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3 Labor Supply and Welfare Effects of a Shift from Income to Consumption Taxation

Gilbert E. Metcalf

3.1 Introduction

In the past few years there has been increasing interest in shifting from an income-based tax system in the United States to a consumption-based system. These tax reforms take a number of forms. Many advocate an increase in the availability of tax-sheltered savings (e.g., expanded IRAs), while others advocate value added taxation. Still others argue for either a broad-based consumption tax or a consumed income tax.[1] All argue that substantial welfare gains result from the reduction in taxation of capital income. On the other hand, some have argued that a shift from income to consumption taxation will lead to a lower real wage, which in turn will decrease labor supply.

The purpose of this paper is to investigate the labor supply and welfare effects of a shift from income to consumption taxation. The first point of the paper is that labor supply effects of a shift to consumption taxation are likely to be small. As part of that discussion, I identify the significant parameters that analysts must know in order to identify the labor supply effects. It turns out that our knowledge of the relevant parameters is sketchy at best and a better understanding of labor supply responses is unlikely to occur without more empirical work.

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1. Rep. Dick Armey has proposed the "Freedom and Fairness Restoration Act," a Hall-Rabushka–style flat consumption tax. Senators Nunn and Domenici's proposed "USA Tax System" is a consumed income tax. The Republican Congress's "Contract with America" would extend IRA treatment to all families and allow withdrawals for first-time home purchases, higher education expenses, medical expenses, or long-term care insurance premiums. The Contract would also provide a 50 percent long-term capital gains deduction (see U.S. Congress 1995 for a description of the tax proposals contained in the Contract with America).

Second, I note that the welfare effects of a change from income to consumption taxation depend importantly on the breadth of consumption taxation. Previous investigations of a shift from income to consumption taxation have assumed that all income was taxed under the former tax system and all consumption is potentially taxed under the latter system. In the real world, not all income is taxed. Specifically, not all saving is taxed. Moreover, not all consumption is necessarily taxed under consumption taxation. As Metcalf (1995) notes in a survey of value added taxation, a wide range of consumption goods are zero rated in European value added taxes (VATs). The Nunn-Domenici consumed income tax plan explicitly exempts housing consumption from the tax base (see Christian and Schutzer 1995 for details of this plan). Hence the shift from income to consumption taxation may not reduce the intertemporal consumption distortion at the same time that it may dramatically increase the intracommodity distortion. The welfare effects of the change depend to a large degree on which goods are untaxed; conceivably, the tax-preferred consumption goods are untaxed based on optimal tax considerations. A more cynical perspective suggests that there may be little correlation between optimal tax rates and actual tax rates in a narrow-based consumption tax.

I present a number of simulation results to illustrate these points. The simulations build on a particular structure of preferences, and no attempt is made to claim generality in the results. Rather the point is to make plausible statements about behavioral responses and welfare effects and to identify the various elasticities that researchers need to measure in order to make definitive statements about the effects of a shift from income to consumption taxation. If anything, this paper identifies what we do not know more than it adds to what we do know. But before we can answer questions we need to know what questions to ask.

Section 3.2 provides some theoretical considerations relevant to a shift from income to consumption taxation, followed by section 3.3., which develops a specific example using a nested constant elasticity of substitution (CES) utility function. Sections 3.4 and 3.5 consider the welfare effects of a change from incomplete income to incomplete consumption taxation. The last section concludes with thoughts about directions for research.

3.2 Labor Supply, Welfare, and a Revenue-Neutral Tax Reform

I begin by considering a general two-period model in which an individual maximizes utility of consumption and leisure over two periods. I assume that all labor supply occurs in the first period. The individual maximization problem is

$$\max U(C_1, C_2, 1 - L) \quad \text{subject to}$$

$$wL = C_1 + pC_2, \tag{1}$$

$$w = 1 - \tau_w, \quad p = \frac{1}{1 + (1 - \tau_s)r}.$$

I have normalized the gross wage rate and the price of current consumption to 1. There is a total of one unit of time endowment that can be allocated to labor (L) or leisure ($1 - L$). The price of future consumption is determined by the after-tax rate of return $(1 - \tau_s)r$. In this simple framework, we can implement a consumption tax either by taxing consumption directly or by taxing wage income.[2] The fact that a consumption tax decreases the real wage creates the possibility that a VAT could have labor supply effects. To reiterate, the key difference between a consumption tax and an income tax is the tax treatment of savings. The former does not tax savings while the latter does.

There are a number of tax reforms incorporating a consumption tax that could be implemented. One reform would be to shift from the current hybrid income-consumption tax system to a consumed income tax. That could be done by eliminating the tax on interest income (setting τ_s to 0) and increasing the tax on wage income (τ_w) to maintain revenue neutrality. Alternatively, a number of different VATs could be implemented with their key distinguishing feature being the extent of zero-rated commodities.

How will a general tax reform (dR) affect labor supply? Slemrod (1987) considers this issue in a model in which cross-price effects are ignored.[3] Following Slemrod, we can decompose the individual labor supply response (dL) as follows:

$$\frac{dL}{dR} = \frac{\partial L^c}{\partial w}\frac{dw}{dR} + \frac{\partial L^c}{\partial p}\frac{dp}{dR} + \frac{\partial L}{\partial Y}\frac{dY}{dR}, \tag{2}$$

where the superscript c indicates a compensated response and Y is income. We can add up over individuals to measure the aggregate labor supply response:

$$\sum \frac{dL}{dR} = \sum \frac{\partial L^c}{\partial w}\frac{dw}{dR} + \sum \frac{\partial L^c}{\partial p}\frac{dp}{dR} + \sum \frac{\partial L}{\partial Y}\frac{dY}{dR}. \tag{3}$$

