

The Transition to Consumption Taxation, Part 2: The Impact on Existing Financial Assets

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Replacing the income tax with a consumption tax is likely to reduce the value of the capital stock. The division of this reduction between bondholders and stockholders and the effects on household lenders and borrowers depend on whether the tax is accommodated through higher consumer prices.

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In Part 1 of this article (Viard 2000), I discuss how replacing the income tax with a consumption tax generally reduces the value of the existing capital stock. In Part 2, I examine the allocation of this wealth decline between holders of different financial assets. How much of the total decline in the value of firms' capital is borne by bondholders and how much by stockholders? Are there wealth transfers between household lenders and household borrowers?

I consider three consumption tax designs—a retail sales tax, a traditional value-added tax (VAT), and a two-part VAT (“flat tax”)—and show that they have similar potential effects. However, the impact of the consumption tax depends on how monetary policy responds to the tax reform and what transition policies, if any, are adopted.

If monetary policy keeps the consumer price level unchanged, the wealth decline generally falls on stockholders rather than bondholders. Also, there is little reallocation of wealth between household lenders and borrowers. It is possible to alter these outcomes with a transition policy that aids stockholders and household borrowers at the expense of bondholders and household lenders.

The effects are different if monetary policy accommodates the consumption tax by allowing the consumer price level to rise. Such accommodation is unlikely under a two-part VAT, but observers disagree on whether it might be adopted under a sales tax or traditional VAT to ease possible labor-market rigidities. If the tax is fully or largely accommodated, bondholders bear a heavier burden than stockholders. Also, wealth is transferred from household lenders to borrowers.

I first describe the three consumption tax designs and their effect on the total value of capital and after-tax rates of return. I then examine the allocation of the wealth decline under different monetary policy responses.

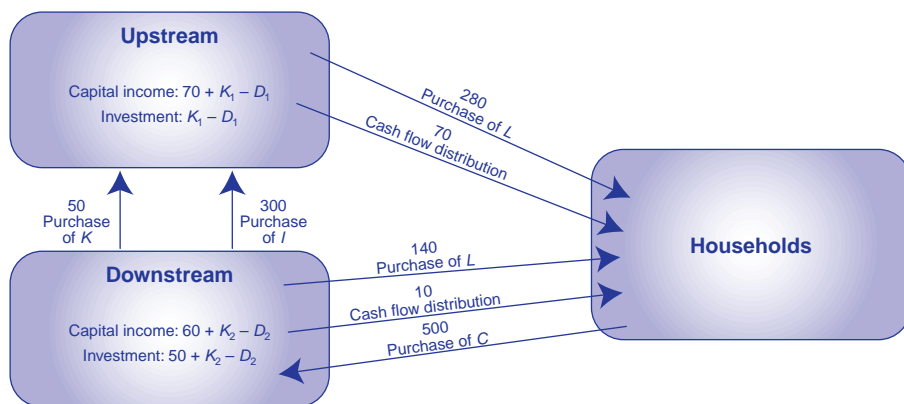
ALTERNATIVE TAX SYSTEMS

Economic Framework

I use a simple framework with no uncertainty and no international trade and investment. Firms produce consumer goods for sale to households, as well as capital and intermediate inputs for sale to other firms or for internal use. Capital depreciates at geometric rate δ , while intermediate inputs are (by definition) immediately used up in production.

Each firm issues bonds that promise fixed future payments and stocks that are residual

Figure 1
Application of Consumption Tax Designs



NOTE: Arrows denote direction of payment.

claims on all other cash flows generated by the firm's capital. By construction, the combined value of the bonds and stocks equals the value of the capital. The aggregate value of firms' capital equals national wealth. Households also make loans to each other. Since each loan is an asset of the lender and an offsetting liability of the borrower, these loans do not add to national wealth.

For each of the consumption tax designs and the income tax, I assume tax rates are the same across firms or households. To address regressivity, households may receive refundable exemptions. Revenues are distributed to households as transfer payments.

I compare the application of the tax systems in an example with two firms, Upstream and Downstream. Figure 1 shows the transactions between firms and households, with arrows denoting the direction of payment. I assume units are chosen such that consumer goods, capital, and intermediate inputs have the same per-unit marginal cost (at the observed output level).¹

During the year, Upstream produces $50 + K_1$ units of capital, selling 50 to Downstream and retaining K_1 . However, D_1 units of capital depreciate. The firm also produces $300 + I_1$ units of intermediate inputs, of which it sells 300 units to Downstream and uses I_1 units internally. Upstream purchases labor from households at a cost of 280 units. It distributes its remaining cash flow of 70 to its bondholders and stockholders.

Figure 1 shows the capital income Upstream generates, $70 + K_1 - D_1$, which is production (minus depreciation of capital and usage of intermediate inputs) minus wage payments. The figure also reports investment, $K_1 - D_1$,

which is the net increase in the firm's capital. Note that cash flow equals capital income minus investment. I do not assign values to internal-use production and depreciation because these values cannot be observed from payment flows.

Downstream produces 500 units of consumer goods and sells them to households. It also produces K_2 units of capital and purchases another 50 units from Upstream. D_2 units of capital are used up through depreciation. Downstream produces I_2 units of intermediate inputs and purchases 300 units from Upstream, all of which are used in its production. Downstream buys labor from households at a cost of 140 units and distributes 10 units of cash flow to its bondholders and stockholders. This cash flow equals the firm's capital income, $60 + K_2 - D_2$, minus investment, $50 + K_2 - D_2$.

