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Economic Effects of A Personal Capital Income Tax Add-On to a Consumption Tax[1]

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I. INTRODUCTION

In recent years, discussions of tax reform in both academic and policy circles have focused on replacing the federal income tax with some form of consumption-based direct taxation. However, very few consumption taxes have actually been implemented around the world; the most prominent example is the plan enacted in Croatia in 1994 but repealed in 2001 (Rose and Wiswesser, 1998; Keen and King, 2002; Zodrow, 2003).

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[2] The views expressed in this paper are those of the authors and do not necessarily reflect those of the Baker Institute for Public Policy or any other organization.

Much more common are reforms that move in the direction of a consumption tax by reducing the taxation of capital income within the context of an income tax.[3] The most prominent example of this approach is the Nordic "dual income tax," under which labor income is taxed at progressive rates but capital income is taxed at a flat rate, typically equal to the minimum tax rate applied to labor income. Such taxes were first enacted in the late 1980s and early 1990s in Denmark, Sweden, Norway and Finland, and broadly similar schedular reforms have subsequently been implemented in numerous other countries, including Austria, Belgium, Italy, Greece and the Netherlands (Nielsen and Sorensen, 1997; Cnossen, 2000; Sorensen, 2005; Eggert and Genser, 2005).[4] Indeed, although the 2005 report of the President's Advisory Panel on Federal Income Tax Reform in the United States discussed at length a true consumption-based tax – its "Progressive Consumption Tax" (PCT) option, modeled after the so-called X-Tax created by the late David Bradford (1986, 2005) – the panel ultimately decided against recommending this approach.[5] Instead, it proposed two alternatives: (1) a reformed and integrated income tax (the "Simplified Income Tax"), and (2) a consumption-based system supplemented with an "add-on" layer of capital income taxation at the individual level (the "Growth and Investment Tax") that is broadly similar to the dual income tax.[6] [7]

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[3] Note that although a consumption tax is often described as exempting capital income, this characterization is misleading; as stressed by Hubbard (2002), only the normal return to capital is exempt under a consumption tax, while above-normal returns and returns to risk-taking are taxed similarly under both consumption and income tax regimes.

[4] In addition, Germany is currently considering implementing a dual income tax (Spengel and Wiegard, 2004), as is Switzerland (Keuschnigg, forthcoming).

[5] See Zodrow and McLure (2006) and the other analyses cited therein for discussions of the panel's report.

[6] A similar plan (that recommended the "allowance for corporate equity" or ACE approach to the business level tax (Devereux and Freeman, 1991) rather than real cash flow approach that characterizes the X-Tax) was proposed recently in Switzerland; see Keuschnigg (forthcoming).

[7] In contrast to most dual income taxes, an important advantage of the Treasury plan is that the marginal effective tax rate applied to new investment at the business level is zero, with interest, dividends and capital

The structure of both these proposals are an indication of the current state of the debate regarding the relative desirability of income-based and consumption-based direct taxes. Specifically, there is widespread agreement that an "ideal" or comprehensive "Haig-Simons" accrual-based tax on real economic income is not administrable, and – as will be discussed below – less but still considerable agreement that the taxation of the normal returns to capital that is inherent under an income tax is relatively undesirable. On the other hand, many observers are unconvinced that a movement to a true consumption tax such as the X-Tax is desirable or could be implemented in practice, citing uncertainty about the magnitudes of the associated efficiency gains and improvements in administrative and compliance simplicity, as well as concerns about the distributional implications of such a reform and its transitional problems.[8] In this context, it is not surprising that the political process in many countries has exhibited a tendency to arrive at a compromise position such as the U.S. tax panel's Growth and Investment Tax (hereafter, GIT) or the dual income tax (hereafter, DIT).

In this paper, we compare the economic effects of such an approach to tax reform, relative to the enactment of a pure consumption tax such as the Hall and Rabushka (1983, 1995) Flat Tax. For the former approach, we analyze a stylized version of the GIT, which provides for consumption tax treatment at the business level (a cash flow tax on real transactions that allows expensing of all purchases of depreciable equipment and disallows interest deductions), supplemented by an individual-level flat rate tax on interest income, dividends and capital gains. In the following section, we review briefly

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gains taxed at the individual level. Such an approach is desirable because it is relatively conducive to attracting foreign direct investment (Altshuler and Grubert, 2006).

[8] For recent collections of articles that reflect the current status of the debate on these issues, see Aaron, Burman and Steuerle (forthcoming), Auerbach and Hassett (2005), and Zodrow and Mieszkowski (2002).

the debate regarding the relative merits of income-based and consumption-based taxation; in particular, we discuss some conditions under which it may be desirable to tax capital income at a rate that is positive but lower than the maximum rate applied to labor income. The remainder of the paper provides the results of some simulations that estimate the economic effects of adding on an individual level flat rate capital income tax to a consumption-based business cash flow tax (such as the Treasury's GIT), relative to the case of implementing a revenue neutral "pure" consumption tax under which interest income, dividends and capital gains are exempt from tax at the individual level (the Flat Tax). Our simulation model is outlined in Section III, as is the initial calibration of the model. Section IV compares the simulation results for a GIT-type reform plan to a pure flat tax, and provides some sensitivity analysis. Some conclusions are offered in the final section.

II. THEORETICAL ARGUMENTS

Given the above discussion, a natural question is whether the economic literature supports a relatively low rate add-on tax on capital income imposed at the individual level. Such an approach would seem to be undesirable on simplicity grounds, as it requires that the full complex apparatus of taxing capital income be maintained in order to raise a relatively small amount of revenue.[9] However, it is certainly possible that a positive but relatively small level of capital income taxation would be desirable on either efficiency or equity grounds. This section provides a brief overview of the voluminous

[9] This point is stressed by Shaviro (2005). For discussions of the relative complexity of income and consumption based taxes, see Slemrod (1996), Gale and Holtzblatt (2002) and Weisbach (2003).

literature on the efficiency aspects of this issue[10]; because the current version of our simulation model assumes a representative individual in each generation, we are unable to address intragenerational equity issues in this paper.[11]

The most striking result in the literature on the relative merits of income and consumption-based taxation is due to the seminal contributions of Judd (1985) and Chamley (1986), who analyze optimal capital and wage income taxation in models in which individuals are assumed to be infinitely lived.[12] In this context, Judd and Chamley show that in the long run the optimal capital income tax rate is zero. This result arises because a capital income tax increases the price of future consumption relative to current consumption by reducing the after-tax interest rate. Although this distortion may be modest over a short time interval, it increases exponentially with time, so that even a small capital income tax rate will eventually be highly distortionary. Since the individuals in these infinite-horizon models have perfect foresight, their consumption patterns are highly distorted by such a tax, with significant declines in saving and capital accumulation and large efficiency costs. A second message of these models is that even though capital income taxation should be avoided entirely in the long run, existing capital should be taxed to the maximum extent feasible since, assuming that such a tax is not anticipated nor expected to be repeated, it represents a nondistortionary or "lump sum"

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[10] The following discussion draws on Zodrow (forthcoming), which provides a recent review of this literature; see also Auerbach (2006).

[11] Note, however, the capital income taxation is not necessarily needed to achieve society's vertical equity goals. The most important result on this topic is due to Atkinson and Stiglitz (1976) who show, within the context of a multi-period life-cycle model in which people differ only in their skill levels, that capital income taxation (modeled as differential taxation of consumption in different periods) is unnecessary if leisure and the various consumption goods are separable in the utility function and a progressive tax on wage income is set optimally. Moreover, Kaplow (2004) extends this result to the case in which the tax on wage income is suboptimal. In addition, capital income taxes have also been justified as proxies for taxes on wealth and on bequests and inheritances.

[12] This assumption can be justified as approximating the "altruistic" case in which the utility function of parents includes the utility function of their children.

source of revenue. Although the practical relevance of this point may appear to be limited, the implementation of a consumption tax may, depending on the transition rules used, be accompanied by such a one-time capital levy – this point is discussed further below.

Although the Judd and Chamley result is a powerful one, its policy implications are limited, both because of questions regarding the validity of models that assume infinitely-lived individuals and because such models are incapable of addressing the critical issues related to intergenerational redistributions and transitional problems that are raised by consumption tax reforms.[13] Accordingly, most policy analyses of consumption tax reforms have focused on life-cycle models with an overlapping generations structure.

The results of such life-cycle analyses are more ambiguous. In the simplest two-period version of the life-cycle model, the optimal capital income tax rate is zero (implying uniform taxation of consumption in both periods, as would occur under a consumption or wage tax) only if first and second period consumption are equally complementary with leisure (Feldstein, 1978; Bradford, 1980; Atkinson and Sandmo, 1980). This result reflects a balancing of two considerations. Uniform consumption taxation tends to be efficient, as it avoids tax distortions of intertemporal consumption allocation decisions. However, the inability to tax leisure directly implies that consumption taxation will inefficiently reduce labor supply, so that differential taxation of consumption goods will be desirable if it can be used to offset the tax-induced increase

[13] For example, see Mieszkowski and Palumbo (2002) and Zodrow (2002). In addition, the logic underlying the exemption of capital income in the long run in infinite horizon models also applies to investments in human capital, potentially leaving very little tax base left; see Jones, Manuelli and Rossi (1993) and Milesi-Ferretti and Roubini (1998).

in leisure demand and the associated reduction in labor supply. If consumption in the two periods is equally complementary to leisure and thus affects labor supply in the same way, any rationale for differential taxation disappears, and uniform commodity taxation (a capital income tax rate of zero) is optimal. This condition is satisfied if the individual utility function is homothetic and separable in leisure and the two consumption goods (Auerbach, 1979), conditions that arguably represent a reasonable benchmark for individual preferences (Atkinson and Stiglitz, 1980).[14]

The analysis of income and consumption taxes within the context of the basic two-period life-cycle model was extended to the multi-period case by Summers (1981) and Auerbach and Kotlikoff (1987); these seminal contributions launched a huge literature that has used dynamic overlapping generations life-cycle computable general equilibrium (CGE) models to simulate the economic effects of replacing income taxes with consumption taxes. Summers emphasized that an increase in the tax rate on capital income reduces the after-tax discount rate individuals use in estimating their human wealth – the present value of all future labor earnings – when making consumption and savings decisions. The resulting increase in human wealth prompts greater consumption early in life, that is, less saving. The simulation results reported by Summers suggested that enactment of a consumption tax reform could result in quite large steady state welfare gains.[15] The Summers model, which assumes myopic expectations, fixed labor supply and exponential wage growth, was significantly extended by Auerbach and Kotlikoff (hereafter, AK) in a model that, among many other things, assumes perfect

[14] Homotheticity implies that increases in wealth are distributed proportionately across consumption in all periods and separability requires that decisions regarding choices among consumption commodities must be independent of the decision regarding how much labor to supply (leisure to demand).

[15] For example, in one central case, the enactment of a cash flow consumption tax results in a steady state welfare gain equal to 11.2% of lifetime income.

foresight on the part of both individuals and firms, allows labor-leisure choices in each period, and assumes a "hump-backed" wage profile over the life cycle taken from the labor economics literature. Partly because of such differences and partly because they use more conservative parameter values than those utilized by Summers, the AK simulations indicate somewhat smaller, but generally still positive, long run increases in economic growth and individual welfare from implementing a consumption tax reform; broadly similar results are reported in the subsequent extensions by Auerbach (1996) and Altig, Auerbach, Kotlikoff, Smetters and Walliser (2001).[16] In addition, all of these papers stress that the taxation of old capital during the transition to a consumption tax is an important source of its efficiency gains; of course, this one-time capital levy does not occur if existing capital is protected with sufficiently generous transition rules.

The analysis thus far suggests that consumption taxation is preferable to income taxation on efficiency grounds and that a consumption tax reform is likely to increase economic growth and individual welfare in the long run. However, a wide variety of qualifications to these results have appeared in the literature. For example, some have argued that the savings responses implied by the infinite horizon and lifecycle models are far greater than those observed in the empirical literature (Ballard, 2002; Gravelle, 2002), suggesting that the efficiency gains from consumption tax reform, especially from eliminating rather than simply reducing the taxation of capital income, may be relatively small. In particular, savings responses in these models are dampened if one uses more conservative parameter values, especially for the intertemporal elasticity of substitution, allows for minimum required purchases (so that less income is discretionary), or adds a

[16] See also Fullerton and Rogers (1993, 1996).

target bequest motive (so that an increase in the after-tax rate of return actually reduces saving since the target bequest is more easily achieved).

A point that is more fundamental from a theoretical perspective is raised in a provocative recent paper by Erosa and Gervais (2002) (hereafter, EG), who conduct optimal taxation analysis to directly address the question of whether a positive capital income tax may be desirable in an overlapping generations model with farsighted individuals who optimize over a life cycle consisting of many periods.[17] These authors construct a model that is generally similar to that utilized by AK, except that the government has access to age-dependent taxes on labor income (and also has complete flexibility with respect to its debt policy). In order to calculate "optimal" tax rates with multiple generations, the government is assumed to maximize a weighted sum of individual utility levels across generations.