If the tax reform is revenue neutral, then $\sum dY/dR$ will equal zero, and the last term in equation (3) is proportional to Cov $(\partial L/\partial Y, dY/dR)$. The presence of this covariance term in equation (3) means that aggregate revenue neutrality does not imply the lack of an income effect on labor supply from a tax reform. For example, if the tax reform shifted the tax burden from groups with large income elasticities to those with small income elasticities, the aggregate income effect would be to increase aggregate labor supply. The ability to shift burdens across taxpayer groups allows for this possibility. If, however, the addi-

2. I am ignoring transitional issues by levying the tax at the beginning of the individual's life.

3. His analysis looks at tax reforms that are unlikely to have significant price effects across commodities.

tional restriction of distributional neutrality is imposed, then the scope for aggregate income effects on labor supply is reduced. Distributional neutrality means that revenue collected from narrower income groups (e.g., quintiles) must be unaffected by the reform. Now, only shifts in tax burden within the narrower group can be used to generate an aggregate income effect. It is unlikely that there will be sufficient systematic variation in income elasticities within groups to generate an aggregate income effect. In this case, changes in aggregate labor supply will be driven by compensated responses:

$$\sum \frac{dL}{dR} = \sum \frac{\partial L^c}{\partial w}\frac{dw}{dR} + \sum \frac{\partial L^c}{\partial p}\frac{dp}{dR}. \tag{4}$$

Equation (4) tells us that the response of labor supply to changes in the tax system will be driven by (1) the compensated elasticity of labor supply with respect to the net wage *and* (2) the compensated cross-price elasticity of labor supply with respect to the price of future consumption.

Our choice of first-period consumption as the numeraire is arbitrary. If we had chosen labor as the numeraire, then labor supply responses would be driven by changes in the prices of first- and second-period consumption. Therefore, the direction of labor supply effects will be driven by the relative complementary of current and future consumption with labor supply. That aggregate labor supply response depends on cross-price elasticities is troubling. Our knowledge of these elasticities is sketchy at best. One effort to measure cross-price effects suggests that they may be important. Using 12 years of panel data from the Panel Study of Income Dynamics (PSID), Fullerton and Skinner (1985) estimate a demand system for consumption and leisure in which they include cross-price effects (lead and lags in wages and interest rates) in both equations. They find that cross-price effects are generally statistically significant. Focusing on their leisure equation, a fall in future consumption prices (rise in the real rate of return one or two periods ahead) increases labor supply—leisure and future consumption appear to be substitutes.

The importance of cross-price elasticities can be seen by considering a shift from our current tax system to a consumed income tax system. The tax rate on interest income (τ_s) is set to zero, and τ_w is increased to maintain budget neutrality. This corresponds to the wage rate and the price of future consumption falling. If labor supply (leisure) is a complement (substitute) to future consumption (as suggested by Fullerton and Skinner 1985), then this tax reform could increase labor supply.[4]

An example with Stone-Geary utility illustrates how these two components

4. This was pointed out early on by Atkinson and Stiglitz (1976), who note in the optimal tax context that "whether there should be an interest income tax or subsidy depends on the complementarity or substitutability (in the Edgeworth sense) between the first-period consumption and labor" (69).

of the labor supply response can work at cross-purposes. Assume that utility is given by

$$(5) \qquad U = \beta_1 \ln(C_1 - \gamma_1) + \beta_2 \ln(C_2 - \gamma_2) + \beta_3 \ln((1 - L) - \gamma_3).$$

The γs are the required consumption parameters of current and future consumption and leisure, while the βs are share parameters and are assumed to add to 1. As is well known, a limitation of the Stone-Geary utility system is that all goods must be substitutes. In that case the first term in equation (4) will be negative (wage reduction reduces labor supply) while the second term will be positive (the decrease in the price of future consumption will lead to a substitution away from leisure: labor supply increases).[5] For a revenue-neutral tax response, these two effects will exactly offset, leading to a zero labor supply response. This simply follows from the weak separability between leisure and consumption in the linear expenditure system. If we are going to get any labor supply response at all, we must choose preferences in which we have not built in weak separability.

As noted in the discussion of equation (1), a consumption tax is equivalent to a wage tax (ignoring transitional issues). An income tax, on the other hand, amounts to a commodity tax with a higher tax rate on future consumption. Nearly 20 years ago, Atkinson and Stiglitz (1976) characterized conditions under which uniform treatment of present and future consumption is optimal. If (1) preferences are weakly separable between leisure and consumption and (2) nonlinear income taxes are possible, then there should be no differentiated tax rates on present and future consumption. This result has been extended to allow for linear income taxes if preferences also exhibit linear Engle curves.[6]

This separability result initially led public finance economists to conclude that income taxation was inefficient and undesirable. Weak separability was enshrined in the discipline because it followed directly from the most commonly employed utility functions (Cobb-Douglas, CES, and Stone-Geary). Of course, this is a limitation, and economists began to seek more flexible functional forms that do not impose an optimal tax result from the outset. Deaton and Muellbauer (1980) provide one example with the almost ideal demand system (AIDS). More to the point, the data do not support weak separability (see, e.g., Browning and Meghir 1991). Hence whether a switch from an income tax to a consumption tax would improve welfare is an empirical matter. The presumption in favor of consumption taxation must also be tempered by

5. It is easy to show that the compensated effect of the tax reform for the Stone-Geary system is given by

$$\frac{dL^c}{dR}\left(\frac{\beta_1 + \beta_2}{w}\frac{dw}{dR} - \frac{\beta_2}{p}\frac{dp}{dR}\right)(l^c - \gamma_3),$$

where l is leisure.

6. Among other sources for this result, see Deaton (1976).

the likelihood that a considerable fraction of consumption is unlikely to be taxed under any of the schemes under discussion.

