax-financed experiments, new bond issuance - bond-financed experiments, or by a combination of both - mixed-financing experiments. The equal yield experiments involve endogenous replacement changes in the personal income tax rates. Replacements can be multiplicative (personal tax rates are multiplied by a certain factor) or additive (a certain factor is added to the personal tax rate). (See Persira (1988b) for a detailed discussion of these points). Finally, the information contained in the different equilibria is synthesized in a scalar policy evaluation indicator, Hickman Equivalent Variations generalized to accommodate intertemporal comparisons when perfect foresight is not assumed and future markets are not open.

3.1 Corporate Tax Integration Schemes

Several ways of dealing with the distortionary effects of the taxation of corporate income have either been suggested or implemented in the United States. Several laws for various periods attempted to alleviate the "double" taxation of dividends and the tax preference for bond financing. In 1936-1937, a dividend-paid deduction was in effect. The corporations were allowed to deduct dividends from the corporate tax base. This effectively reduced the corporate income tax to a tax on retained earnings. For that reason this tax provision was promptly eliminated. More recently, during the planning that preceded the Tax Reform Act of 1986, the U.S. Treasury Department proposed that 10% of the dividends be deductible by corporations. This plan encountered some opposition from the corporation who claimed they would be forced to pay higher dividends as a result. Ultimately, this plan was not adopted by the Tax Reform Act of 1986. A dividend-received credit for individuals was in effect in the U.S. from 1954 to 1963. Households were allowed to deduct 4% of dividends received as a credit against their income tax. Although this method provided some relief from the "double" taxation of dividends, it was perceived as reducing the
progressiveness of the personal income tax. When this dividend credit was repealed in 1964, a dividend exclusion was introduced. A basic exclusion from the personal income tax of dividends under $100 ($200 for joint returns) was introduced. This dividend exclusion was eliminated with the Tax Reform Act of 1986.

All of the above methods provide only a partial integration of the personal and corporate income taxes. Full integration would be a way of eliminating all the distortions generated by the corporate income taxation. One possibility is a full integration mechanism in the form of partnership. Corporations would be treated like partnerships, and corporate income would be taxed at the personal income level whether distributed or not. The partnership method raises several difficult problems. The most important problem stems from having to impute corporate income to stockholders. To avoid the possibility of an individual having to liquidate assets to pay taxes on earnings he or she did not receive, the corporate tax is kept as a withholding device. Under this full integration mechanism corporations are treated the same way closely-held corporations are treated under the current tax law. Corporations impute retained earnings among the shareholders in order to withhold their income taxes. Shareholders, in turn, include both imputed and actual dividends in their tax base and would deduct the tax withheld by the firm from their tax payments.

An alternative approach of achieving full integration is to repeal the corporate income tax. All corporate income would be fully taxed at the personal income level. This form of full integration seems to have some political clout and has been occasionally suggested. In 1977, full integration was advocated by a group of experts from the U.S. Treasury Department in “Blueprints for Basic Tax Reform”, and was subsequently considered by the Carter Administration. Also, in early 1983, the repeal of the corporate income tax was suggested in an offhand remark by President Reagan.

In this paper, two integration methods are considered. The first method is a partial integration scheme. It is designed to partially reduce or eliminate the “double” taxation of dividends. The second method is a full integration plan.
i) **Method 1: Partial Integration by Dividend Deduction from the Corporate Tax Base**

Partial integration promotes equal treatment of dividends and interest payments, while maintaining a corporate income tax. This partial integration method specifies that dividends can be fully deducted from the corporate income tax base. This eliminates the "double" taxation of dividends. However, because dividends are now deductible, the corporate tax is levied solely on retained earnings. Therefore, this method discourages internal financing. This may be an undesirable feature when large deficits generate important financial crowding-out effects and tight fund markets.

This partial integration scheme assumes particular importance in the light of the recent Tax Reform Act of 1986. In fact, unlike other distortionary effects of the corporate income tax, the issue of "double" taxation of dividends was not addressed by the Tax Reform Act of 1986.

ii) **Method 2: Full Integration Achieved by Repealing the Corporate Income Tax**

Under this full integration scheme the corporate income tax is eliminated. Individuals pay income taxes on both corporate dividends and retained earnings. According to this integration scheme the different distortions associated with the taxation of corporate income are eliminated.