Calculating the optimal pattern of wage and capital income tax rates is significantly more complicated in this setting. EG show that a capital income tax rate of zero is optimal if (1) the standard conditions for uniform taxation (homotheticity and separability of leisure and consumption) are satisfied, and (2) age-conditioned labor income tax rates are set appropriately. The additional complexity of age-conditioned labor income tax rates is required because (in contrast to the infinite-horizon models where the optimal capital tax rate is zero, and consumption and leisure are constant in the steady state for the representative individual), consumption and leisure vary over the lifecycle in an overlapping generations model. Specifically, because leisure demand tends to increase (or be U-shaped) and consumption demand increases over the lifecycle,

[17] See also Garriga (2003).

the optimal wage tax rates also vary over the lifecycle. For example, the optimal tax rate on labor income is relatively low (increasing the opportunity cost of leisure) when leisure demand is high and relatively inelastic, consistent with the standard Ramsey optimal taxation principle of taxing inelastically demanded goods at relatively high rates (Auerbach and Hines, 2002).[18] Since age-dependent wage income taxes are infeasible, the central issue is whether their effects can be approximately replicated with the appropriate pattern of capital income tax rates. Since the optimal time path of age-dependent wage tax rates tends to increase over most of the lifecycle, EG find that some capital income taxation is in fact typically optimal. In addition, as above, if leisure and consumption are not separable in the individual utility function, capital income taxation (or subsidization) may be desirable, depending on the relative complementarities of consumption in different periods with leisure.

In an attempt to determine the quantitative significance of their result, EG simulate optimal (constant) capital and wage tax rates in their model under a parameterization that is chosen to closely follow Auerbach, Kotlikoff and Skinner (1983), coupled with various approaches to weighting the utilities of different generations in the government social welfare function. EG show that the optimal capital income tax rate is indeed positive in their simulations, ranging from roughly 4-15%, which is roughly 30-35% of the optimal tax rate on wage income. Their analysis thus provides some support for the idea that the optimal tax rate on capital income is positive but less than the optimal tax rate on labor income, consistent with the dual income tax approach and the Growth and Investment Tax plan recommended by the U.S. tax reform panel.

[18] In addition, EG show that the optimal age-dependent wage income tax rates depend inversely and fairly sensitively on the social welfare weights assigned to various generations.

Thus, although there is arguably a presumption that consumption taxation is preferable to income taxation on efficiency grounds, this result is far from obvious. In particular, a positive (but presumably relatively low) tax on capital income may be desirable, or the efficiency costs of imposing such a tax may be relatively small (and thus might be offset by some associated equity gains, although such gains are not considered in this analysis). In this paper, we investigate this possibility of within the context of a dynamic overlapping generations life-cycle computable general equilibrium model. Specifically, we simulate the economic effects of two potential revenue neutral tax reforms – a pure flat tax consisting of a cash flow tax on real transactions at the business level coupled with an individual level tax on wage income above a fixed exemption amount, and the same tax supplemented with an "add-on" 15 percent flat tax on capital income imposed at the individual level, such as that recommended by the president's tax reform panel (and broadly similar in its economic effects to a dual income tax).

The model is designed to allow consideration of the various factors noted above that might make some positive capital income taxation desirable. In particular, the model (1) assumes individual lifecycle behavior rather than an infinite time horizon, (2) assumes a target bequest motive, (3) allows for minimum consumption purchases for all three goods in the model (owner-occupied housing, rental housing and a composite consumption good), (4) assumes the same structure of individual preferences analyzed by Erosa and Gervais (consumption and leisure are not separable, so that a zero tax rate on capital income is not necessarily optimal), and (5) is simulated for various values of the key parameters, including the intertemporal elasticity of substitution.[19]

[19] Note, however, that a number of factors that would affect the desirability of the taxation of capital income are not considered in our model. For example, capital income taxation may be desirable in the

In addition, as noted above, a key feature of any consumption tax reform, and an important source of its potential efficiency gains, is the possibility of the imposition of a one-time capital loss on existing capital owners.[20] Our model is designed to calculate these windfall losses explicitly in the case of the imposition of the flat tax and the "flat tax plus capital income tax add-on" reform options analyzed in this paper.[21]

First, the imposition of a flat tax might impose a loss on the owners of business equity. Expensing under a flat tax implies very generous tax treatment of new investment – a marginal effective tax rate of zero. However, in the absence of special transition rules, firms would not be allowed to deduct the remaining basis of existing depreciable assets, although the returns earned by such assets (and the proceeds of asset sales) would be included in the tax base. As a result, the rate of return on existing assets would fall relative to the return on new investments, and arbitrage across new and existing assets would imply that the value of existing assets would fall; Gravelle (1996) constructs a simple model in which the decline is proportional to the rate of tax. Moreover, as long as the general price level remained unchanged under the Flat Tax, lenders would be insulated from this loss since the nominal value of outstanding bonds would be fixed; thus the entire reform-induced one-time windfall loss would be borne by business equity owners.

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presence of credit constraints (Chamley, 2001), if high-skilled workers are more complementary with capital than are low-skilled workers (Salanié, 2003), or to offset labor income tax distortions of decisions regarding human capital accumulation (Nielsen and Sorensen, 1997). On the other hand, capital income subsidies may be desirable under certain circumstances, for example if the economy is characterized by imperfect competition (Judd, 1997) or if it is deemed desirable to attract foreign direct investment in the presence of imperfect information (Gordon and Bovenberg, 1996).

[20] In addition, the imposition of such a one-time loss on existing capital owners might mitigate the distributional problems associated with implementing a consumption tax reform due to significantly lowered tax rates on high-income individuals and exemption of the normal returns to capital.

[21] For additional details, see Diamond and Zodrow (2006).

It is important to note, however, that this analysis ignores a wide variety of other factors associated with the implementation of a flat tax, most of which would act to offset the one-time windfall tax on existing assets (Auerbach, 1996; Lyon and Merrill, 1999; Zodrow, 2002). A partial list of these factors, all of which are considered in our model, includes: (1) the costs of adjusting the capital stock, which would allow the owners of capital to earn above-normal returns on both existing assets and new investments during the period of transition to the new post-reform equilibrium; (2) a short run (and perhaps a long run) increase in the after-tax rate of interest, which would allow the owners of capital to earn a higher after-tax rate of return on existing assets and new investments; (3) the reduction under a lower-rate flat tax of the expected tax on assets that were allowed accelerated depreciation allowances, including "bonus depreciation" and expensing of investments in research and development or advertising, under the current income tax[22]; and (4) the efficiency gains obtained from eliminating distortions of saving and investment decisions and reducing distortions of the labor-leisure choices, as well as from improvements in the allocation of capital across alternative assets and business sectors.[23]

Second, the imposition of a flat tax might impose a loss on the owners of owner-occupied housing (different from that imposed on the owners of business equity). This price decline is due to a reform-induced increase in the user cost of housing, as perceived by the owner-occupier, which arises primarily because (1) normal returns to business

[22] This point is stressed by Lyon and Merrill (1999).

[23] The model tends to overstates transitional losses for two additional reasons. First, to the extent the "new view" of dividend taxation is accurate, the enactment of a consumption tax reform would benefit existing assets by removing individual level taxation of dividends that is capitalized into current asset prices; see Auerbach (1996). Because the model is based on the "traditional" view of dividend taxation, it does not capture this effect. Second, as noted previously, above-normal returns and the returns to risk-taking are treated similarly under income and consumption taxes so that little changes in tax treatment would result from reform. Since the model is characterized by perfect competition and certainty, it does not consider this factor.

equity investments are effectively untaxed under the Flat Tax, making such investments relatively more attractive and raising the opportunity cost of equity-financed investment in owner-occupied housing, and (2) deductions for mortgage interest and property taxes are eliminated.[24] The increase in the user cost of owner-occupied housing that would occur under the Flat Tax would tend to reduce the demand for owner-occupied housing, which in turn would tend to result in a decline in the price of owner-occupied housing in the short run. Some estimates suggest that implementation of a flat tax could cause huge declines in the prices of owner-occupied housing, on the order of 15-30 percent (Brinner et al., 1995; Capozza, Green and Hendershott, 1996). However, other analysts have concluded that offsetting factors imply that the actual short run decline in housing prices would be quite modest (Bruce and Holtz-Eakin, 1999; Gravelle, 1996; Hall, 1997; Diamond and Zodrow, 2006).[25] These offsetting factors, all of which are considered in our model, include reform-induced declines in interest rates, capital reallocation into other sectors, and conversion of owner-occupied housing into rental housing.

III. MODEL STRUCTURE AND CALIBRATION

The distinguishing feature of the analytical approach used in this paper is the treatment of owner-occupied and rental housing markets in the context of a dynamic overlapping-generations life-cycle general equilibrium model that explicitly calculates reform-induced changes in all asset values during the transition to a consumption tax reform. The model has three production sectors – owner-occupied housing, rental

[24] The user cost of owner-occupied housing is defined as the sum of the opportunity cost of the homeowner's equity, the after-tax cost of mortgage interest, depreciation and maintenance expenditures, and (arguably) property tax payments.

[25] In the long run, the quantity of housing and the cost of housing would return to an equilibrium reflecting production costs and the absence of taxation, including the cost of land.

housing, and a composite good sector that includes all non-housing goods and services. The time path of investment demands in all three sectors is modeled explicitly, taking into account capital stock adjustment costs.[26] On the consumption side, the current tax advantage of owner-occupied housing relative to other assets is taken into account in modeling the demands for the three goods. Thus, the model allows for a fairly detailed description of both the transitional and the long run effects of implementing a consumption-based tax reform on the prices of housing and business assets, including both a composite good and rental housing.[27] This section outlines the basic structure of the model, which combines various features from similar and well-known models constructed by Auerbach and Kotlikoff (1987), Goulder and Summers (1989), Goulder (1989), Keuschnigg (1990) and Fullerton and Rogers (1993), with the time path of investment in each production sector calculated to maximize firm value in the presence of convex (quadratic) adjustment costs, following Hayashi (1982). The full details of the model are provided in Diamond and Zodrow (2005).

The Composite Good Production Sector

In each period *s*, firms in the composite good production sector produce output (X_s) using capital K_s^X and labor L_s^X using a CES production function with an elasticity of substitution in production σ_X and a capital share parameter a_X. Firms are assumed to choose the time path of investment to maximize the present value of firm profits or,

[26] Note, however, the domestic saving is the only source of new capital in the economy, which is assumed to be closed.

[27] At the same time, however, the treatment of housing is less detailed than in some of the partial equilibrium studies noted above, since land is not considered and the model does not allow for multiple income groups within each generation.

equivalently, maximize firm value V_X, net of all taxes. Total taxes in the composite good production sector in period *s*, are

$$T_s^X = \tau_{bs}^X \left[p_s^X X_s - w_s L_s^X - f_{FT} I_s^X - \Phi_s^X I_s^X - f_{IT} i_s B_s^X - f_{IT} \delta_\tau^X K_{\tau s}^X \right] + (1 - \tau_{bs}^X) \tau_{ps}^X K_s^X ,$$

where τ_{bs} is the tax rate on business income in the composite good sector, p_s^X is the price of the composite good, w_s is the wage rate, I_s^X is gross investment, Φ_s^X are (deductible) adjustment costs per unit of investment, i_s is the before-tax interest rate, B_s^X is total indebtedness, $\delta_{\tau s}^X$ is depreciation for tax purposes, $K_{\tau s}^X$ is the remaining tax basis of the capital stock, τ_{ps}^X is the property tax rate on both composite good sector and non-residential capital, with property taxes assumed to be fully deductible against the business income tax, and f_{IT} (f_{FT}) is one under the income tax (flat tax) and zero otherwise.[28] Following Goulder and Summers (1989) and Cummins, Hassett and Hubbard (1994), the adjustment cost function per unit of investment is assumed to be a quadratic function of gross investment per unit of capital

$$\Phi_s \left(\frac{I_s^X}{K_s^X} \right) = \frac{p_s^X (\beta^X / 2)(I_s^X / K_s^X - \mu^X)^2}{I_s^X / K_s^X}$$

where β^X is the parameter that determines the level of adjustment costs and μ^X is set so that adjustment costs are zero in the steady state.

Assuming firms do not make any financial investments, total net cash receipts, including net new bonds issued B_s^X and net new shares issued VN_s^X, must either be used to finance new investments (including adjustment costs) or distributed to shareholders

[28] That is, depreciation and interest expense are deductible under an income tax, while expensing is allowed under the Flat Tax with no interest deductions. The property tax on businesses is treated as a tax on capital rather than a benefit tax (Muthitacharoen and Zodrow, forthcoming).

$$[p_s^X X_s - w_s L_s^X - i_s B_s^X] - T_s^X + BN_s^X + VN_s^X = I_s^X \left(1 + \Phi_s^X\right) + DIV_s^X ,$$

where DIV_s^X is the dividend payout in the composite good sector. Each firm is assumed to maintain a fixed debt/asset ratio b^X and pay out a constant fraction of earnings after taxes and depreciation in each period. This implies that new investments are financed with debt and new share issues if retained earnings do not supply enough equity to finance the desired level of investment.