3.3 Simulations and Labor Supply

I model consumer behavior with a time separable nested CES function. Utility for an individual is given by

$$U = [\alpha^{1/\rho} v_1^{(\rho-1)/\rho} + (1 - \alpha)^{1/\rho} v_2^{(\rho-1)/\rho}]^{\rho/(\rho-1)}, \tag{6}$$

where aggregate consumption in each period (v_i) is modeled as

$$v_i = [\beta_i^{1/\sigma_i} C_i^{(\sigma_i-1)/\sigma_i} + (1 - \beta_i)^{1/\sigma_i} l_i^{(\sigma_i-1)/\sigma_i}]^{\sigma_i/(\sigma_i-1)}, \tag{7}$$

subject to the lifetime budget constraint

$$w_1 T_1 + w_2 T_2 = w_1 l_1 + w_2 l_2 + p_1 C_1 + p_2 C_2. \tag{8}$$

Consumers optimize by choosing consumption in each of two periods (C_i) along with leisure (l_i). They face consumption prices p_i and wage rates w_i. Their time endowment in each period equals T_i.

This formulation is quite general; nesting consumption and leisure within each time period allows the possibility of leisure affecting the marginal rate of substitution between current and future consumption. That is, weak separability is not built into this model. The parameter ρ measures the intertemporal elasticity of substitution between aggregate consumption bundles, while σ_i measures the elasticity of substitution between leisure and consumption in each time period.

We can compute the marginal rate of substitution between current and future consumption directly. It is given by

$$\text{MRS}_{12} = \left(\frac{\alpha}{1 - \alpha}\right)^{\rho^{-1}} \left(\frac{\beta_1^{\sigma_1^{-1}}}{\beta_2^{\sigma_2^{-1}}}\right) \left(\frac{v_1^{\sigma_1^{-1}-\rho^{-1}}}{v_2^{\sigma_2^{-1}-\rho^{-1}}}\right) \frac{C_1^{-\sigma_1}}{C_2^{-\sigma_2}}. \tag{9}$$

Since v_i is a function of l_i, weak separability between consumption and leisure is avoided so long as the intertemporal elasticity of substitution is not equal to either of the intracommodity elasticities of substitution.

The budget in equation (8) says that the value of the lifetime time endowment can be allocated to leisure and consumption in each period. The wage rate in each period is net of the tax on labor income. Taking the first-period price of consumption as the numeraire, w_2 equals the second-period net-of-tax wage discounted to the first period by the after-tax rate of return. Similarly, the price of C_2 is the period-two price discounted by the after-tax return. At this stage, I will treat consumption as a composite good with price 1. Thus C is the expenditure on consumption in each period. If we define Y as lifetime full income (net of tax) and q_i as the (shadow) price of aggregate consumption, we can rewrite the lifetime budget constraint in equation (8) as

$$Y = q_1 v_1 + q_2 v_2. \tag{10}$$

Solving the first-stage maximization problem (treating aggregate consumption as the argument) yields demand functions

$$v_1 = \frac{\alpha Y}{q_1^{\rho}[\alpha q_1^{1-\rho} + (1-\alpha) q_2^{1-\rho}]}, \tag{11}$$

$$v_2 = \frac{(1-\alpha) Y}{q_2^{\rho}[\alpha q_1^{1-\rho} + (1-\alpha) q_2^{1-\rho}]}.$$

Ignoring time subscripts, the within-period optimization problem uses the budget constraint

$$pC + wl = qv. \tag{12}$$

The demand functions for C and l are given by

$$C = \frac{\beta(qv)}{p^{\sigma}[\beta p^{1-\sigma} + (1-\beta) w^{1-\sigma}]}, \tag{13}$$

$$l = \frac{(1-\beta)(qv)}{w^{\sigma}[\beta p^{1-\sigma} + (1-\beta) w^{1-\sigma}]}.$$

To run simulations, we need values for the parameters of the utility functions. I will choose parameter values in part based on estimates in the literature and in part based on calibration using data from 1989 Consumer Expenditure Survey (CEX).

Auerbach and Kotlikoff (1987) review the literature on the intertemporal elasticity of substitution and note that parameter estimates range from 0.07 to over 1.00. I follow Auerbach and Kotlikoff and choose $\rho = 0.25$.

The parameters σ_i and β_i will affect the household's labor supply elasticity and labor-leisure allocation. The leisure-consumption elasticity (σ) can perhaps be best chosen by determining the resultant labor supply elasticities. The elasticity σ measures the percentage change in the leisure consumption ratio in any year following a 1 percent change in the wage-price ratio, holding other prices constant. If consumption were unchanged, σ would measure the labor supply elasticity directly. However, since consumption will adjust as the wage changes, we need to measure the labor supply responsiveness explicitly to relate the elasticity of labor supply to the elasticity of substitution between consumption and leisure. I follow Auerbach and Kotlikoff (1987) and choose a value of σ equal to 0.8. Finally, the parameter α measures time preferences for the individual, and I choose a central value for this parameter equal to 0.50.

Equations (13) can be combined to provide an expression for β:

$$\beta = \frac{p^{\sigma} C}{p^{\sigma} C + w^{\sigma} l}. \tag{14}$$

Average expenditures on consumption when young provide a value for C_1, while p equals 1 in period one.[7] To complete our computation of β, we need estimates of wage rates and leisure.

To compute leisure, I turn to the CEX. The CEX asks household members how many hours they worked in the past week. I take this from the family file for the reference member of the household and the spouse (if present). I check for the presence of regular work and adjust the reported labor supply figure accordingly.[8] To simplify the analysis, I assume that second-period labor supply equals zero. Based on CEX data for 1989, a small percentage of elderly households report hours (29 percent), and their average—conditional on working—is roughly 30 hours per week. Within this group, many will only work for a small part of the year.