Given the different nature of the two plans above, different efficiency effects are to be expected. The efficiency gains under full integration are potentially large when compared to partial integration, because all the distortions are eliminated. However, the foregone tax revenues that have to be recovered through replacement mechanisms are higher under full integration. The relative size of the net efficiency effect of full integration is unclear on "a priori" grounds.

3.2 **Simulation Results**

**Efficiency Effects of Integration**

**Proposition #1** - The efficiency gains from full integration are very modest. The efficiency
The efficiency gains from such a radical measure as the elimination of the corporate income tax are at best very modest and often negative. Under the best scenario, the elimination of the corporate income tax under multiplicative replacement has long-run welfare effects which are positive but very low. The gains range from 55 to 58 billions of 1973 dollars or .158% to .165% of the present discounted value of intertemporal consumption and leisure, the adjusted GNP. On the other hand, the elimination of the corporate income tax under additive replacement has long-run welfare effects which are negative and range from -.098% to -.112% of the present value of the adjusted GNP.

The efficiency gains reported are certainly a minuscule proportion of the adjusted GNP. To put things in perspective let us compare the efficiency gains to the corporate tax revenues. The corporate tax revenues have been about 2% of GNP or 1.4% of the adjusted GNP. Therefore, the efficiency gains from integration are at the very best about 12% of corporate tax revenues eliminated by integration.

In FKSW full integration with lump-sum replacement was found to yield dynamic gains as large as $695 billion of 1973 dollars, or about 1.4% of the present value of consumption and leisure in the U.S. economy. Dynamic gains under multiplicative replacement are about .62% of the present value of the intertemporal adjusted GNP.

The efficiency gains predicted by the model in this paper are well below the estimates in FKSW. The long-run gains from full integration simulated in this model are at least four-times lower than comparable results in FKSW. This difference can be attributed to two factors. First, in the model in this paper, investment decisions are subject to rigidities: capital is not perfectly mobile across industries; installation of capital is costly; and, it takes time for capital to adjust to the optimal level. Therefore, lower efficiency gains are to be expected. Secondly, while both models capture intertemporal consumption and labor-leisure decisions, the endogenously recursive
nature of equilibrium in this paper better captures the intertemporal distortions induced by higher
marginal income tax rates. More on this below.

PROPOSITION #2 - Results from integration follow a sharply increasing intertemporal
pattern: long-run average benefits are much larger than short-run average benefits.

The intertemporal pattern of efficiency gains from integration is characterized by relatively
small short-run gains followed by relatively large long-run gains. Multiplicative replacement
short-run average results are about .07% of the adjusted GNP, while in the long-run welfare
effects are about .165%. Therefore, average long-run benefits are more than twice as large as the
average short-run benefits, which implies a sharply increasing efficiency pattern. This is a
persistent pattern in the simulation experiments.

This intertemporal pattern is explained in part by the existence of adjustment costs. Since
capital is not perfectly mobile across sectors and it takes time for capital to adjust towards the
optimal levels, it also takes time for the investment efficiency effects to take place. The full
benefits of integration on the allocation of capital will only be reaped in the long run.

Other important factors for the intertemporal pattern of efficiency gains are the distortions
generated by the replacement mechanisms in the intertemporal labor-leisure decisions. In fact,
for both bond-financed and mixed-financed equal yield and unlike tax-financed equal yield, the
average long-run replacement is smaller than the average short-run replacement. In the two
cases the intertemporal pattern is even more marked: average long-run benefits are about three
times as large as the average short-run benefits.

PROPOSITION #3 - The distortions induced by the tax replacement mechanisms on the
intertemporal labor-leisure decisions are of primordial importance in terms of the efficiency
effects of integration.

The complete elimination of the corporate income tax under the best scenario of tax financed
equal yield and multiplicative replacement, would require a permanent increase in the personal
Income tax rates of around 12%. The distortions induced by the tax replacement mechanisms on the intertemporal labor-leisure decisions are of primordial importance in terms of the efficiency effects of integration. This idea which has previously been suggested in the literature (see Fullerton-Gordon (1983)) is confirmed by the simulation results in this paper.

The efficiency benefits from integration are inversely related to the size of change in the personal income tax rates. With full integration, tax-financed equal yield requires the lowest increase in personal tax rates and yields the highest efficiency results. In turn, bond-financed equal yield requires the largest increase in personal tax rates and yields the lowest efficiency results. This is a persistent pattern in the simulation experiments.