The model assumes individual level arbitrage, which implies that the after-tax return to bonds must equal the after-tax return received by the shareholders of the firm, or

$$\left(1 - \tau_{bs}^X\right) i_s = \frac{\left(1 - \tau_{ds}\right) DIV_s^X + \left(1 - \tau_{gs}\right)\left(V_{s+1}^X - V_s^X - VN_s^X\right)}{V_s^X},$$

where τ_{is} is the average marginal personal income tax rate on interest income, τ_{ds} is the average marginal tax rate on dividends, τ_{gs} is the average effective annual accrual tax rate on capital gains $\left(V_{s+1}^X - V_s^X - VN_s^X\right)$. Solving this expression for V_s^X, subject to the transversality condition requiring a finite value of the firm, yields

$$V_s^X = \sum_{u=s}^{\infty} \frac{\left[\left(1 - \tau_{du}\right) / \left(1 - \tau_{gu}\right)\right] DIV_u^X - VN_u^X}{\prod_{v=s}^{u} \left[1 + (1 - \tau_{iu}) i_u / (1 - \tau_{gu})\right]},$$

That is, the value of the firm in the composite good sector equals the present value of all future net distributions to the owners of the firm. The time path of investment that maximizes this expression in the presence of adjustment costs is

$$\frac{I_s^X}{K_s^X} = \frac{q_{s+1}^X - 1 + b^X + f_{FT} \Omega_s^X \tau_{bs} + f_{IT} Z_{s+1}^X}{\mathrm{p_s} \beta^X \left(1 - \tau_{bs} \Omega_s^X\right)},$$

where q_{s+1}^X is shadow price of additional capital (commonly referred to as 'marginal q' which equals the ratio of the market value of a marginal unit of capital to its replacement cost), Ω_s^X is a weighted average of the dividend and capital gains tax rates divided by one minus the capital gains tax rate, and Z_{s+1}^X is the tax savings from accelerated depreciation allowances on future investments.

The relationship between 'marginal q' and 'average q' (denoted as Q_s^X) is

$$q_s^X = \frac{V_s^X - X_s^X}{K_s^X} = Q_s^X - \frac{X_s^X}{K_s^X}$$

where X_s^X is the value of future depreciation deductions on the existing stock of capital used in the production of the composite good.

The Owner-Occupied and Rental Housing Production Sectors

Housing is produced in the owner-occupied and rental housing production sectors where, following Goulder and Summers (1989) and Goulder (1989), rental housing is produced by non-corporate landlords and owner-occupied housing is produced by the owners. The technology used in the production of rental housing (R_s) and owner-occupied housing (O_s) is assumed to be identical – capital and labor combined in a CES production function with an elasticity of substitution in production of σ_H and a capital share parameter of a_H.[29] Landlords and owner-occupiers are also are assumed to choose time paths of investment to maximize the equivalent of firm value, net of total taxes.

[29] Thus, the producer prices of rental and owner-occupied housing services are identical. However, rental and owner-occupied housing services are not perfect substitutes, so that the mix of rental and owner-occupied housing services changes along the transition path to a new equilibrium.

In the case of the rental housing sector, the firm is modeled as a non-corporate firm. This implies that landlords are taxed at the individual level, so total taxes paid are

$$T_s^R = \tau_{bs}^R \left[p_s^R R_s - w_s L_s^R - f_{FT} I_s^R - \Phi_s^R I_s^R - f_{IT} i_s B_s^R - mK_s^R - f_{IT} \delta_\tau^R K_{\tau s}^R \right] + (1-\tau_{bs}^R)\tau_{ps}^R K_s^R,$$

where τ_{bs}^R is the average marginal tax rate applied to rental housing income,[30] m is annual maintenance expenditures per unit of rental housing capital, and the definitions of all other variables are analogous to those in the composite good production sector. Solving the cash flow equation in the rental housing sector for after-tax rents received by landlords S_s^R yields

$$S_s^R = p_s^R F_s^R(\cdot) - w_s L_s^R - i_s B_s^R - mK_s^R - T_s^R + BN_s^R + E_s^R - I_s^R(1+\Phi_s^R),$$

where E_s^R is net new equity invested by landlords in the rental housing sector. Individual arbitrage in this case implies

$$(1-\tau_{is}) i_s = \frac{S_s^R + (1-\tau_{gs})(V_{s+1}^R - V_s^R - E_s^R)}{V_s^R}$$

which can be solved for the value of the rental housing firm

$$V_s^R = \sum_{u=s}^{\infty} \frac{\left[1/(1-\tau_{gu})\right] S_s^R - E_s^R}{\prod_{v=s}^{u} \left[1 + (1-\tau_{iu}) i_s / (1-\tau_{gu})\right]}.$$

The time path of investment that maximizes this expression in the presence of adjustment costs is

$$\frac{I_s^R}{K_s^R} = \frac{q_{s+1}^R - \Omega_s^R + b^R \Omega_s^R + f_{FT} \Omega_s^R \tau_{bs}^R + f_{IT} Z_{s+1}^R}{p_s \Omega_s^R \beta^R (1-\tau_{bs}^R)}.$$

[30] The tax rate on rental housing income is a weighted average of the non-corporate tax rate on landlord profits and the corporate tax rate. The weight is determined by the share of rental housing produced in the corporate sector, which is equal to 10 percent.

The expression for relationship between 'marginal q' and 'average q' in the rental housing sector is analogous to that in the composite good sector.

By comparison, in the owner-occupied housing sector, since imputed rents are untaxed and maintenance expenditures are not deductible while mortgage interest and property taxes are deductible, total taxes are

$$T_s^O = -z_s \tau_{is} i_s B_s^O + (1 - z_s \tau_{is}) \tau_{ps}^O K_s^O ,$$

where z_s is the fraction of individuals who are itemizers. The flow of (untaxed) imputed rents to owner-occupiers is

$$S_s^O = p_s^O F_s^O - w_s L_s^O - i_s B_s^O - T_s^O - mK_s^O + BN_s^O + E_s^O - I_s^O (1 + \Phi_s^O)$$

The expressions for individual level arbitrage and firm value are analogous to those in the rental housing sector, and investment in the owner-occupied sector is

$$\frac{I_s^O}{K_s^O} = \frac{q_{s+1}^O - \Omega_s^O + b^O \Omega_s^O}{\mathrm{p}_s \Omega_s^O \beta^O}.$$

The expression for relationship between 'marginal q' and 'average q' in the owner-occupied housing sector is analogous to that in the composite good sector.

Individual Behavior

On the individual side, the model has a dynamic overlapping generations framework with fifty-five generations alive at each point in time. There is a representative individual for each generation, who has an economic life span (which begins upon entry into the work force) of fifty-five years, with the first forty-five of those years spent working, and the last ten spent in retirement. Individual tastes are identical so that differences in behavior across generations are due solely to differences in lifetime

budget constraints. An individual accumulates assets from the time of "economic birth" that are used to finance both consumption over the life cycle, especially during the retirement period, and the making of bequests. The model follows Fullerton and Rogers (1993) in including a relatively primitive "target model" of bequests, with the real values of bequests assumed to be fixed and thus unaffected by changes in economic conditions, including changes in income.

At any point in time *s*, the consumer maximizes rest-of-life utility LU_s subject to a lifetime budget constraint that requires the present value of lifetime wealth including inheritances to equal the present value of lifetime consumption including bequests. In particular, an individual of age *a* at time *s*=*t* chooses the time path of consumption of an aggregate consumption good and leisure in each period *s* to maximize rest-of-life utility

$$LU_s = \frac{\sigma}{\sigma - 1} \sum_{s=t}^{t+54-a} \frac{U_s(a)^{\left(1-\frac{1}{\sigma}\right)}}{(1+\rho)^{s-t}},$$

where σ is the intertemporal elasticity of substitution, ρ is the pure rate of time preference, and $U_s(a)$ is assumed to be a CES function of consumption of the aggregate consumption good and leisure in period *s* with an intratemporal elasticity of ε and a leisure share parameter of a_E. The aggregate consumption good is modeled as a CES function of the composite good and aggregate housing services (including a minimum purchase requirement for both goods), with aggregate housing services in turn modeled as CES function of owner-occupied and rental housing services. In addition, as described in detail in Diamond and Zodrow (2005), the model includes a simple social security system, government purchases of the composite good, transfer payments, a hump-backed

wage profile over the life cycle, a progressive tax on wage income, and constant average marginal tax rates applied to interest income, dividends, and capital gains.

Parameter Values and Calibration

The parameter values shown in Table 1 are chosen so that in the year of reform the initial income tax equilibrium closely resembles the prevailing features of the U.S. economy in 2003. In addition, a number of other parameter values are chosen to be consistent with empirical estimates and those used in other CGE studies, especially AAKSW (2001), Auerbach and Kotlikoff (1987), Auerbach (1996), and Fullerton and Rogers (1993).

The choice of the intertemporal elasticity of substitution (σ) determines the willingness of consumers to substitute consumption across periods in response to changes in the relative prices of consumption and thus plays a critical role in establishing the responsiveness of saving to the enactment of a consumption tax. This parameter is set equal to 0.35, reflecting a compromise between the value of 0.25 used by AAKSW and the value of 0.5 used by FR. This higher value can also be justified by the inclusion in the model of a "target" bequest motive and minimum required expenditures, which tend to reduce the magnitude of the saving responses in the model. The intratemporal elasticity of substitution (ε) determines consumer willingness to substitute between labor supply and leisure in response to changes in their relative prices and is thus critical in determining the labor supply response to a change in the after-tax wage. This parameter

is set equal to 0.6.[31] The rate of time preference, ρ, is set equal to 0.004, consistent with AAKSW (2001).

The elasticities of substitution between the composite good and aggregate housing consumption (σ_{CH}) and between rental and owner housing (σ_{RO}) are chosen so that the values of the compensated own-price elasticities of owner and rental housing are both roughly -0.8 as reported in Rosen (1985).[32] The various weighting parameters in the production functions and utility function are set to replicate as closely as possible the actual pattern of aggregate production and consumption for the three goods in the model.

The initial steady state values for the capital stocks, investment and consumption in each sector are calibrated to be consistent with data from the U.S. Bureau of Economic Analysis (2004). The size of adjustment costs and the extent to which the existing capital is discounted (relative to new investments) due to the existence of accelerated depreciation allowances and bonus depreciation are also important in determining the magnitude of asset price effects predicted by the model. The simulations are performed for two values of the adjustment cost parameter (β_X) in the composite good production sector: $\beta_X = 0$ as a benchmark case,[33] and $\beta_X = 10$, following AAKSW. In the absence

[31] The share parameter in the utility function is set so that the fraction of the endowment used for leisure and home production is 0.4 which, when coupled with an intratemporal elasticity of substitution of 0.6 implies that the aggregate labor supply elasticity is contained within the wide range of empirical estimates. This value is significantly lower than the value assumed in AAKSW (2001) and AK (1987), but yields an aggregate labor supply elasticity that is consistent with most of the empirical literature; it is, however, inconsistent with the relatively large labor supply elasticities found in the recent work of Prescott (2005) and Davis and Henreckson (2005). Note, however, that this assumption is conservative in that higher values of intratemporal elasticity of substitution would increase the beneficial effects of tax reform and reduce the potential for decline in housing values.

[32] Estimates of housing demand elasticities span a wide range. DiPasquale and Wheaton (1994) report an estimated housing demand elasticity equal to -0.15, while Riddel (2004) reports an estimated housing price elasticity equal to -1.5.