I assume a time endowment of 5,000 hours per year and subtract the estimated labor supply from the endowment to compute leisure. Table 3.1 provides some distributional information on labor supply across different categories of workers. Roughly 70 percent of the household heads age 30 or over in the CEX family file report hours worked. Conditional on reporting hours, the mean hours are 2,055 per year, with the median occurring at 2,000 hours per year.[9] Nearly 93 percent of the households with household head between ages 30 and 60 report hours, with mean hours just under 2,000 per year.

To compute the gross (of tax) wage rate, I use data from the CEX household member file. Those household members currently working are asked how large their most recent paycheck was. I divide this amount by the number of hours worked in the previous week after adjusting the paycheck by the frequency of payment. I then regress the log of the wage on age, age squared, and dummy variables for sex and race, as well as indicators for whether the household member is divorced or single. There are 6,072 usable observations with which I can run the regression. Results are reported in table 3.2. Wage increases with age until about age 46, after which it begins to fall. At age 30 wages are increasing a bit less than 4 percent per year. Women have wages roughly 30 percent lower than men after controlling for age, race, and marital status. Nonwhites earn roughly 6 percent less, as do divorced and single men. The results are statistically significant and plausible.

The regression results from table 3.2 are applied to the reference person and spouse (if present) in the family files. Column (1) of table 3.3 reports summary statistics on the generated wage used in the wage regression in table 3.2. Col-

7. I consider time periods of 30 years so that effective adult life equals 80 years. Think of an individual living for 20 years as a child followed by two 30-year periods of different work amounts. Death occurs at age 80 (60 in economic years). For purposes of compounding savings, I take the midpoint of the first time period.

8. The CEX asks household members how many weeks they worked the previous year. It also asks if they worked part or full time for part or all of the previous year.

9. The CEX reports weekly hours. I multiply by 50 to obtain annual values.

Table 3.1 **Labor Supply Statistics across Age Groups**

	All	Young[a]
Average labor supply	1,439	1,996
	(1,080)	(776)
Average labor supply conditional on $L > 0$	2,055	2,152
	(633)	(492)
Percentage with $L > 0$	70.0	92.7
25th Percentile[b]	2,000	2,000
50th Percentile[b]	2,000	2,000
75th Percentile[b]	2,375	2,400
N	1,422	918

Source: Data from 1989 CEX family file.

Note: Numbers in parentheses are standard deviations.

[a]Age 30–60.

[b]Percentiles are conditional on $L > 0$.

Table 3.2 **Wage Regressions: Dependent Variable = Log (wage)**

Variable	Coefficient
Age	.097
	(.004)
Age squared	−.001
	(.000)
Female	−.299
	(.017)
Nonwhite	−.059
	(.024)
Divorced	−.060
	(.028)
Single	−.061
	(.025)
Intercept	.603
	(.087)
R^2	.18
N	6,072

Source: Data from 1989 CEX household member file.

Note: Wage is computed as last gross paycheck divided by the number of hours in the pay period. Numbers in parentheses are standard errors. All estimated coefficients are significant at the 95 percent level.

umn (2) presents summary statistics for the reference member in the family file. The mean wage is roughly $1.50 per hour lower in the family file, reflecting the fact that wages are being imputed to workers and nonworkers alike. Also, the age distribution of individuals differs across the family and member files. The mean age in the family file equals 36.9 years, while it equals 49 years

Table 3.3 **Imputed Wage from CEX**

	Member (1)	Family (2)
Mean	10.38	8.88
Standard deviation	9.77	2.86
25th Percentile	5.25	6.91
50th Percentile	8.29	8.95
75th Percentile	13.00	11.50
N	6,072	1,957

Source: Wage imputed from information in 1989 CEX household member file. See text for details of construction. Col. (2) gives imputed wage from regression in table 3.2 applied to household heads in CEX family file.

in the member file. There is virtually no skew in the distribution. If it were important to model variation in wages across the entire population then this would be troubling. However, I will be using mean wages within various age groups for purposes of calibrating β so that the lack of skew is less problematic. Isolating the individuals in the family file who are "young" (age 30–60), the mean wage (age) is \$10.10 (40.2).

The final step to constructing a value for w is to compute the marginal tax rate on wage income for households in the CEX. I use the NBER TAXSIM tax calculator for this purpose. I feed income and household data from the family file to TAXSIM and compute a federal tax liability.[10] I then recompute the tax liability after adding \$100 of wage income to the return. The difference in tax liabilities divided by 100 is the marginal tax rate on wage income. The median tax rate is 15 percent with an interquartile range running from 10.4 to 28 percent. The correlation between gross wage and tax rate is .46.

We now have the pieces to estimate values of β. For this two-period model, I select households in the CEX sample in which the reference person is between ages 30 and 60. I take averages of per capita consumption, leisure, and net wage rates across this group. Table 3.4 gives average values, and the resulting value of β_1 equals .43. To account for the absence of labor supply in the second period, I set β_2 below β_1 at .33. Parameterizing the model as I have leads to negligible labor supply elasticities. The uncompensated wage elasticity for the young equals -0.07 while the compensated elasticity equals 0.44.

3.4 Simulation Results and Sensitivity Analysis

I now consider the experiment of switching from a tax on capital income and increasing the tax on consumption to maintain revenue neutrality over the

10. For completeness, I should compute a marginal tax rate using federal and state income tax codes. However, it is difficult to impossible to determine the state in which CEX households live.

Table 3.4 **Commodity-Leisure Weight Parameter**

Variable	Average Value
p_1	1
$\tilde{W}_1$	8.55
C_1	12,785
l_1	3,004
σ_1	.80
β_1	.43
N	918

Source: Averages are taken from 1989 CEX family file for households with reference person in age range 30–60 (period one).

Note: $\tilde{W}$ is the wage net of tax. N is the number of observations in the group.