Also, the relative difference in efficiency gains among the several equal yield alternatives is directly related to the differences in the tax replacement factor. Tax-financed experiments produce benefits 2.5% higher than mixed-financed and require a tax replacement which is 2.4% lower. In turn, mixed-financed equal yield produces benefits 1.3% higher than bond-financed, and requires a tax replacement which is 1.3% lower. On average, a 1% increase in the tax replacement generates a 1% decrease in the efficiency benefits. This is a persistent pattern in all the simulation experiments.

PROPOSITION 4 - Marginal financial crowding-out effects induced by changes in government deficits seem to be of second-order importance.

Tax-financed equal yield blocks additional changes in deficits and "a fortiori" blocks marginal financial crowding out. In turn, bond-financed and mixed-financed equal yield are in general accompanied by marginal financial crowding-out effects. The differences among the three equal yield schemes suggest the importance of marginal financial crowding out effects.

Full integration results show slightly lower deficits under both bond-financed and mixed-financed equal yield, .024% and .005% respectively. Therefore, no substantial changes in the path of government indebtedness are induced by corporate tax integration. That is not
surprising since the corporate tax revenues foregone by integration are actually being collected at the personal income level. This is essentially a constant tax revenue experiment.

On the other hand, the small changes in government indebtedness are negatively associated with the efficiency gains. Lower deficits are expected to generate favorable marginal financial crowding out effects. However, these remain unnoticeable in the simulation results. In fact, efficiency gains with tax-financed equal yield are always higher than with bond-financed and mixed-financed equal yield despite the fact that the latter two generate lower government debt. This suggests the second order importance of marginal financial crowding out vis-à-vis the additional distortions in the intertemporal labor-leisure decisions.

There is an interesting corollary to this proposition. The fact that FKSW postulate balanced budgets, blocks not only financial crowding out but also marginal financial crowding out. The efficiency results are still biased upwards in absolute terms since financial crowding out is not considered. However, the absence of significant marginal crowding-out effects suggests that the comparisons of different scenarios in FKSW may not be seriously biased.

**PROPOSITION #5 - The efficiency effects of partial integration are systematically negative.**

*This is a new second-best situation.*

Simulation results for partial integration are reported in Table 2. Partial integration accomplished by dividend deduction from the corporate tax base, yields systematically negative efficiency effects. The long-run negative effects are at best \(-.183\%\) of present value of consumption and leisure in the case of tax-financed equal yield with multiplicative replacement.

The persistently negative effects of partial integration contrast with the positive effects of full integration. This is an interesting second-best property of our economy. Partially alleviating distortions does not necessarily yield global efficiency gains. The elimination of double taxation does not directly generate efficiency gains in terms of allocation of investment across sectors. On the other hand, the tax replacement factors are substantially higher than under full integration.
Therefore, large efficiency distortions in the intertemporal consumption and labor-leisure allocations are created.

The second-best nature of partial integration is in contrast with previous results in FKSW. Comparable results in FKSW show long-run efficiency gains of about .32% of the intertemporal adjusted GNP. This is substantially lower than their full integration results. Still, there are efficiency gains from partial integration. Part of the difference between the results in this paper and FKSW should be attributed to the fact that while both models capture intertemporal consumption and labor-leisure decisions, the endogenously recursive nature of equilibrium in this model better captures the distortions induced by higher marginal income tax rates. Another reason for the difference between the two models may have to do with the different types of replacement used in the two works. FKSW used increased corporate tax rates, not personal tax rates, as a replacement mechanism. Therefore, the primordial distortions on the intertemporal labor-leisure decisions are not operating in FKSW. However, increased marginal corporate tax rates increase the wedge between the corporate and noncorporate sectors and introduces additional distortion into the allocation of capital in the economy.