[33] To ensure convergence of the model, a positive value of the adjustment cost parameter is required; the results for the "no adjustment cost case" reflect a value of the adjustment cost parameter of 0.2. Note that the recent results of Hall (2004) suggest that adjustment costs for both capital and labor are quite small.

of data on the values of the adjustment cost parameters in the owner-occupied and rental housing sectors, these values are assumed to equal the values of the adjustment cost parameters in the composite good sector (although the values need not necessarily be equal). The model is calibrated so that, in the initial equilibrium, the existence of accelerated depreciation allowances including bonus depreciation implies that undepreciated basis of capital in the composite good and rental sectors is equal to $8.3 trillion.[34]

The income tax system in the base case equilibrium raises $2,782 billion in total tax revenue; federal taxes raise $2046 billion and state and local taxes raise $946 billion. The social security payroll tax raises $754 billion, which is assumed to equal the amount of social security benefits. The remaining federal taxes are raised by corporate and individual income taxes. The effective tax rate in the composite good sector is 26 percent, and the effective tax rate in the rental housing sector is 16.9 percent.[35] The income-weighted average marginal wage tax rate is equal to 25.2 percent and the average wage tax rate is 21.0 percent.[36] The tax rate on individual interest income is 14.7 percent, the tax rate on dividends is 12 percent, capital gains in the composite good and rental housing sectors are taxed at an effective annual accrual rate of 5 percent, and capital gains in the owner-occupied housing sector are untaxed.[37] Federal government expenditures on goods and services are 79 percent of total federal revenues, and the remaining federal revenues are used to fund transfers. Government debt is set so that the

[34] The $8.3 trillion figure is a non-published estimate provided by Joint Committee on Taxation.
[35] See Auerbach (1996) and Gravelle (1994). The corporate share of the composite good sector is 61.5 percent, and the corporate share of the rental housing sector is 10 percent.
[36] The value of the income weighted marginal wage tax rate is based on data presented in the report of the President's Advisory Panel on Federal Tax Reform (2005).
[37] The effective annual accrual tax rate on capital gains in the owner-occupied housing sector is assumed to equal zero, since the Taxpayer Relief Act of 1997 exempted gains up to $250,000 on the sale of a house for single taxpayers and up to $500,000 for married taxpayers filing a joint return.

debt to GDP ratio is 35 percent consistent with observed data, and this ratio is assumed to be constant at the same value in the steady state.

The state and local government sector raises 307 billion in property taxes, 222 billion in retail sales taxes (excluding excise taxes), 37 billion in business income taxes, and 380 billion in personal income taxes. The average property tax rate on capital in the composite good sector is 0.81 percent, and the average property tax rate on residential capital is 1.71 percent. The average state tax rate on personal and business income is set at 0.04 in order to raise state business revenues and state personal income tax revenues are consistent with data in U.S. Bureau of Economic Analysis (2004). The state retail sales tax rate is set at 0.075, with the retail sales tax base assumed to include 56 percent of total non-housing consumption.[38] It is assumed that state and local expenditures equal total state and local tax revenues. Table 2 presents initial values for the federal and state tax rates. Table 3 provides values for various variables in the initial steady state equilibrium.

IV. SIMULATION RESULTS

The reform simulated is the replacement of the federal income tax system (but not the payroll tax) with (1) a revenue-neutral Hall and Rabushka (1995) flat tax (hereafter, FT) that applies the same constant tax rate to both a comprehensive measure of household labor incomes, with an exemption amount that is initially set at $20,000 per

[38] Note, however, that Ring (1999) estimates that on average roughly 40 percent of the state retail sales tax base is made up of business purchases. The taxation of business purchases under the state retail sales tax is ignored in this model, and thus, the average state retail sales tax rate is overstated.

household,[39] and business real cash flow (which allows expensing of all non-financial business purchases and ignores financial flows and thus does not allow deductions for interest expense), and (2) the same flat tax on wages and business cash flow, supplemented by an "add-on" capital income tax at the individual level on interest, dividends and capital gains at a rate of 15 percent (hereafter, AT).[40] Since adjustment costs are critical for analyzing transitional effects but there is uncertainty about the magnitude of these effects, simulation results are presented for the cases of no adjustment costs ($\beta_X = 0$) and positive adjustment costs ($\beta_X = 10$).[41] The assumption of a comprehensive flat tax base, which follows the admittedly highly optimistic Hall and Rabushka (1995) approach of assuming taxation of all fringe benefits, elimination of all deductions and exemptions other than a standard deduction and personal exemptions, and elimination of the Earned Income Tax Credit, implies that the required tax rate under the FT plan is in the range from 21.0 to 22.3 percent in the year of reform, depending on the level of adjustment costs, and gradually declines to a steady state value of 20.1 percent.[42] Under the somewhat broader-based AT plan, the wage tax rate ranges from 19.1 to 19.7 percent in the year of reform, depending on the level of adjustment costs, and gradually declines to a steady state value of 18.6 percent. The following discussion begins by comparing the macroeconomic effects of the enactment of the FT and AT on prices,

[39] The initial exemption amount reflects the amounts proposed in Hall and Rabushka (1995) (a standard deduction for joint filers of $16,500 plus $4,500 for each non-spousal dependent), adjusted for inflation and for an average household size of 2.3 working age individuals. The exemption amount grows at the steady state growth rate of the economy.

[40] Taking into account the advantages of deferral and tax exemption of death and the disadvantage of the taxation of inflationary gains, the annual accrual individual level capital gains tax rate associated with the statutory rate of 15 percent is assumed to be 5 percent.

[41] The simulation results are typically be presented as ranges for the range of adjustment costs noted above; unless otherwise noted, the first number corresponds to the value with high adjustment costs, and the second number corresponding to the value with no adjustment costs.

[42] The associated payroll tax rate necessary to fund the pre-reform level of social security benefits is 9.5 percent in the year of reform and 9.2 percent in the long run equilibrium.

output, investment and the allocation of capital, and then examines the effects of enactment of the two reform plans on business equity, housing prices and intergenerational redistributions.

Macroeconomic Effects on Prices, Output, Investment and Capital Allocation

Tables 4-7 show that the general time paths of the wage rate and interest rate are similar under the FT and AT, with or without adjustment costs. In the year of enactment of the FT, with the capital stock initially fixed, the before-tax wage rate declines initially by 0.5-0.6 percent as labor supply increases immediately by 1.8-1.9 percent, depending on the level of adjustment costs. In the year of enactment of the AT, the before-tax wage rate declines initially by 0.6 percent as labor supply increases immediately by 2.2 percent, with or without adjustment costs. The increase in labor supply is a result of both an increase in the after-tax wage rate and an increase in the after-tax interest rate that causes individuals to substitute future consumption and leisure for current consumption and leisure.[43] [44] The labor supply increase is larger under the AT because the additional layer of capital income taxation allows for a lower tax rate on labor income and thus a higher after-tax wage rate. This effect is mitigated to some extent by higher after-tax interest rates under the FT relative to the AT in the year of reform. Under both reforms, the before-tax wage rate rises as increased saving leads to a higher capital-labor ratio; note

[43] Note that the net-of-tax wage actually decreases for generations that are near the age of retirement at the time of reform. They have low wages, due to the "humped-back" " nature of their wage profile, and thus face higher marginal tax rates under the FT than under thee progressive income tax rate structure in the initial equilibrium. This effect is far outweighed by the increase in the net-of-tax wage for all younger generations. In addition, labor supply increases due to an income effect as the increase in the after-tax interest rate reduces the present value of future labor earnings.

[44] Note that part of the increase in the wage rate and the resulting increase in labor supply is attributable to the reform-induced reallocation of capital from owner-occupied housing into the much more labor-intensive production of the composite good (discussed below), which stimulates the demand for labor.

that this effect is larger under the FT because of its more generous treatment of capital income. In the long run steady state, the before-tax wage rate is 4.2 (2.5) percent higher and the capital-labor ratio is 8.8 (5.2) percent higher under the FT (AT). The long run before-tax interest rate is 1.3 percentage points lower under the FT and 1.4 percentage points lower under the AT, with more than half of the decline occurring within 10 years after reform. The after-tax interest rate initially increases by 0.8-1.4 percentage points under the FT and by 0.9-0.5 under the AT, depending on the level of adjustment costs, and then declines steadily to a value 0.2 (0.1) percentage points higher than in the initial steady state under the FT (AT).

Under the FT, gross domestic product (GDP) increases by 1.3-1.0 percent in the year of reform and by 4.9 percent in the long run. Under the AT, GDP increases by more in the short run – 1.5-1.4 percent in the year of reform, reflecting the larger short run labor supply response to the larger reduction in the after-tax wage. However, GDP increases by a smaller 3.9 percent in the long run, reflecting the less generous treatment of capital income under the AT. Even for the highest level of adjustment costs, most of the increase in GDP (4.2 percent under the FT and 3.4 percent under the AT) occurs within 20 years of the enactment of reform, as labor supply and aggregate investment increase and as capital is reallocated among the three production sectors. Under the FT, composite good (non-housing) output is 1.5-1.4 percent larger in the year of reform and 5.2 percent larger in the long run steady state, rental housing output decreases by 0.0-1.4 percent in the year of reform but increases by 1.2 percent in the long run, and the change in output in the owner-occupied housing sector ranges from an increase of 0.1 percent to a decline of 1.5 percent in the year of reform and is 3.6 percent larger in the long run.

Under the AT, composite good (non-housing) output is 1.6 percent larger in the year of reform and 4.1 percent larger in the long run steady state, the change in rental housing output ranges from an increase of 0.8 percent to a decline of 0.2 percent in the year of reform and increases by 1.6 percent in the long run, and the change in output in the owner-occupied housing sector ranges from an increase of 1.0 percent to a decline of 0.1 percent in the year of reform and is 3.3 percent larger in the long run.

Under the FT, investment in the composite good sector increases by 11.4-44.6 percent in the year of reform, and then gradually falls to a level that is 16.9 percent higher than in the initial steady state. Investment in the rental housing sector increases by 18.9-52.8 percent in the year of reform and by 15.0 percent in the long-run steady state. Investment in owner-occupied housing decreases by 8.4-100.5 percent in the year of reform, and increases by 2.3 percent in the long run steady state.[45] These changes in investment imply a short run increase in the savings rate of roughly 6.2-12.3 percent and a long run increase in the savings rate of 8.4 percent.

As expected, given the less generous treatment of capital income under the AT, investment responses are more modest for this reform. Investment in the composite good sector increases by 7.5-27.8 percent in the year of reform, and then gradually falls to a level that is 10.9 percent higher than in the initial steady state. Investment in the rental housing sector increases by 13.5-33.9 percent in the year of reform and by 9.9 percent in

[45] Recall that this dramatic reduction in investment reflects not only the elimination of new and replacement investment in owner-occupied housing in the year of reform but also the conversion of some owner-occupied housing to rental housing. The analysis assumes that such conversions would qualify for consumption tax treatment. Although such treatment is consistent with consumption tax treatment, it creates the potential for huge tax avoidance. Accordingly, some proposals, including the progressive consumption tax option discussed by the recent presidential tax reform panel, limit expensing to assets purchased from other businesses. This would imply a tax bias against conversions of owner-occupied housing, implying larger adjustment costs in the housing sector. However, only a very small level of adjustment costs is required in the model to limit disinvestment in the owner-occupied housing sector to declines in new and replacement investment.

the long-run steady state. Investment in owner-occupied housing decreases by 3.6-56.8 percent in the year of reform, and increases by 2.3 percent in the long run steady state. These changes in investment imply a short run increase in the savings rate of roughly 3.8-9.1 percent and a long run increase of 4.9 percent.

In general, the increases in investment in the composite good and rental housing sectors and the initial decline in investment in owner-occupied housing occur for two reasons. First, eliminating or reducing the tax on the normal rate of return to investment and the gradual decline in interest rates reduce the cost of capital and thus increase the optimal level of investment in the composite good and rental housing sectors relative to the initial steady state. Second, the reduction of the relative tax advantage of owner-occupied housing at the individual level due to the elimination of deductions for home mortgage interest and property taxes reduces demand for such housing and thus encourages a reallocation of capital from the owner-occupied housing sector to the composite good and rental housing sectors, and thus also increases investment in these sectors. The increases in investment is larger under the FT relative to the AT because the reductions in effective tax rates on capital investment in the composite and rental housing sectors are larger under the FT.

One of the economic benefits of fundamental tax reform is a more efficient allocation of capital across the housing and composite good sectors, but this naturally comes only with a reduction in investment in owner-occupied housing during a transition period following reform. Under the FT, the capital stocks in the composite good and rental housing sectors increase in every year after reform in relation to the initial steady state, and are 16.9 and 15.0 percent larger, respectively, in the long run steady state. The

responses are smaller under the AT, with the capital stocks in the composite good and rental housing sectors are 10.9 and 9.9 percent larger, respectively, in the long run steady state. By comparison, in the owner-occupied housing sector, the stock of capital declines in relation to the initial steady state, as capital is reallocated from the owner-occupied housing to the rental housing and composite good sectors. The reallocation of capital from the owner-occupied housing sector to the composite and rental housing sectors is larger under the FT than the AT since under the latter (as modeled in this paper) a tax preference for owner-occupied housing is retained (mortgage interest payments and property taxes are assumed to be deductible at the 15 percent rate). Under the FT, the capital stock in the owner-occupied housing sector is 1.0-6.1 percent smaller five years after the reform is enacted. In the long run, the share of the capital stock in the owner-occupied housing sector falls from 40.4 to 37.3 percent, while the share of composite good capital increases from 48.3 to 51.0 percent and the share of rental housing capital increases modestly from 11.3 to 11.7 percent. By comparison, under the AT, the capital stock in the owner-occupied housing sector is 0.4-3.2 percent smaller five years after the reform is enacted. In the long run steady state, the share of the capital stock in the owner-occupied housing sector falls from 40.4 to 38.5 percent, while the share of composite good capital increases from 48.3 to 49.9 percent and the share of rental housing capital increases modestly from 11.3 to 11.5 percent.