Table 3.5 **Shift to Consumption Taxation**

	Tax Base			
Variable	Capital Income (1)	Consumption (2)	Capital Income (3)	Consumption (4)
C_1	15,090	14,164	14,815	13,065
C_2	18,273	20,808	14,503	18,862
L_1	1,986	1,954	2,040	1,971
S	6,056	5,279	6,914	5,257
τ_k	.25		.50	
τ_c		.097		.205
EV_1		.19		.78
EV_2		5.64		11.75

Notes: Results of simulations with $\rho = .25$, $\sigma_1 = .80$, $\sigma_2 = .80$, $\alpha = .50$, $\beta_1 = .43$, and $\beta_2 = .33$. The consumption tax rate is adjusted to collect the same lifetime tax revenue as under the capital income tax. EV_1 measures the equivalent variation of the change from the income tax expressed as a percentage of lifetime resources, while EV_2 measures equivalent variation as a percentage of lifetime discounted tax revenue.

individual's lifetime.[11] I begin with a tax rate of 25 percent on capital income. Table 3.5 presents results.

Column (1) gives information about consumption, labor supply, and savings under the capital income tax. The individual consumes roughly 70 percent of first-period income, saving the remaining 30 percent. The large amount of sav-

11. The issue of revenue neutrality is an important one. Typically policymakers consider revenue neutrality in a limited sense, for example over a five-year period. Neutrality here means that the present discounted value of tax revenue, discounted at the before-tax return, is unchanged. As Summers (1981) has noted, equivalent tax rates on wage and consumption taxation will not necessarily achieve revenue neutrality in the steady state given the different composition of savings over the lifetime arising from the two different tax systems.

ing means that a nontrivial consumption tax will be needed to recoup the revenues lost when capital income is untaxed.

Column (2) presents a shift to a comprehensive consumption tax. The effect of this tax reform is to increase the price of current consumption while decreasing the price of future consumption. This is borne out by a moderate decrease in current consumption (−6 percent) and a large increase in future consumption (14 percent).

A consumption tax rate of 9.7 percent suffices to balance the government's budget. There is a modest welfare gain from this reform. Expressed as a fraction of potential lifetime income, the welfare gain equals 0.19 percent of income. Alternatively, the gain is equal to roughly 5 percent of lifetime tax collections. Perhaps surprisingly, savings falls under this tax reform by over 10 percent. One of the arguments in favor of a shift to consumption taxation is the favorable effects on capital accumulation. For example, Summers (1981) finds a highly sensitive response of savings to changes in the tax treatment of capital income, which in turn leads to substantial welfare gains from shifting to consumption taxation. However, there is no theoretical basis for expecting savings to rise with a switch from income to consumption taxation (see Feldstein 1978 for an extended discussion of this point).

Column (3) increases the initial capital income tax rate from 25 to 50 percent. Comparing columns (3) and (1), the most significant difference is the 21 percent drop in second-period consumption. Shifting to a consumption tax from a capital income tax leads to a larger percentage increase in future consumption (relative to the 25 percent capital income tax) and a larger percentage drop in current consumption. Doubling the tax rate on capital income leads to roughly a quadrupling of the excess burden (expressed as a percentage of a lifetime earnings), as one would expect from the quadratic deadweight loss rule.[12]

Concerns about the labor supply effects of a shift from capital income to consumption taxation are misplaced if the results from this analysis are correct. Labor supply falls somewhat—on the order of 1–3 percent. The labor supply effects seem small relative to the welfare gains from shifting tax bases.

Table 3.6 presents some sensitivity analyses for the results. The first set indicates that changes in the intertemporal elasticity parameter (ρ) can have significant welfare effects. Halving the parameter cuts the welfare gains in half, while doubling the parameter doubles the welfare gain. Labor supply is also affected. If ρ equals 0.125, labor supply falls over 4 percent.

The results are also somewhat sensitive to changes in α, the intertemporal weight parameter. Welfare gains from a shift to consumption taxation fall as α rises, reflecting the lower weight placed on future consumption (and any distortions arising from the capital income tax). Altering σ_1 has modest effects

12. The equivalent variation as a fraction of tax revenue only doubles because the tax revenue itself roughly doubles when the capital income tax rate is doubled.

Table 3.6 **Sensitivity Analysis**

ρ	α	σ_1	σ_2	$\%\Delta L$	EV_1
.25	.50	.80	.80	−3.4	.78
.125	.50	.80	.80	−4.4	.35
.50	.50	.80	.80	−1.8	1.45
.25	.35	.80	.80	−4.6	.84
.25	.65	.80	.80	−1.7	.35
.25	.50	.95	.80	−4.0	.87
.25	.50	.65	.80	−2.4	.72

Note: Results of simulations corresponding to shifting from a 50 percent capital income tax to a consumption tax; $\beta_1 = .43$, $\beta_2 = .33$, and the interest rate equals 5 percent.

on labor supply and welfare effects. The welfare gains from the tax shift rise with σ_1, though the gains are not dramatic.[13]

3.5 Narrowing the Tax Base

One of the main attractions of a consumption tax is the elimination of the intertemporal distortion. Table 3.5 suggests that significant welfare gains result from the elimination of this distortion. However it comes at the cost of possibly creating intracommodity distortions if various items are excluded from the tax base. Typically, European VATs exclude housing, food consumed at home, and medical care from the tax base. Moreover, in this country much of personal saving is not subject to taxation. According to the most recent *Flow of Funds* report, net acquisition of financial assets in the derivation of personal saving equaled $526 billion in 1993. Of that, roughly 65 percent was flows into life insurance and pension reserves.[14] On a levels basis, between one-third and one-half of all financial assets are held as nontaxable assets. Therefore, a change from income to consumption taxation creates the possibility of generating a small intertemporal welfare gain while creating a large intracommodity welfare loss. I now turn to simulations in which I explore this possibility.