This second-best result in this work should be interpreted with some care. The partial integration mechanism alleviates not only the double taxation of dividends but also the distortion in favor of debt financed investment against equity. Under this partial integration scheme the same treatment is given to dividends and interest payments on debt. This eliminates the tax preference towards debt. Equal treatment of dividends induce more equity financing and encourages dividend outlays. Partial integration should induce lower debt-equity ratios, higher dividend-retention ratios and improved investment financing efficiency. However, like in FKSW, these effects are not captured in this paper. In this sense the simulation results in both this paper and FKSW, in particular the partial integration experiments, are biased downwards. (See Fullerton-Gordon (1983) for a study focusing on the effects of integration on corporate financial decisions.)
Two final remarks are in order. First, under partial integration, the first-order importance of the distortion in the intertemporal labor-leisure decisions is confirmed. The case of tax-financed equal yield under multiplicative replacement requires the lowest marginal changes in personal income tax rates. It also shows the lowest efficiency losses. Also, this case is unique in that it violates the intertemporal pattern discussed in Proposition 2. Long-term losses are on average higher than short-term losses. However, this case is also unique in that the average replacement factor is higher in the long run than in the short run. Second, the secondary importance of marginal financial crowding-out effects is illustrated here again. Bond-financed and mixed-financed equal yield generate slightly lower government deficits than tax-financed equal yield. Despite this fact, tax-financed equal yield generates the lowest losses.

**Distributional Effects of Integration**

The distributional effects of integration are reported in Tables 3-5. All the results are obtained under full integration with multiplicative tax replacement.

**Proposition 6** - Intertemporal utility gains from integration are positively correlated with wealth. In turn, wealth gains from integration are negatively correlated with wealth. Therefore, utility gains and wealth gains are negatively correlated.

Intertemporal utility gains from integration are positively correlated with wealth. High-income households benefit most from integration in terms of changes in intertemporal utility. They witness an increase of above 12% in the present value of their consumption and leisure. In turn, the lowest income class suffers a utility loss of about -6.5%. The intertemporal utility of the middle income group remains essentially unaltered. To summarize, unlike in FKSW, integration is not Pareto improving in terms of its utility effects.

Wealth gains from integration are negatively correlated with wealth. Low-income households
benefit most from integration in terms of changes in wealth ownership. Their wealth increases about 7%. In turn, the highest income class group shows a wealth increase below 1%. It should be noticed that integration is Pareto improving from the standpoint of wealth accumulation.

Utility gains and wealth gains are negatively correlated. The highest income group shows the highest utility gains and the lowest wealth accumulation gains. Inversely, the lowest income group shows the lowest utility gains (actually a utility loss) and the highest wealth accumulation gains. Accordingly, in the model in this paper the lowest income group behaves with the highest savings elasticity with respect to interest rates. The highest income group, in turn, prefers to use the additional available income to finance current consumption and leisure.

**Proposition #7** - Integration induces small changes in the private capital formation. The highly incorporated sectors gain the most with tax integration.

Integration induces small changes in the private capital formation. Sector 1 (the primary sector essentially) which is lowly integrated shows a decrease in the capital stock. On the other hand, the other three sectors which have relatively high degrees of incorporation show increased capital stock. The elimination of the corporate income tax eliminates the wedge in price of capital for the corporate sector. Therefore, integration induces a reallocation of investment in the economy in favor of the corporate sectors. The sector with highest degree of incorporation - Sector 3 (manufacturing sector essentially) gains the most with tax integration in terms of capital accumulation - about a 1% increase.

It should be noted that the gains in capital accumulation are relatively small when compared with FKSW. That has to do with the modeling in this paper of an investment behavior induced by
4. Summary and Concluding Remarks

The results in this paper have important implications for the policy debate on tax integration. Corporate tax integration is shown to generate very small efficiency gains and under some scenarios to yield efficiency losses. This casts some doubt on the practical desirability of integration. The benefits of integration may be too small when compared to the costs of implementation and compliance associated to an actual policy change. If however, the goal of corporate tax integration is to be pursued, the choice of the right implementation strategy is crucial for the success, if limited, of the policy. Furthermore, since it takes time for the benefits of integration to be generated, political difficulties may be expected in the short-run when the benefits of integration are not yet apparent. Finally, tax integration would not be regarded unanimously as a desirable policy. In particular, low income groups would be likely to oppose integration while high income groups would be likely to favor it. Besides the political difficulties that would generate, the very fact that the lowest income groups may be worse-off after integration may make the desirability of integration questionable on grounds of equity.