Effects on Business Equity Prices and Housing Values

As noted previously, the implementation of a consumption tax raises some interesting transitional issues. Some observers have argued that, in the absence of special

transition rules, the windfall losses experienced by the owners of corporate equity and owner-occupied housing would be sufficiently large to make the enactment of a consumption tax reform politically infeasible. Others have countered that such windfall losses would be desirable, because they would (1) act as a lump sum tax on existing capital, allowing lower future tax rates and larger efficiency gains, and (2) offset the reduction in progressivity associated with the FT, attributable to reducing the marginal tax rates on the wealthy and eliminating the taxation of the normal returns to capital. Yet others have concluded that these transitional problems are overstated, and that the enactment of a consumption tax reform would have little effect – or might even increase – the values of business assets and owner-occupied housing. The uncertainty regarding these issues implies that implementing a pure consumption tax may be politically infeasible, and that inevitable political compromises would instead produce tax reform proposals such as the U.S. tax panel's "Growth and Investment Tax" or a Nordic dual income tax. In this section, we compare the effects of the FT and AT plans on asset values within the context of our model.

Table 4 shows the effects of implementing the FT if adjustment costs are set approximately to zero and there are no transition rules. In this case, the average value of equity in the composite good production sector (average Q) decreases by 16.5 percent in the year of reform, while the average value of equity in the rental housing sector (where remaining basis is relatively large) decreases by 29.9 percent. The effects of reform on the value of equity in the owner-occupied sector are much more modest, where home equity values initially fall by 2.9 percent which, with a debt-asset ratio of 0.35, is

equivalent to a 1.9 percent decline in the total value of owner-occupied housing; equity values return to their initial levels by the fourth year after the reform.[46]

Table 5 shows the effects of implementing the AT if adjustment costs are set approximately to zero and there are no transition rules. In this case, because the tax treatment of the income generated by new capital assets is less generous than under the FT, the declines in asset prices are more modest. The average value of equity in the composite good production sector decreases by 12.0 percent in the year of reform, while the average value of equity in the rental housing sector decreases by 22.5 percent. Home equity values initially fall by 1.4 percent which, with a debt-asset ratio of 0.35, is equivalent to a 0.9 percent decline in the total value of owner-occupied housing; equity values again return to their initial levels by the fourth year after the reform.

These windfall losses in the composite good and rental housing sectors are moderated when adjustment costs are added to the analysis, since the reallocation of capital to these sectors is slowed, allowing existing assets to earn above-normal returns during the transition. By comparison, adjustment costs – which are assumed to be symmetric across all sectors – slow down the reallocation of capital out of the owner-occupied housing sector, increasing windfall losses in that sector. This effect is magnified by the higher interest rates that occur during the transition in the presence of adjustment costs. The asset price effects related to the enactment of a FT and an AT with adjustment costs ($\beta_X = \beta_H = 10$) are shown in Tables 6 and 7, respectively.

[46] In the long run, the value of average Q in the owner-occupied sector returns to its initial steady state value since there are no business level taxes in this sector. By comparison, the value of average Q in the other two sectors, which is adjusted for business tax factors, declines in the long run as a result of the more generous treatment of investment in these sectors under the flat tax.

In the case of the FT with adjustment costs, shown in Table 6, the average value of equity in the composite good production sector falls by 10.4 percent in the year of reform, while the average value of equity in the rental housing sector falls by 26.3 percent. The average value of equity in the owner-occupied housing sector initially falls by 4.2 percent, which is equivalent to a 2.7 percent decline in the total value of owner-occupied housing. In the case of the AT with adjustment costs, shown in Table 7, the average value of equity of firms in the composite good production sector decreases by 1.5 percent in the year of reform, while the decline in the average value of equity in the rental firm sector is reduced to 15.4 percent. In this case, the average value of owner-occupied housing equity falls by 2.1 percent in the year of reform, which is equivalent to a 1.4 percent decline in the total value of owner-occupied housing.

Thus, our results suggest that implementing the AT would decrease the total value of owner-occupied housing by 0.9 to 1.4 percent in the year of reform, depending on the level of adjustment costs. On the other hand, the declines in the values of rental housing are relatively large under all scenarios. This suggests that, even though most discussion of transitional issues in the housing market has focused on owner-occupied housing, the transitional problems are most severe – and thus the case for transition relief is strongest – in the rental housing sector.

Intergenerational Welfare Effects

Figure 1 presents the intergenerational welfare effects of implementing the FT and AT in the model, calculated as equivalent variations and expressed as percentage changes of remaining lifetime utility, using a measure of lifetime resources including the

value of leisure across all generations; these changes take into account all reform-induced welfare gains and losses considered in the model. The general pattern of welfare changes is similar with or without adjustment costs; however, the magnitudes and signs of the net welfare change for a particular generation can vary considerably with the assumed level of adjustment costs. For example, the generation of economic age 54 in the year of enactment of the FT (AT) experiences a net welfare loss of 1.8 (0.7) percent under the assumption of high adjustment costs and a net welfare loss of 11.3 (7.4) percent with no adjustment costs. This reflects the fact that as the level of adjustment costs increases the one-time windfall tax on existing capital owners is offset by above-normal returns on new and existing investments. Note that for those who are retired at the time of reform (between the economic ages of 45 and 54), as the age in the year of enactment decreases the net welfare gain increases; this occurs because the retired generations with longer life spans after reform receive inframarginal returns and a higher after-tax interest rate on their remaining financial wealth over a longer period of time.

The net welfare gains decline steadily for generations that are approximately within 7 to 12 years of retirement, depending on the levels of adjustment costs. This pattern of welfare gains is due in part to two factors. First, replacing the federal income tax system with a system that provides heavier taxation of wages raises the marginal tax rate on labor income for generations that are near retirement, since the wage profile has a "humped-back" shape and the income tax rates are structured in a progressive manner in the initial income tax steady state.[47] Second, the initial decrease in the wage rate tends to have a larger impact on older and middle-aged generations since they have fewer years to

[47] For generations within 7 years of retirement, implementing the Flat Tax actually raises the marginal tax rate on labor income due to the humped-back wage profile and the progressive income tax rates in the initial income tax steady state.

benefit from the higher wage rates several years after reform, and during these years they are faced with the higher marginal tax rates on wage income near retirement. For this reason, the welfare gains of younger individuals in the age range from 25 to 38 are larger the longer they have to benefit from higher wages and reductions in their marginal tax rates in their prime working years.

As discussed above, since the model assumes a "target" bequest, older generations are not allowed to pass on part of any windfall gains or losses to their heirs. Thus, the generation of economic age 25 in the year of enactment experiences a discontinuous increase in net welfare, since it is the first generation to receive an inheritance after reform and thus benefits from the above-normal returns on business equity during the transition period. Generations older than age 25 would have received their inheritance before the reform and thus would suffer a welfare loss, since their inherited assets would be subject to the one-time tax at the time of reform. The steady decline in the welfare gain for individuals younger than age 25 reflects the fact that these individuals would hold their inherited assets a shorter period of time over the transition period and thus would experience smaller welfare gains relative to older generations age 25 and younger. Net welfare continues to decline until the efficiency effects of reform begin to dominate other welfare effects. The discontinuity at age zero reflects the fact that generations born after reform can plan optimally over their entire life without any unexpected changes in the tax system. In the long run steady state, the increase in net welfare is equal to 2.7 percent of remaining lifetime utility.

The relatively large net welfare gains (and smaller net welfare losses) in this study as compared to some of the other studies cited above are partially attributable to the

increased efficiency gains that result from explicitly modeling the elimination of tax distortions of investment across the composite good, rental housing, and owner-occupied housing sectors. Furthermore, with higher levels of adjustment costs, the rate at which investment is reallocated across the three sectors tends to occur less rapidly. This leads to higher inframarginal returns and thus larger increases (smaller decreases) in the total real value of equity in the composite good and rental housing sectors. This study suggests that in this case these gains tend to almost completely offset the one-time tax on existing assets; at the same time, however, it must be noted that the relevance of these results are called into question by recent results which suggest that adjustment costs are significantly smaller than once believed (Hall, 2004).

For generations alive at the time of reform, the three oldest generations are better off under the AT because, as noted above, the one-time tax on existing assets is smaller. For generations between the ages of 52 and 18 in the year of enactment, the net welfare gains are larger under the FT than the AT because the after-tax above-normal returns on capital are higher under the FT and more than offset the higher after-tax wage rate under the AT. For generations between the ages of 18 and 21 in the year of enactment, the higher after-tax wage rate under the AT more than offsets the higher after-tax above-normal returns on capital income under the FT for these generations. In the long run, the efficiency gains are larger under the FT and thus the net welfare gains for future generations are larger under the FT (2.7 percent) than under the AT (2.4 percent).

V. SENSITIVITY ANALYSIS

The magnitudes of the behavioral responses in the model are determined primarily by the values chosen for many important parameters. In this section, the values of several of the most important parameters are varied to determine the sensitivity of the results to changes in the magnitudes of the behavioral responses. All simulations in this section assume adjustment costs with $\beta_X = \beta_O = \beta_R = 10$.

The intertemporal elasticity of substitution reflects the willingness of consumers to substitute present consumption and leisure for future consumption and leisure. Since the value used in our simulations (0.35) is somewhat higher than assumed in some other studies (e.g., AAKSW and AK use 0.25),[48] Table 8 shows the effects of lowering the intertemporal elasticity of substitution from 0.35 to 0.25. In this case, the changes in GDP are roughly the same as in the base case in all periods, and labor supply is slightly lower than in the base case in all periods.

Lowering the intertemporal elasticity of substitution naturally reduces the various saving and investment responses. The initial increase in investment in the composite good sector is 6.9 percent instead of 7.5 percent, and the initial increase in investment in the rental housing sector is 12.0 percent instead of 13.5 percent. In the year of reform, investment in the owner-occupied housing sector falls by 4.8 percent instead of 3.6 percent. In the long-run, investment in all three sectors is 0.1 percentage points smaller than in the base case.

In addition, with the lower intertemporal elasticity of substitution, the average value of equity in the composite good (rental housing) sector falls in the year of reform

[48] Recall, however, that the savings response in our model is damped by the assumptions of a target bequest and the inclusion of minimum required purchases.

by 2.4 (16.2) percent, relative to a decline of 1.5 (15.4) percent in the base case. The initial decline in the average value of equity in owner-occupied housing is 2.8 percent, relative to 2.1 in the base case. The larger declines in the average values of equity in the all three sectors reflect the smaller saving response to the reform-induced increase in the after-tax rate of return.

The intratemporal elasticity of substitution (ε) determines the responsiveness of labor supply to changes in the after-tax wage rate, with a larger intratemporal elasticity of substitution implying a larger labor supply response. In the base case, we assume an intertemporal elasticity of substitution of 0.6. Since AK and AAKSW use a larger intratemporal elasticity of substitution (0.8) – and in light of the relatively large labor supply elasticities found in the recent work of Prescott (2005) and Davis and Henreckson (2005) – Table 9 shows the results if this parameter is increased from 0.6 to 0.8. In this case, labor supply initially increases by 2.8 instead of 2.2 percent, and in the long run, labor supply is 3.0 percent (rather than 2.1 percent) greater than in the initial steady state.

The larger increase in labor supply is associated with correspondingly larger increases in GDP and investment. The initial increase in GDP is 2.1 percent in the year of reform, compared to 1.5 percent in the base case simulation. In the long run, GDP increases by 5.1 percent instead of 3.9 percent. Composite good investment increases by 2.1 percent in the year of reform, compared to an initial increase of 1.6 in the base case simulation. The change in investment in the rental housing and owner-occupied housing sectors is 15.3 and -2.8 percent respectively, compared to an increase of 13.5 and a decrease of 3.6 percent in the base case. The short run increases in investment relative to the base case are a result of higher after-tax interest rates during the transition period.

The average value of equity in the composite good decreases by 0.3 percent instead of 1.6 percent, and the average value of equity in the rental housing sector decreases by 14.6 percent instead of 15.4 percent. The average value of equity in the owner-occupied housing sector decreases by 1.6 percent instead of 2.1 percent. The smaller asset price declines relative to the base case are consistent with higher after-tax returns in the composite good and rental housing sectors and a larger income effect that mitigates the decrease in the demand of owner-occupied housing.