I modify the utility function in equation (7) above to allow for nontaxed consumption goods. The ν functions now include taxed (C_i) and nontaxed (D_i) consumption goods and leisure with share parameters β_{ci}, β_{di}, and $1 - \beta_{ci} - \beta_{di}$, respectively. The values of β are calibrated in a similar fashion as in equation (14) for a VAT that zero rates food consumed at home, shelter, and medical

13. Changing σ_2 has negligible effects on welfare or labor supply.

14. This likely understates tax-exempt savings. While there was a net decumulation of tax-exempt securities in 1993 ($16 billion), $187 billion was invested in mutual funds, some of which was invested in tax-exempt securities. Overall, mutual funds increased their holdings of tax-exempt securities by $45 billion in 1993; it is likely that the bulk of that addition came from the household sector.

Table 3.7 **Consumption Expenditures for Selected Categories in 1989**

Category	Consumer Unit Spending ($)	Percentage
Food at home	2,390	9
Shelter	4,660	17
Health care	1,407	5
All three categories	8,457	30

Source: 1989 CEX.

Table 3.8 **Zero Rating with a VAT**

Variable	Capital Income (1)	Comprehensive VAT (2)	Partial VAT (3)
C_1	10,335	9,115	8,496
C_2	10,107	13,146	12,239
D_1	4,478	3,950	4,582
D_2	4,398	5,716	6,622
L_1	2,040	1,971	1,972
S	6,915	5,257	5,255
τ_k	.50		
τ_c		.205	.315
EV_1		.78	.52
EV_2		11.75	7.81

Notes: Results of simulations with $\rho = .25$, $\sigma_1 = .80$, $\sigma_2 = .80$, $\alpha = .50$, $\beta_{c1} = .30$, $\beta_{d1} = .13$, $\beta_{c2} = .23$, and $\beta_{d2} = .10$. The consumption tax rate is adjusted to collect same lifetime tax revenue as under capital income tax. See table 3.5 for definitions of EV_1 and EV_2.

costs. In 1989 these three consumption categories accounted for 30 percent of total consumption expenditures (see table 3.7).

Table 3.8 reports results of the simulation. Column (1) assumes a capital income tax of 50 percent. Prior to the VAT, the commodity that will be subject to the partial VAT accounts for roughly 70 percent of total consumption. The share parameters were chosen to generate a 30 percent nontaxable consumption fraction, with total consumption, labor supply, and savings to correspond to column (1) of table 3.5.

Column (2) of table 3.8 assumes that all consumption is taxed. Hence the results are equivalent to those in column (4) of table 3.5. A tax rate of 20 percent suffices to replace the capital income tax. A partial VAT is modeled in column (3).

If a partial VAT is employed, the welfare gains from shifting from capital income to consumption taxation are reduced by over 30 percent. The equivalent variation (as a fraction of lifetime income) falls from 0.78 to 0.52. The

Table 3.9 Extent of Zero Rating and Welfare

Percentage of Untaxed Commodity[a]	τ_c[b]	EV_1	EV_2
0	20.5	.78	11.75
30	31.5	.52	7.81
50	48.4	.15	2.28
60	66.3	−.20	−2.03

Note: See table 3.5 for definitions of EV_1 and EV_2.

[a]Fraction of consumption under the capital income tax that will be untaxed with a shift to a partial consumption tax.

[b]Tax rate necessary on the taxed commodity to balance the budget.

tax rate on consumption must now rise to 31.5 percent to maintain revenue neutrality. There is a larger fall in consumption of the tax good and a small increase in the consumption of the untaxed good, particularly in the second period.

Despite the fact that 30 percent of consumption is untaxed (introducing a substantial intracommodity distortion), the welfare gains from shifting from capital income to partial consumption taxation are still positive and substantial. To examine the relative importance of the intracommodity and intertemporal distortion, I redid the analysis allowing for increasingly greater fractions of consumption to be untaxed. Table 3.9 presents the results.

If 50 percent of consumption is untaxed, a tax rate of 48 percent on the remaining goods is required to balance the government's budget. The welfare gains from not taxing capital income fall sharply with EV_2 dropping from 11.75 percent (no exclusions) to 2.28 percent. Once excluded consumption exceeds 60 percent of total consumption, the capital income tax becomes preferable from a welfare perspective to a consumption tax. At the untaxed fraction of 60 percent, a VAT rate of 66.3 percent is required to balance the budget and there is a welfare loss of 3 percent from the reform.

These results suggest that the benefits from removing the intertemporal distortion swamp any distortions that arise from taxing only a fraction of consumption (unless the fraction of untaxed consumption exceeds one-half). While some sensitivity analysis should be carried out to consider the robustness of this conclusion, the fact that welfare losses only occur with very narrow consumption tax bases suggest that this is not an important distortion (relative to the intertemporal distortion).

Some rough calculations suggest that this is likely to be a robust result. The effect of eliminating the capital income tax is to decrease the price of future consumption. Let p_1 be the price of future consumption under the capital income tax and p_2 the price once the tax is eliminated. Similarly, C_2^1 is the amount of future consumption under the capital income tax and C_2^2 the amount once

the tax is eliminated. An approximation for the deadweight loss reduced by eliminating the tax is given by[15]

$$\Delta DWL_s = \tfrac{1}{2}(p_1 - p_2)(C_2^1 - C_2^2). \tag{15}$$

The price of future consumption equals $[1 + (1 - \tau)r]^{-30}$. Given an interest rate of 5 percent, $p_1 = 0.48$ and $p_2 = 0.23$. The price is effectively cut in half by eliminating the capital income tax. What is the effect on future consumption? The change in saving in the simulations is on the order of 25 percent. That is, $S_2 = 0.75S_1$. Since $S_i = p_i C_2^i$, $0.23C_2^2 = (0.75)(0.48)C_2^1 = 1.56C_2^1$. Therefore, the change in consumption is $C_2^1 - C_2^2 = 0.56C_2^1$. Consumption in the first period in this model is on the order of 70 percent of income (Y). Hence, the change in consumption is approximately $-0.56(0.70Y) = -0.39Y$. Thus, $\Delta DWL_s = \tfrac{1}{2}(0.48 - 0.23)(0.39Y) = -0.049Y$.