The single most important omission in this paper is the analysis of the effects of tax integration on the optimal financial decisions by households and corporations. The integration of the corporate and personal income taxes should be expected to change the optimal household portfolio decisions. In fact, the different rates of return of the different financial assets change with integration. By not letting the households optimally adjust their portfolio to the new market conditions after integration, a source of efficiency is not accounted for. Therefore, the results in this work may be biased downwards. (See Siemrod (1980) for a model optimal household portfolio decisions in a static general equilibrium environment.)

In turn, the integration of the corporate and personal income taxes should be expected to affect the optimal corporate financial rules and dividend-retention policies. With integration, the tax
preference towards bonds against equity disappears or is alleviated. Therefore, the debt-equity ratios in the different corporate sectors would tend to decrease after integration. Also, with integration the tax preference towards retained earnings against dividends disappears. Therefore, the dividend-retention ratios in the different corporate sectors would tend to increase after integration. However, in the event that integration induces higher government deficits, the corporations may want to react by using internal funds more intensively. In this case, the net effect of integration on the dividend-retention ratios would be ambiguous. At any rate, by not letting the corporations adjust their debt-equity ratios and dividend-retention policies to the new market conditions after integration, some efficiency effects of integration are not accounted for. Therefore, the results in this work may be biased downwards. In fact, it was already suggested that the second-best nature of the partial integration results may be due in part to the lack of optimal corporate financial rules and dividend policies. While the adverse conditions for equity issuance and dividend payout disappear or are attenuated when dividends are exempted from the corporate income tax base, the model assumes that financial rules and retention policies do not change. (See Fullerton-Gordon (1983) for a general equilibrium model in which debt-equity rules are endogenously determined by trading off the tax preference of debt against the potential bankruptcy costs of equity financing.) Despite its desirability, the treatment of financial decisions is a complex and somewhat controversial matter that is beyond the scope of this paper.
REFERENCES


### TABLE 3
Intertemporal Utility Changes
Revised Case/Base Case

<table>
<thead>
<tr>
<th>FULL INTEGRATION With Multiplicative Replacement</th>
<th>LOW INCOME GROUP</th>
<th>MEDIUM INCOME GROUP</th>
<th>HIGH INCOME GROUP</th>
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</thead>
<tbody>
<tr>
<td>Bond Financing</td>
<td>0.92854</td>
<td>1.00988</td>
<td>1.1126</td>
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<tr>
<td>Tax Financing</td>
<td>0.94057</td>
<td>1.00991</td>
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<td>0.93782</td>
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<td>1.11209</td>
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### TABLE 4
Wealth Accumulation Changes
Revised Case/Base Case

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<thead>
<tr>
<th>FULL INTEGRATION With Multiplicative Replacement</th>
<th>LOW INCOME GROUP</th>
<th>MEDIUM INCOME GROUP</th>
<th>HIGH INCOME GROUP</th>
</tr>
</thead>
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<tr>
<td>Bond Financing</td>
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<td>1.00877</td>
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<td>Tax Financing</td>
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<td>1.00879</td>
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### TABLE 5
Changes in Capital Accumulation
Revised Case/Base Case

<table>
<thead>
<tr>
<th>FULL INTEGRATION With Multiplicative Replacement</th>
<th>SECTOR 1 Agriculture</th>
<th>SECTOR 2 Manufacturing</th>
<th>SECTOR 3 Services</th>
<th>SECTOR 4 Capital</th>
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<tr>
<td>Bond Financing</td>
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### Efficiency Effects of Full Integration

<table>
<thead>
<tr>
<th>FULL INTEGRATION</th>
<th>EQUIVALENT VARIATIONS</th>
<th>TAX REPLACEMENT FACTOR</th>
<th>GNP</th>
<th>DEFICITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Short-Run</td>
<td>Long-Run</td>
<td>Short-Run</td>
<td>Long-Run</td>
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<tr>
<td>Long-run 0.85</td>
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Base Adjusted GNP is 34991.575 billion 1973 dollars.

### Efficiency Effects of Partial Integration

<table>
<thead>
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<th>PARTIAL INTEGRATION</th>
<th>EQUIVALENT VARIATIONS</th>
<th>TAX REPLACEMENT FACTOR</th>
<th>GNP</th>
<th>DEFICITS</th>
</tr>
</thead>
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<td>Short-Run</td>
<td>Long-Run</td>
<td>Short-Run</td>
<td>Long-Run</td>
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</table>

Base Adjusted GNP is 34991.575 billion 1973 dollars.