The elasticity of substitution between the composite good and housing consumption (σ_{CH}) determines the degree to which consumers are willing to substitute between the composite good and the two housing goods. Table 10 reports results for an increase in the elasticity of substitution between the composite good and the two housing goods from 0.8 to 1.5. The short run increase in GDP is 1.3 percent in the year of reform instead of 1.5 percent. The short run increase in output in the composite sector is the same as in the base case, while output in the rental and owner-occupied housing sectors falls by 0.5 and 0.4 percent, respectively, instead of increasing by 0.8 and 1.0 percent. In the long run, GDP increases by 4.0 percent instead of 3.9 percent, with a larger increase in the output in the composite sector (4.3 instead of 4.1 percent) and smaller increases in output in the rental and owner-occupied sectors. In the year of reform, the increase in composite good investment is 8.1 percent instead of 7.5 percent, and the increase in rental housing investment is 11.9 percent instead of 13.5 percent. The initial decline in owner housing investment is 6.2 percent instead of 3.6 percent. In the long run, investment in the owner-occupied housing sector increases by 2.2 percent instead of 2.3 percent in the base case. With the higher elasticity of substitution, the average value of equity in the

composite good sector decreases by 0.7 percent instead of declining by 1.5 percent in the base case, as demand for the composite good relative to the housing goods increases more than in the base case. The decline in the average value of equity in the rental sector is 16.6 instead of 15.4 percent, and the average value of equity in the owner housing sector falls by 3.7 percent instead 2.1 percent.

The elasticity of substitution between owner-occupied and rental housing (σ_{RO}) determines the degree to which consumers can substitute between owner-occupied and rental housing. Table 11 reports results for an increase the elasticity of substitution between rental and owner-occupied housing from 0.8 to 1.5. In this case, the long run increase in output in the rental sector is 5.3 percent instead of 1.6 percent, and the long run increase in output in the owner-occupied sector is 2.0 percent instead of 3.3 percent.

In the year of reform, the increase in investment in the rental sector is 17.3 percent instead of 13.5 percent, and the decrease in investment in the owner-occupied sector is 4.7 instead of 3.6 percent. In the long run, investment in the rental housing sector increases by 14.9 percent instead of 9.9 percent, and investment in the owner-occupied sector increases by 1.5 percent rather than 2.3 percent. Changes in the elasticity of substitution between rental and owner-occupied housing have a modest effect on the average value of equity in each sector. In the year of reform, the decline in the average value of owner-occupied housing equity is 2.7 percent instead of 2.1 percent. The average value of equity in the rental housing sector decreases by 13.8 percent instead of 15.4 percent, while the average value of equity in the composite good sector decreases by 1.2 percent instead of 1.5 percent.

A wide range of values have been estimated for the elasticity of substitution between capital and labor in different production sectors (σ_X, σ_H). In the base case, the elasticity of substitution between capital and labor is assumed to be $\sigma_X = \sigma_H = 0.8$. Table 12 reports the effects of implementing the AT assuming that the elasticity of substitution in the composite good sector is $\sigma_X = 0.6$ and the e elasticity of substitution in the housing sectors is $\sigma_H = 0.7$.[49] The effects of the lower elasticity of substitution between capital and labor are modest. The initial increase in GDP is the same as in the base case and the long-run increase in GDP is 3.8 percent instead of 3.9 percent. The increase in labor supply is 2.1 percent in every period which is roughly equivalent to the base case. The initial increase in rental housing investment is 14.6 percent instead of 13.5 percent, and the initial increase in investment in the composite good sector is 7.6 percent instead of 7.5 percent. Investment in owner-occupied housing sector falls by 3.5 percent instead of 3.6 percent. In the long run, investment in the composite good sector increases by 9.9 percent instead of 10.9 percent. In the long run, investment in the rental housing sector increases by 11.2 percent instead of 9.9 percent, and investment in the owner-occupied housing sector increases by 3.0 percent instead of 2.3 percent. The percentage changes in asset values are roughly equivalent to the base case.

VI. CONCLUSION

This paper examines the economic effects of implementing a stylized version of the Growth and Investment Tax plan recommended by the President's Advisory Panel on

[49] Chirinko (2002) estimates that the elasticity of substitution is lower in the corporate sector. In addition, the small share of labor income in production implies that changes in the elasticity of substitution in the housing sector would not have a significant impact on the results.

Federal Tax Reform in the United States (which supplements a consumption-based business tax on real cash flow with an individual level flat tax on interest, dividends and capital gains), relative to the effects of enacting a pure consumption tax such as the Hall and Rabushka (1983, 1995) Flat Tax. The analysis is conducted within the context of a dynamic overlapping generations computable general equilibrium model that includes a corporate sector that produces a composite good and rental and owner-occupied housing production sectors, and allows for the costs of adjusting all capital stocks in response to the enactment of the reform.

Our results provide an estimate of the differences in macroeconomic effects, windfall gains and losses, and welfare gains under the two plans. They suggest that the short run increase in GDP would be larger under the AT (1.5 percent) than under the FT (1.3 percent), reflecting a larger initial reduction in the after-tax wage and thus a larger short run labor supply response. In the long run, however, GDP increases by 3.9 percent under the AT relative to 4.9 percent under the FT, reflecting the less generous treatment of capital income under the AT and thus smaller long run increases in investment. Investment in the composite good (rental housing) sector is 10.9 (9.9) percent higher under the AT, relative to 16.9 (15.0) percent higher under the FT. The long run increase in the savings rate is 4.9 percent under the AT and 8.4 percent under the FT. One of the economic benefits of fundamental tax reform is a more efficient allocation of capital across the housing and composite good sectors. In the long run, the share of the capital stock in the owner-occupied housing sector falls from 40.4 to 38.5 percent under the AT, relative to 40.4 to 37.3 percent under the FT.

Many observers are unconvinced that a movement to a true consumption tax such as a FT is desirable, citing concerns about the transitional problems related to the tax-induced changes in asset values of such a reform. These windfall losses in the composite good and rental housing sectors are significantly moderated under an AT. For example, the average value of equity in the composite good (rental housing) sector falls by 1.5 (15.4) percent in the year of reform under the AT instead of by 10.4 (26.3) under the FT. However, efficiency gains are larger under the FT and thus the net welfare gains for future generations are larger under the FT (2.7 percent) than under the AT (2.4 percent).

Our analysis has been conducted within the framework of a single representative individual in each generation. An additional critical issue is the distribution of these welfare changes across lifetime income groups taking into account differences in investment patterns across income groups, especially since lower and middle income groups hold disproportionately large shares of their investment portfolios in owner-occupied housing relative to the upper income groups. Another critical issue is the differential treatment during the transition of different types of capital. These topics are the focus of ongoing research.

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Table 1: Utility Function and Technological Parameter Values

Symbol	Description	Value	Source
	Consumers		
ρ	Rate of time preference	0.003	AAKSW
$\sigma 1$	Intertemporal elasticity of substitution	0.35	AAKSW
$\sigma 2$	Intratemporal elasticity of substitution	0.6	FR
$\sigma 3$	Elasticity of substitution for composite good and housing	0.5	-
$\sigma 4$	Elasticity of substitution for rental and owner housing	0.8	-
α_E	Utility weight on leisure	0.3	-
α_C	Utility weight on composite consumption	0.72	-
α_G	Utility weight on composite good consumption	0.75	-
α_H	Utility weight on composite housing consumption	0.25	-
α_O	Utility weight on owner-occupied housing	0.78	-
α_R	Utility weight on rental housing	0.22	-
N	Population growth rate	0.01	AK, FR
	Technology		
G	Technological growth rate	0.01	AK, FR
α_1	Capital share in composite good production	0.25	-
α_2	Capital share in housing production	0.99	-
β	Composite good adjustment cost parameter	2	-
β_{rh}	Rental housing adjustment cost parameter	2	-
β_{oh}	Owner housing adjustment cost parameter	2	-
μ	Composite good adjustment cost parameter	0.1081	$\delta + 0.0201$
μ_h	Housing adjustment cost parameter	0.0391	$\delta_h + 0.0201$
ζ	Dividend payout ratio in the composite good sector	0.68	NIPA
b	Debt-to-capital ratio (in all three sectors)	0.35	FR
δ	Economic depreciation in the composite good sector	0.088	Jorgenson
δ_h	Economic depreciation in the housing sector	0.019	Jorgenson

Table 2: Federal and State Tax Rates

Symbol	Description	Value
	Federal Taxes	
τ_d	Dividend Tax Rate	0. 081
τ_i	Interest Income Tax Rate	0. 106
τ_g	Composite good Capital Gains Tax Rate	0.04
τ_b	Effective Composite good Business Tax Rate	0.26
τ_{rs}	Effective Rental Housing Tax Rate	0.169
τ_{gr}	Rental Housing Capital Gains Tax Rate	0.04
τ_{go}	Owner Housing Capital Gains Tax Rate	0
τ_{wmarg}	Income Weighted Marginal Wage Tax Rate	0.252
τ_{wave}	Average Wage Tax Rate	0.21
τ_s	Social Security Tax Rate	0.1
	State Taxes	
τ_c^{st}	Sales Tax Rate	0.075
τ_p^{r}	Housing Property Tax Rate	0.0171
τ_p^{nr}	Composite good Property Tax Rate	0.0081
τ_b^{st}	Average Business Tax Rate	0.04
τ_w^{st}	Average Wage Tax Rate	0.04

Table 3: Initial Income Tax Steady State Values

	Composite good	Rental Housing	Owner Housing	Total
Output	10107	400	1227	11734
Capital	12069	2813	10107	24989
Wages	7690	8	25	7724
Firm Value	6662	1777	6569	15008
Investment	1305	110	395	1810
Earnings	1943	-	-	1943
Net Services	-	105	383	488

Table 4
Base Case Simulation - No Adjustment Costs

Years After Enactment	0	1	2	4	6	10	15	20	50	100
After-Tax Interest Rate	0.3	1.4	1.6	1.3	1.0	0.6	0.4	0.3	0.2	0.2
Before-Tax Interest Rate	-1.2	-0.1	0.2	-0.2	-0.5	-0.9	-1.1	-1.2	-1.3	-1.3
Before-Tax Wage Rate	-0.5	0.8	1.7	2.6	3.0	3.5	3.9	4.1	4.2	4.2
Price of Rental Services	-1.4	-2.7	-4.1	-6.0	-7.2	-9.1	-10.5	-11.2	-11.7	-11.7
Price of Owner Services	-1.4	4.3	7.7	9.2	7.9	5.1	3.1	2.1	1.4	1.3
Flat Tax Rate	22.3	22.3	21.8	21.1	20.8	20.5	20.3	20.2	20.1	20.1
Payroll Tax Rate	7.1	7.0	6.9	6.8	6.8	6.8	6.8	6.8	6.7	6.7
Labor Supply	1.8	1.9	2.0	2.1	2.1	2.0	1.9	1.8	1.8	1.8
Investment NH	44.6	35.4	27.6	19.8	17.9	17.7	17.4	17.1	17.0	16.9
Investment RH	52.8	52.9	44.1	31.8	27.2	23.9	20.4	17.5	15.3	15.0
Investment OH	-100.5	-55.0	-19.6	11.3	15.7	11.7	7.8	5.0	2.5	2.3
Non-Housing Capital	0.0	4.7	8.0	11.4	12.9	14.6	15.9	16.5	16.9	16.9
Rental Housing Capital	0.0	2.0	4.0	6.7	8.5	11.0	13.0	14.1	14.9	15.0
Owner Housing Capital	0.0	-3.9	-5.8	-6.1	-4.6	-1.9	0.2	1.4	2.2	2.3
Tobin's Q - Non-Housing	-16.5	-19.9	-20.8	-20.4	-19.8	-19.2	-18.9	-18.8	-18.7	-18.7
Tobin's Q - Rental Housing	-29.9	-31.4	-31.4	-30.4	-29.8	-29.4	-29.1	-29.0	-28.9	-28.9
Tobin's Q - Owner Housing	-2.9	-2.4	-1.3	0.2	0.5	0.4	0.2	0.1	0.0	0.0
Non-Housing Firm Value	-16.5	-16.1	-14.5	-11.3	-9.4	-7.4	-6.1	-5.4	-4.9	-4.9
Rental Housing Firm Value	-29.9	-30.0	-28.7	-25.8	-23.9	-21.6	-19.9	-19.0	-18.4	-18.3
Owner Housing Firm Value	-2.9	-6.2	-7.0	-5.9	-4.1	-1.5	0.4	1.5	2.2	2.3
GDP	1.0	2.2	3.1	4.0	4.3	4.5	4.7	4.8	4.9	4.9
Non-Housing Output	1.4	2.6	3.4	4.3	4.6	4.8	5.0	5.1	5.2	5.2
Rental Housing Output	-1.4	-0.8	-0.4	0.2	0.4	0.7	0.8	1.0	1.2	1.2
Owner Housing Output	-1.5	0.3	1.5	2.7	3.0	3.1	3.3	3.5	3.6	3.7

(1) Adjustment costs are approximately zero (β=0.3).