Now consider the consumption tax. The former capital income tax collected is $[(0.23)^{-1} - (0.48)^{-1}]S_1$ in future consumption units. Savings is roughly 20 percent of wage income in the model, yielding tax revenue of roughly $0.45Y$. In present value terms, that equals $(0.23)(0.45Y) = 0.10Y$. If current consumption is roughly 70 percent of income, then the consumption tax rate required to replace the capital income tax is $0.10Y/0.70Y = 14$ percent. With a partial VAT covering 70 percent of consumption, the required tax rate would be $0.10Y/[(0.70)(0.70Y)] = 20$ percent. The deadweight loss associated with the increase in the partial consumption tax would equal

$$\Delta DWL_c = -\tfrac{1}{2}\varepsilon t^2 C_1, \tag{16}$$

where ε is the compensated elasticity of demand for consumption. The change in the deadweight loss thus equals $\tfrac{1}{2}(0.20)^2(0.49Y)\varepsilon = 0.0098\varepsilon Y$. Assuming a demand elasticity of 1, the reduction in deadweight loss from eliminating the capital income tax is roughly five times the increased deadweight loss from the partial consumption tax. Put slightly differently, the difference in deadweight loss between a comprehensive consumption tax and the partial consumption tax equals

$$\tfrac{1}{2}\varepsilon Y[(0.20)^2(0.49) - (0.14)^2(0.70)] = 0.0029\varepsilon Y.$$

Deadweight loss increases by about 40 percent with the partial consumption tax; however, the magnitudes are quite small relative to the deadweight loss from the capital income tax.

15. Feldstein (1978) provides an extensive analysis of welfare costs using Harberger deadweight loss triangles. As he points out, the formula requires the analysis of the tax system as a whole, and separate analysis of each tax component is inappropriate. For my purposes, I am only demonstrating the relative importance of the individual components of a reform rather than rigorously measuring excess burden with this formula.

3.6 Conclusion

Let me begin by noting that this analysis has taken the production side of the economy as given. Factor prices and commodity prices are assumed to be unaffected by the tax reform. This is clearly unrealistic. A partial consumption tax is likely to lead to an increase in the price for the untaxed commodity relative to the price of the tax commodity. This will serve to make the partial consumption tax look more like a comprehensive consumption tax and reduce the losses arising from the presence of untaxed commodities.

I began this paper by making two points on the subject of consumption versus income taxation. First, labor supply effects—when they are considered at all—are generally thought to be negative with a consumption tax. The shift from income to consumption taxation involves a narrowing of the tax base and the effective tax on wage income must rise. However, as I have shown, labor supply effects are likely to be quite small, and moreover, labor supply can increase or decrease in response to a shift to consumption taxation.

The second point that I have made in this paper is that the welfare gains from a shift to consumption taxation may be overstated if there is only partial taxation of consumption. However, the reduction in gains from partial consumption taxation are not very large, and over plausible ranges of parameter estimates, the gains from removing the intertemporal distortion exceed the losses from the intracommodity distortion.

Overall, there are two reassuring messages that come out of this paper for supporters of consumption taxation. First, a shift from income to consumption taxation is not likely to have large adverse labor supply effects. Second, the welfare losses from partial consumption taxation are relatively unimportant compared to the gains from removing the intertemporal distortion. While there are many good reasons to avoid zero rating and exemption of goods in a consumption tax, welfare reasons are not paramount. Administrative and distributional concerns are likely to loom much larger than welfare concerns.

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Comment

Gary Burtless

Many economists—and a smaller number of politicians—favor replacing the present income tax system with a partial or comprehensive tax on household consumption. The claimed advantages of a consumption tax include a reduction in the distortion of consumers' allocation decision between consuming today and consuming in the future. Because it taxes the return on savings, an income tax favors current over deferred consumption. A consumption tax would reduce or eliminate this distortion.

Gilbert Metcalf examines the potential effect of a consumption tax on labor supply, saving, and consumer well-being within a stylized model of consumer behavior. The effects of the tax are measured relative to those of a capital income tax that raises the same amount of revenue over each consumer's life span. In comparison with an income tax, the consumption tax induces consumers to work less and save less. It also improves consumer welfare because agents are permitted to allocate consumption across different periods of their lives without tax penalty.

Metcalf's conclusions rest on several clearly stated assumptions. Individuals are assumed to live for two periods and to consume completely their net lifetime incomes by the time they expire. That is, they do not share their incomes with relatives, nor do they leave bequests. Their consumption and labor supply over the two periods of their lives are determined by a time-separable constant

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elasticity of substitution (CES) utility function. Metcalf assumes the values of the critical variables in this utility function or infers their values based on observed consumption and labor supply patterns in the Bureau of Labor Statistics Consumer Expenditure Survey (CEX). To simplify the analysis, the author also assumes that individuals do not work during the second period of their lives. This is not entirely consistent with evidence in the CEX, which suggests that nearly a third of older family heads are employed and that employed older people work approximately two-thirds as much as younger workers. I doubt that Metcalf's simplification leads to a major distortion in his qualitative results, given the other assumptions in his model.

The other assumptions of the model are clearly open to question, however. The substantial amount of work effort among a minority of older CEX respondents reflects a substantial diversity in individual circumstances (such as wealth and labor market opportunities) and individual preferences (i.e., utility functions). Metcalf's analysis ignores the diversity in circumstances and preferences to focus on the response of a representative agent, who is assigned a wage and preference function that is thought to reflect the population average.