Table 5
Dual Income Tax - No Adjustment Costs[1]

Years After Enactment	0	1	2	4	6	10	15	20	50	100
After-Tax Interest Rate	0.1	0.9	1.0	0.8	0.6	0.4	0.2	0.1	0.1	0.1
Before-Tax Interest Rate	-1.4	-0.6	-0.5	-0.7	-0.9	-1.1	-1.3	-1.4	-1.4	-1.4
Before-Tax Wage Rate	-0.6	0.2	0.8	1.4	1.7	2.1	2.4	2.5	2.5	2.5
Price of Rental Services	-0.2	-1.0	-1.9	-3.3	-4.3	-5.7	-6.8	-7.3	-7.3	-7.4
Price of Owner Services	-0.1	3.2	5.1	5.8	5.0	3.1	1.8	1.1	1.0	1.0
Flat Tax Rate	19.7	19.7	19.5	19.1	18.9	18.8	18.6	18.6	18.6	18.6
Payroll Tax Rate	7.0	7.0	6.9	6.9	6.9	6.9	6.8	6.8	6.8	6.8
Labor Supply	2.2	2.2	2.3	2.3	2.2	2.1	2.1	2.0	2.1	2.1
Investment NH	27.8	22.1	17.4	13.1	12.0	11.8	11.6	11.3	11.0	11.0
Investment RH	33.9	34.2	28.8	21.9	19.2	16.8	14.1	11.9	10.2	9.9
Investment OH	-56.8	-30.1	-8.9	8.7	11.2	9.1	6.6	4.4	2.4	2.3
Non-Housing Capital	0.0	2.9	5.0	7.2	8.3	9.6	10.5	10.9	10.9	11.0
Rental Housing Capital	0.0	1.3	2.6	4.4	5.6	7.4	8.9	9.6	9.8	9.9
Owner Housing Capital	0.0	-2.2	-3.2	-3.2	-2.2	-0.4	1.1	1.9	2.2	2.3
Tobin's Q - Non-Housing	-12.0	-14.5	-15.1	-15.0	-14.8	-14.5	-14.4	-14.3	-14.3	-14.3
Tobin's Q - Rental Housing	-22.5	-23.8	-23.8	-23.3	-23.0	-22.8	-22.7	-22.6	-22.6	-22.6
Tobin's Q - Owner Housing	-1.4	-1.4	-0.7	0.2	0.3	0.3	0.1	0.1	0.0	0.0
Non-Housing Firm Value	-12.0	-12.0	-10.9	-8.9	-7.7	-6.4	-5.4	-5.0	-4.9	-4.9
Rental Housing Firm Value	-22.5	-22.8	-21.9	-20.0	-18.7	-17.1	-15.8	-15.2	-15.0	-14.9
Owner Housing Firm Value	-1.4	-3.5	-3.9	-3.1	-1.9	-0.1	1.3	2.0	2.2	2.3
GDP	1.4	2.2	2.7	3.2	3.5	3.7	3.8	3.9	3.9	3.9
Non-Housing Output	1.6	2.4	2.9	3.4	3.7	3.9	4.0	4.1	4.1	4.1
Rental Housing Output	-0.2	0.2	0.5	0.8	1.0	1.1	1.3	1.4	1.6	1.6
Owner Housing Output	-0.1	1.0	1.8	2.4	2.7	2.8	2.9	3.0	3.2	3.3

(1) Adjustment costs are approximately zero (β=0.3).

Table 6
Base Case Simulation - High Adjustment Costs

Years After Enactment	0	1	2	4	6	10	15	20	50	100
After-Tax Interest Rate	0.3	0.8	0.9	0.9	0.8	0.7	0.5	0.4	0.3	0.2
Before-Tax Interest Rate	-1.2	-0.7	-0.6	-0.6	-0.6	-0.8	-1.0	-1.1	-1.2	-1.3
Before-Tax Wage Rate	-0.6	-0.2	0.1	0.7	1.2	2.0	2.7	3.1	4.0	4.2
Price of Rental Services	0.0	-0.6	-1.1	-2.1	-3.1	-4.8	-6.5	-7.8	-10.9	-11.7
Price of Owner Services	0.1	0.8	1.4	2.4	3.1	3.9	4.1	3.9	2.2	1.4
Flat Tax Rate	21.0	21.3	21.3	21.2	21.0	20.8	20.6	20.4	20.2	20.1
Payroll Tax Rate	7.1	7.0	7.0	7.0	6.9	6.9	6.8	6.8	6.8	6.7
Labor Supply	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8
Investment NH	11.4	11.8	12.2	12.8	13.4	14.3	15.0	15.4	16.7	16.9
Investment RH	18.9	19.1	19.2	19.2	19.0	18.7	18.0	17.1	15.5	15.0
Investment OH	-8.4	-7.7	-6.7	-4.6	-3.0	-0.4	1.3	1.9	2.6	2.3
Non-Housing Capital	0.0	1.2	2.3	4.3	6.1	8.9	11.3	13.0	16.3	16.9
Rental Housing Capital	0.0	0.7	1.4	2.8	4.0	6.1	8.3	10.0	13.9	14.9
Owner Housing Capital	0.0	-0.3	-0.6	-1.0	-1.3	-1.4	-1.0	-0.6	1.5	2.3
Tobin's Q - Non-Housing	-0.1	-2.8	-4.6	-7.0	-8.9	-11.6	-13.9	-15.6	-18.2	-18.6
Tobin's Q - Rental Housing	-19.9	-21.2	-21.9	-22.5	-23.1	-24.0	-25.0	-26.1	-28.3	-28.9
Tobin's Q - Owner Housing	-5.1	-5.1	-4.5	-2.9	-1.6	0.2	1.3	1.5	0.7	0.0
Non-Housing Firm Value	-0.1	-1.6	-2.4	-3.0	-3.3	-3.8	-4.2	-4.6	-4.9	-4.9
Rental Housing Firm Value	-19.9	-20.6	-20.7	-20.4	-20.0	-19.3	-18.8	-18.7	-18.3	-18.3
Owner Housing Firm Value	-5.1	-5.4	-5.0	-3.9	-2.8	-1.1	0.3	0.9	2.2	2.3
GDP	1.3	1.6	1.8	2.3	2.7	3.3	3.8	4.2	4.8	4.9
Non-Housing Output	1.5	1.7	2.0	2.5	2.9	3.5	4.0	4.4	5.1	5.2
Rental Housing Output	0.0	0.1	0.3	0.6	0.7	0.9	1.1	1.2	1.3	1.2
Owner Housing Output	0.1	0.5	0.8	1.4	1.9	2.5	3.0	3.4	3.7	3.7

Table 7
Dual Income Tax - High Adjustment Costs

Years After Enactment	0	1	2	4	6	10	15	20	50	100
After-Tax Interest Rate	0.2	0.5	0.6	0.6	0.5	0.4	0.3	0.2	0.2	0.1
Before-Tax Interest Rate	-1.3	-1.0	-0.9	-0.9	-1.0	-1.1	-1.2	-1.3	-1.3	-1.4
Before-Tax Wage Rate	-0.6	-0.4	-0.2	0.2	0.5	1.1	1.5	1.8	2.4	2.5
Price of Rental Services	0.8	0.4	0.0	-0.8	-1.5	-2.7	-4.0	-4.8	-6.8	-7.3
Price of Owner Services	1.0	1.3	1.7	2.2	2.5	2.7	2.7	2.6	1.6	1.0
Flat Tax Rate	19.1	19.2	19.2	19.1	19.0	18.9	18.8	18.7	18.6	18.6
Payroll Tax Rate	7.0	7.0	7.0	7.0	7.0	6.9	6.9	6.9	6.8	6.8
Labor Supply	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1
Investment NH	7.5	7.7	8.0	8.4	8.7	9.4	9.9	10.1	10.8	10.9
Investment RH	13.5	13.4	13.4	13.3	13.1	12.9	12.3	11.5	10.3	9.9
Investment OH	-3.6	-3.1	-2.5	-1.3	-0.3	1.2	2.1	2.3	2.5	2.3
Non-Housing Capital	0.0	0.8	1.5	2.8	4.0	5.8	7.4	8.5	10.5	10.9
Rental Housing Capital	0.0	0.5	1.0	1.9	2.8	4.3	5.8	6.9	9.3	9.9
Owner Housing Capital	0.0	-0.1	-0.3	-0.4	-0.4	-0.3	0.0	0.4	1.7	2.2
Tobin's Q - Non-Housing	-1.5	-3.3	-4.4	-6.0	-7.2	-9.1	-10.8	-12.1	-13.9	-14.3
Tobin's Q - Rental Housing	-15.4	-16.4	-16.9	-17.5	-17.9	-18.7	-19.6	-20.4	-22.2	-22.6
Tobin's Q - Owner Housing	-2.1	-2.1	-1.8	-0.9	-0.2	0.7	1.2	1.2	0.5	0.0
Non-Housing Firm Value	-1.5	-2.5	-2.9	-3.3	-3.6	-3.9	-4.2	-4.6	-4.9	-4.9
Rental Housing Firm Value	-15.4	-16.0	-16.1	-15.8	-15.6	-15.2	-14.9	-15.0	-15.0	-14.9
Owner Housing Firm Value	-2.1	-2.3	-2.1	-1.3	-0.7	0.4	1.3	1.6	2.2	2.3
GDP	1.5	1.7	1.9	2.2	2.5	2.8	3.2	3.4	3.8	3.9
Non-Housing Output	1.6	1.8	2.0	2.3	2.6	3.0	3.3	3.6	4.0	4.1
Rental Housing Output	0.8	0.9	1.0	1.2	1.3	1.4	1.5	1.6	1.7	1.6
Owner Housing Output	1.0	1.2	1.4	1.8	2.1	2.4	2.8	3.0	3.3	3.3

Table 8
Low Intertemporal Elasticity of Substitution with Adjustment Costs

Years After Enactment	0	1	2	4	6	10	15	20	50	100
After-Tax Interest Rate	0.2	0.6	0.7	0.6	0.6	0.5	0.3	0.3	0.2	0.1
Before-Tax Interest Rate	-1.3	-0.9	-0.8	-0.9	-0.9	-1.0	-1.2	-1.2	-1.3	-1.4
Before-Tax Wage Rate	-0.6	-0.4	-0.2	0.2	0.5	1.0	1.5	1.8	2.3	2.5
Price of Rental Services	0.9	0.5	0.1	-0.6	-1.2	-2.5	-3.7	-4.5	-6.5	-7.2
Price of Owner Services	1.1	1.5	1.8	2.4	2.7	3.0	3.0	2.9	1.9	1.1
Flat Tax Rate	19.1	19.3	19.3	19.2	19.1	19.0	18.8	18.8	18.6	18.6
Payroll Tax Rate	7.0	7.0	7.0	7.0	7.0	6.9	6.9	6.9	6.9	6.8
Labor Supply	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0
Investment NH	6.9	7.2	7.5	7.9	8.3	9.0	9.5	9.7	10.5	10.8
Investment RH	12.0	12.2	12.3	12.3	12.3	12.3	11.8	11.0	10.1	9.8
Investment OH	-4.8	-4.3	-3.5	-2.2	-1.1	0.6	1.6	1.9	2.3	2.2
Non-Housing Capital	0.0	0.7	1.4	2.7	3.7	5.5	7.1	8.2	10.2	10.8
Rental Housing Capital	0.0	0.5	0.9	1.8	2.6	4.0	5.4	6.5	8.9	9.7
Owner Housing Capital	0.0	-0.2	-0.3	-0.6	-0.7	-0.6	-0.3	0.1	1.4	2.1
Tobin's Q - Non-Housing	-2.4	-4.2	-5.2	-6.6	-7.7	-9.4	-10.9	-12.1	-13.9	-14.3
Tobin's Q - Rental Housing	-16.2	-17.2	-17.6	-18.0	-18.3	-19.0	-19.7	-20.5	-22.2	-22.6
Tobin's Q - Owner Housing	-2.8	-2.9	-2.5	-1.4	-0.6	0.5	1.1	1.1	0.6	0.1
Non-Housing Firm Value	-2.4	-3.5	-3.9	-4.1	-4.3	-4.4	-4.6	-5.0	-5.1	-5.0
Rental Housing Firm Value	-16.2	-16.8	-16.9	-16.5	-16.2	-15.8	-15.4	-15.4	-15.2	-15.1
Owner Housing Firm Value	-2.8	-3.1	-2.8	-2.0	-1.2	-0.1	0.8	1.2	1.9	2.2
GDP	1.5	1.7	1.8	2.1	2.4	2.7	3.1	3.3	3.8	3.9
Non-Housing Output	1.6	1.7	1.9	2.2	2.4	2.8	3.2	3.4	3.9	4.0
Rental Housing Output	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.6	1.6
Owner Housing Output	1.1	1.3	1.5	1.8	2.1	2.4	2.7	3.0	3.2	3.2

Table 9
High Intratemporal Elasticity of Substitution with Adjustment Costs

Years After Enactment	0	1	2	4	6	10	15	20	50	100
After-Tax Interest Rate	0.2	0.6	0.7	0.6	0.6	0.5	0.3	0.3	0.2	0.1
Before-Tax Interest Rate	-0.5	-0.1	-0.1	-0.1	-0.2	-0.3	-0.4	-0.5	-0.6	-0.7
Before-Tax Wage Rate	-0.8	-0.6	-0.3	0.1	0.5	1.1	1.6	2.0	2.6	2.8
Price of Rental Services	1.4	0.8	0.4	-0.5	-1.3	-2.7	-4.1	-5.1	-7.4	-8.0
Price of Owner Services	1.6	1.9	2.2	2.7	3.0	3.2	3.1	2.8	1.4	0.8
Flat Tax Rate	19.0	19.2	19.2	19.1	19.0	18.8	18.6	18.6	18.4	18.3
Payroll Tax Rate	7.0	7.0	7.0	6.9	6.9	6.9	6.8	6.8	6.8	6.8
Labor Supply	2.8	2.8	2.8	2.8	2.9	2.9	2.9	2.9	3.0	3.0
Investment NH	8.4	8.8	9.1	9.6	10.1	10.9	11.5	11.8	12.7	12.9
Investment RH	15.3	15.5	15.6	15.6	15.4	15.2	14.6	13.7	12.3	11.9
Investment OH	-2.8	-2.2	-1.4	0.0	1.1	2.7	3.7	3.9	4.0	3.7
Non-Housing Capital	0.0	0.9	1.7	3.2	4.5	6.7	8.6	9.9	12.3	12.9
Rental Housing Capital	0.0	0.6	1.2	2.2	3.2	5.0	6.8	8.1	11.0	11.8
Owner Housing Capital	0.0	-0.1	-0.2	-0.3	-0.2	0.1	0.6	1.2	3.0	3.7
Tobin's Q - Non-Housing	-0.3	-2.2	-3.4	-5.0	-6.4	-8.5	-10.3	-11.7	-13.9	-14.3
Tobin's Q - Rental Housing	-14.6	-15.7	-16.2	-16.7	-17.2	-18.0	-19.0	-20.0	-22.1	-22.6
Tobin's Q - Owner Housing	-1.6	-1.7	-1.3	-0.3	0.5	1.4	1.9	1.7	0.6	0.0
Non-Housing Firm Value	-0.3	-1.4	-1.7	-2.0	-2.1	-2.4	-2.6	-3.0	-3.3	-3.3
Rental Housing Firm Value	-14.6	-15.2	-15.2	-14.8	-14.5	-14.0	-13.6	-13.6	-13.5	-13.4
Owner Housing Firm Value	-1.6	-1.8	-1.5	-0.5	0.3	1.5	2.5	2.9	3.6	3.7
GDP	2.1	2.3	2.5	2.9	3.2	3.7	4.1	4.4	5.0	5.1
Non-Housing Output	2.1	2.4	2.6	2.9	3.3	3.8	4.2	4.5	5.1	5.3
Rental Housing Output	1.4	1.5	1.6	1.8	1.9	2.1	2.3	2.4	2.6	2.6
Owner Housing Output	1.6	1.9	2.1	2.5	2.9	3.3	3.7	4.1	4.4	4.4

Table 10
High Elasticity of Substitution Between Non-Housing and Housing Consumption with Adjustment Costs

Years After Enactment	0	1	2	4	6	10	15	20	50	100
After-Tax Interest Rate	0.1	0.5	0.6	0.5	0.5	0.4	0.2	0.2	0.1	0.1
Before-Tax Interest Rate	-0.7	-0.3	-0.2	-0.2	-0.3	-0.4	-0.5	-0.6	-0.7	-0.7
Before-Tax Wage Rate	-0.6	-0.4	-0.1	0.3	0.7	1.3	1.8	2.1	2.7	2.8
Price of Rental Services	-0.5	-0.9	-1.3	-2.1	-2.8	-4.0	-5.1	-5.9	-7.6	-8.2
Price of Owner Services	-0.4	0.0	0.3	0.9	1.3	1.7	1.9	1.9	1.2	0.6
Flat Tax Rate	19.1	19.3	19.3	19.2	19.1	18.9	18.8	18.7	18.6	18.5
Payroll Tax Rate	7.0	7.0	7.0	7.0	6.9	6.9	6.9	6.9	6.8	6.8
Labor Supply	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0
Investment NH	8.1	8.5	8.8	9.3	9.7	10.4	10.9	11.2	11.8	12.0
Investment RH	11.9	12.3	12.4	12.4	12.3	12.4	12.1	11.5	10.7	10.4
Investment OH	-6.2	-5.5	-4.7	-3.2	-2.0	-0.1	1.2	1.7	2.4	2.2
Non-Housing Capital	0.0	0.9	1.7	3.1	4.4	6.4	8.2	9.4	11.5	11.9
Rental Housing Capital	0.0	0.5	0.9	1.8	2.6	4.0	5.5	6.6	9.3	10.3
Owner Housing Capital	0.0	-0.2	-0.4	-0.7	-0.9	-0.9	-0.7	-0.3	1.3	2.1
Tobin's Q - Non-Housing	-0.7	-2.7	-3.9	-5.5	-6.9	-9.0	-10.8	-12.2	-14.3	-14.7
Tobin's Q - Rental Housing	-16.6	-17.6	-18.0	-18.3	-18.6	-19.2	-19.9	-20.6	-22.3	-22.9
Tobin's Q - Owner Housing	-3.7	-3.7	-3.2	-2.0	-1.1	0.3	1.1	1.2	0.7	0.1
Non-Housing Firm Value	-0.7	-1.9	-2.3	-2.6	-2.8	-3.1	-3.5	-3.9	-4.5	-4.5
Rental Housing Firm Value	-16.6	-17.2	-17.2	-16.9	-16.5	-16.0	-15.5	-15.4	-15.0	-14.9
Owner Housing Firm Value	-3.7	-3.9	-3.6	-2.7	-1.9	-0.7	0.4	0.9	2.0	2.2
GDP	1.3	1.5	1.7	2.0	2.3	2.7	3.1	3.4	3.9	4.0
Non-Housing Output	1.6	1.8	2.0	2.4	2.6	3.1	3.5	3.8	4.2	4.3
Rental Housing Output	-0.5	-0.5	-0.5	-0.4	-0.3	-0.2	0.0	0.2	0.8	1.1
Owner Housing Output	-0.4	-0.3	-0.1	0.1	0.4	0.8	1.2	1.6	2.4	2.7

Table 11
High Elasticity of Substitution Between Owner and Rental Housing Services with Adjustment Costs

Years After Enactment	0	1	2	4	6	10	15	20	50	100
After-Tax Interest Rate	0.2	0.6	0.6	0.6	0.5	0.4	0.3	0.2	0.1	0.1
Before-Tax Interest Rate	-0.6	-0.2	-0.1	-0.2	-0.3	-0.4	-0.5	-0.6	-0.6	-0.7
Before-Tax Wage Rate	-0.6	-0.4	-0.1	0.3	0.6	1.2	1.7	2.1	2.7	2.8
Price of Rental Services	0.8	0.4	0.1	-0.5	-1.2	-2.5	-3.8	-4.9	-7.5	-8.2
Price of Owner Services	0.9	1.2	1.4	1.9	2.2	2.3	2.3	2.1	1.1	0.6
Flat Tax Rate	19.1	19.3	19.3	19.2	19.1	18.9	18.8	18.7	18.6	18.5
Payroll Tax Rate	7.0	7.0	7.0	7.0	6.9	6.9	6.9	6.9	6.8	6.8
Labor Supply	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0
Investment NH	7.9	8.3	8.6	9.0	9.5	10.2	10.7	11.0	11.8	11.9
Investment RH	17.3	17.8	18.1	18.4	18.5	18.7	18.2	17.3	15.5	14.9
Investment OH	-4.7	-4.2	-3.5	-2.3	-1.3	0.2	1.2	1.4	1.6	1.5
Non-Housing Capital	0.0	0.8	1.6	3.0	4.3	6.3	8.1	9.3	11.4	11.9
Rental Housing Capital	0.0	0.7	1.3	2.6	3.8	5.9	8.2	9.9	13.9	14.8
Owner Housing Capital	0.0	-0.2	-0.3	-0.6	-0.7	-0.7	-0.4	-0.1	0.9	1.4
Tobin's Q - Non-Housing	-1.2	-3.1	-4.2	-5.8	-7.1	-9.1	-10.9	-12.2	-14.3	-14.6
Tobin's Q - Rental Housing	-13.8	-14.8	-15.2	-15.7	-16.1	-17.0	-18.2	-19.4	-22.2	-22.8
Tobin's Q - Owner Housing	-2.7	-2.8	-2.4	-1.5	-0.7	0.4	0.9	0.9	0.4	0.0
Non-Housing Firm Value	-1.2	-2.3	-2.7	-3.0	-3.2	-3.4	-3.7	-4.1	-4.5	-4.5
Rental Housing Firm Value	-13.8	-14.3	-14.1	-13.5	-12.9	-12.1	-11.5	-11.4	-11.4	-11.4
Owner Housing Firm Value	-2.7	-3.0	-2.8	-2.0	-1.3	-0.3	0.5	0.8	1.3	1.4
GDP	1.5	1.7	1.9	2.2	2.5	2.9	3.3	3.5	4.0	4.1
Non-Housing Output	1.6	1.8	2.0	2.3	2.6	3.0	3.4	3.7	4.2	4.3
Rental Housing Output	0.8	1.1	1.4	2.0	2.5	3.3	3.9	4.4	5.2	5.3
Owner Housing Output	0.9	1.0	1.1	1.4	1.5	1.7	1.8	2.0	2.0	2.0

Table 12
Low Elasticity of Substitution in Production with Adjustment Costs

Years After Enactment	0	1	2	4	6	10	15	20	50	100
After-Tax Interest Rate	0.1	0.6	0.7	0.6	0.5	0.4	0.2	0.2	0.1	0.0
Before-Tax Interest Rate	-0.6	-0.1	0.0	-0.1	-0.2	-0.3	-0.5	-0.6	-0.6	-0.7
Before-Tax Wage Rate	-0.9	-0.5	-0.2	0.3	0.7	1.4	2.0	2.4	2.9	3.0
Price of Rental Services	0.7	0.3	-0.2	-1.0	-1.9	-3.4	-4.9	-5.9	-8.2	-8.7
Price of Owner Services	0.9	1.3	1.6	2.1	2.4	2.5	2.3	2.0	0.7	0.1
Flat Tax Rate	19.1	19.3	19.3	19.2	19.1	18.9	18.8	18.7	18.6	18.6
Payroll Tax Rate	7.0	7.0	7.0	6.9	6.9	6.9	6.8	6.8	6.8	6.8
Labor Supply	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Investment NH	7.6	7.9	8.1	8.3	8.6	9.0	9.3	9.4	9.8	9.9
Investment RH	14.6	15.1	15.2	15.2	15.1	14.9	14.2	13.3	11.7	11.2
Investment OH	-3.5	-2.8	-1.9	-0.4	0.7	2.4	3.3	3.4	3.3	3.0
Non-Housing Capital	0.0	0.8	1.6	2.9	4.0	5.7	7.2	8.1	9.6	9.9
Rental Housing Capital	0.0	0.6	1.1	2.2	3.2	4.9	6.6	7.9	10.6	11.2
Owner Housing Capital	0.0	-0.1	-0.2	-0.3	-0.3	-0.1	0.5	1.0	2.5	3.0
Tobin's Q - Non-Housing	-1.5	-3.7	-4.9	-6.6	-8.0	-10.0	-11.7	-12.9	-14.5	-14.8
Tobin's Q - Rental Housing	-15.1	-16.3	-16.6	-17.1	-17.5	-18.4	-19.4	-20.4	-22.5	-22.9
Tobin's Q - Owner Housing	-2.0	-2.1	-1.6	-0.5	0.3	1.3	1.7	1.5	0.5	0.0
Non-Housing Firm Value	-1.5	-2.9	-3.4	-4.0	-4.3	-4.9	-5.4	-5.9	-6.3	-6.4
Rental Housing Firm Value	-15.1	-15.8	-15.7	-15.3	-14.9	-14.4	-14.0	-14.1	-14.3	-14.3
Owner Housing Firm Value	-2.0	-2.2	-1.8	-0.8	0.0	1.2	2.2	2.5	3.0	3.0
GDP	1.5	1.7	1.9	2.2	2.5	2.9	3.2	3.4	3.7	3.8
Non-Housing Output	1.6	1.8	2.0	2.3	2.6	3.0	3.3	3.5	3.9	3.9
Rental Housing Output	0.8	0.8	0.9	1.1	1.2	1.3	1.4	1.4	1.4	1.4
Owner Housing Output	1.0	1.2	1.4	1.8	2.1	2.5	2.8	3.0	3.1	3.1

Figure 1
Equivalent Variation