I suspect that the main limitation in this study for practical policy making is its focus on a single representative agent. Population responses may differ from those of a single representative agent because some groups in the population are almost certainly more responsive to taxation than others. If the most responsive groups are also ones that have a high wage or an exceptional propensity to save, the economy-wide effects of a tax change will not be accurately reflected by the responses of a single representative member of the population who has average characteristics and preferences. However, Metcalf's focus permits us to see clearly how aspects of the tax system and the individual preference function can affect individual welfare and behavioral response.

The sensitivity analysis shown in tables 3.5, 3.6, 3.8, and 3.9 is straightforward and illuminating. Compared with a capital income tax that raises the same discounted revenue over each taxpayer's life span, a consumption tax reduces labor supply. The intuition behind this result is plain. In Metcalf's model a consumption tax is equivalent to a tax on wages, so workers are modestly discouraged from working. Because the assumed labor supply elasticity is very low, however, the reduction in labor supply is small, so Metcalf finds only a small decline in lifetime earnings.

The consumption tax also yields a reduction in first-period consumption *and* saving, in large measure because it increases tax burdens in the first period. The wage earner has less net income in the first period to divide between consumption and saving. However, the worker has more net income in the second period, and hence she consumes more in that period than she would under a capital income tax. When consumers are permitted to allocate freely their consumption between the two periods without special tax penalty, they choose to defer consumption to the second period. The improvement in consumers' welfare from this reallocation of consumption between periods more than off-

sets the loss of welfare from reduced lifetime earnings, yielding an improvement in consumer well-being. Metcalf's sensitivity analyses suggest that this improvement will likely remain even if the consumption tax is not uniform across commodities. However, this conclusion is probably sensitive to changes in preference parameters about which economists know little.

As noted in the paper, these results do not come out of a general equilibrium model that includes the production side of the economy. Workers reduce their labor supply and saving under a consumption tax, so it would be surprising if the economy could produce as much output as under an income tax. Nor does the paper consider the formidable problem of shifting from an income tax to a consumption tax system. In Metcalf's stylized model it might seem feasible to impose a consumption tax starting with a particular cohort, rather than imposing it on all generations at the same time. This simple solution to the transition problem is not available to policymakers, because most taxpayers' life spans last longer than two periods. A transition rule that is fair to retired 70-year-olds and to 20-year-olds just entering the labor force may not be fair to 50-year-olds who have accumulated assets under an income tax system for 30 years and face the prospect of working for 15 additional years and drawing retirement benefits for 20 years under a consumption tax system. Any transition rule will create winners and losers. Practical efforts to minimize the number of losers or the size of their losses may involve imposing burdens on taxpayers who cannot vote, namely, future workers who are left with a larger public debt.

The paper is convincing in showing the long-run advantages of a consumption tax under sensible assumptions. Even a consumption tax involves distortions, of course. The tax is imposed on goods and services that are purchased in the market, but it exempts goods and services produced in the home as well as leisure consumption. Decisions about home production and labor supply behavior will therefore be distorted by a consumption tax just as they are by an income tax. In addition, as Metcalf points out, almost no existing consumption tax is uniformly imposed on all goods and services. Some market goods and services are more lightly taxed than others; some goods and services are exempt from taxes altogether. Thus, consumption taxes that are politically feasible may cause distortions in budget allocation across different classes of commodities, even though they lessen the distortion in allocations across time periods.

As actually implemented in current tax law, the income tax introduces a comparable distortion. Different classes of income are subject to differing tax rates. Imputed rent on owner-occupied homes and unrealized gains on capital income are exempt from the income tax. Employer contributions to medical insurance are also untaxed. Several forms of capital income, in addition to unrealized capital gains, are lightly taxed in comparison with an identical stream of money wages. For example, assets held in qualified pension plans, 401(k) plans, and individual retirement accounts (IRAs) generate returns that are untaxed until withdrawals from the plan begin sometime during retirement.

Like a consumption tax which imposes differing rates on different classes of commodities, an income tax that imposes differing rates on different classes of income can distort agents' behavior. Actual income tax systems favor certain kinds of income-generating activities over others, just as most implemented consumption tax systems favor certain kinds of consumption over others. In the case of the U.S. income tax, two of the most costly tax preferences are aimed at boosting particular forms of household saving. The preferences to encourage home ownership and qualified pension plans are expensive to the Treasury, but they may induce taxpayers to save more in their homes and in company pension plans than taxpayers would save under an income tax system in which all forms of income were subject to a uniform tax rate.

In fact, of course, the present U.S. income tax contains elements of a consumption tax as well as an income tax. The tax preference for pensions exempts contributions to pension plans and income earned in the plans from taxes until money is withdrawn in retirement. For workers who are contributing less to pension plans than allowed by their employer and by current law, the present income tax system causes no distortion in the intertemporal allocation of resources. Workers are free at the margin to increase their consumption in old age without any special tax penalty. The specific income-tax-induced distortion treated in this paper is not relevant in this case. The number of workers who can make additional tax-preferred contributions to pension plans is very large since many workers do not make the largest allowed contribution to 401(k) or IRA plans. Even those workers who cannot make additional tax-preferred contributions to pension plans are less constrained than it may appear. Workers with a strong preference for deferring compensation into the future have the option of seeking an employer who offers a pay package with less current money compensation and more deferred compensation. While it is more costly for workers to find employers offering the optimal mix of current and deferred compensation than it is for them to allocate their consumption under a consumption tax, the present income tax system certainly offers workers rich opportunities for deferring taxes on compensation until the compensation is used for consumption. In view of this feature of the U.S. income tax, the welfare gains of moving to a comprehensive consumption tax are likely to be noticeably smaller than suggested in this paper.