The key difference between the various consumption tax designs is whether the tax is imposed on firms or on households. Table 1 explains the calculation of the bases on which the firms are taxed under each system.²

Retail Sales Tax

Under the retail sales tax, each firm is taxed on the consumer goods it produces. The aggregate tax base is clearly national consumption. Firms are not taxed on production of capital or intermediate inputs (whether used internally or sold to other firms), and households are not taxed. So Downstream is taxed on 500 units of consumer goods, with no tax on Upstream or the households.

Sales tax rates can be expressed in either tax-inclusive or tax-exclusive terms. For example, consider a consumer good for which a household pays a firm \$100 and the firm pays \$25

Table 1

Computation of Base on Which Firm Is Taxed

	Sales of consumer goods	Sales of capital	Minus purchases of capital	Internal production of capital	Minus depreciation of capital	Sales of intermediate inputs	Minus purchases of intermediate inputs	Minus wage payments
Retail sales tax	✓							
Traditional VAT	✓	✓	✓			✓	✓	
Two-part VAT	✓	✓	✓			✓	✓	✓
Two-part income tax	✓	✓		✓	✓	✓	✓	✓

sales tax and retains the other \$75. The tax-exclusive rate is 33.3 percent because the \$25 tax payment is 33.3 percent of the \$75 after-tax amount retained by the firm. However, the tax-inclusive rate is 25 percent because the \$25 tax payment is 25 percent of the household's \$100 pretax payment.

Although sales tax rates are usually expressed in tax-exclusive form, I use the tax-inclusive form for the sales tax and the other consumption tax designs. This is consistent with the common practice of reporting income tax rates in tax-inclusive form; if a household receives \$100 pretax income, pays \$25 income tax, and retains \$75, the rate is said to be 25 percent, not 33.3 percent. In this article, I generally assume a 25 percent tax-inclusive rate for a new consumption tax because this rate is roughly sufficient to replace current U.S. individual and corporate income tax revenues.³

Traditional VAT

The traditional VAT taxes each firm on its value added, which is its sales (of consumer goods, capital, and intermediate inputs) minus its purchases (of capital and intermediate inputs), as the second row of Table 1 shows. Upstream's value added is 350 because it sells 50 units of capital and 300 units of intermediate inputs to Downstream and makes no purchases. Downstream's value added is 150 because it sells 500 units of consumer goods and purchases 50 units of capital and 300 units of intermediate inputs from Upstream. The combined tax base is still 500.

The VAT differs from the sales tax only when one firm sells capital or intermediate inputs to another firm. Neither firm owes anything under the sales tax; the VAT imposes tax on the seller but reduces the purchaser's tax by the same amount. Since their combined liability is zero, capital and intermediate inputs effectively remain tax-exempt. (As with the sales tax, no tax is imposed on internal-use production of capital or intermediate inputs.) The aggregate

VAT base, like the aggregate sales tax base, is national consumption.

Two-Part VAT

Unlike the tax designs outlined above, the two-part VAT is partly imposed on households. As the third row of Table 1 shows, the base on which each firm is taxed is the same as under the traditional VAT, except that wage payments are deductible. Each household is taxed on its wage income. So Downstream is taxed on 70 (350 value added minus 280 wage payment), Upstream is taxed on 10 (150 value added minus 140 wage payment), households are taxed on 420 wages, and the aggregate base is still 500. Since the combined tax base on which each firm and its workers are taxed under the two-part VAT is the same as the base on which the firm is taxed under the traditional VAT, the two taxes have the same aggregate base.

It can be seen that the base on which each firm is taxed—value added minus wages—equals the cash flow distributed to bondholders and stockholders. In the aggregate, firms are taxed on national cash flow and households are taxed on national wages. Many economists have noted that national consumption equals national cash flow plus national wages.⁴

Following the usage of its most prominent supporters, Hall and Rabushka (1995), the two-part VAT is usually called the “flat tax,” a misleading name that often causes it to be confused with a flat-rate income tax.⁵

Income Tax

The aggregate income tax base is net national product, defined as national consumption plus net investment (the production of new capital minus depreciation). The fourth row of Table 1 describes a two-part income tax system in which firms are taxed on the net capital income they generate and households are taxed on wages. To bring each firm's net investment into the tax base, the two-part VAT is modified in three ways. The deduction for capital pur-

chased from other firms is eliminated (but the tax on selling firms is retained), capital produced for internal use is taxed, and depreciation is deducted. The treatment of intermediate inputs does not change; inputs used internally remain tax-exempt, and purchased inputs remain deductible (offsetting the tax on the selling firm).⁶ Upstream is taxed on $70 + K_1 - D_1$ and Downstream is taxed on $60 + K_2 - D_2$, the capital incomes shown in Figure 1. Households continue to pay tax on their wage income of 420. The aggregate tax base is $550 + K_1 + K_2 - D_1 - D_2$, which is net national product.

The income tax base is more complex than the consumption tax base because it requires the measurement of depreciation and internal-use capital. Distinguishing capital from intermediate inputs and measuring depreciation of the former are unavoidable complications of the income tax.⁷

This hypothetical two-part income tax omits many of the complicating features of the actual U.S. individual and corporate income tax. I now add a few of the omitted features to the analysis. I assume firms are taxed at rate τ_f on the tax base described above. (Since corporations can deduct interest paid to bondholders but not payments to stockholders, this approach implicitly assumes that firms issue a mix of bonds and stocks and reduces the value τ_f to reflect the tax savings from the interest deduction.) To represent the various investment incentives in the U.S. income tax, I assume firms receive an investment tax credit at rate Z for purchases and internal production of capital and pay a recapture tax of the same rate on sales of capital.

Households are taxed at rate τ_p on both wages and capital income from firms (although the capital income is also taxed at the firm level). This same tax rate applies to household loans; household lenders are taxed on their interest income and household borrowers deduct their interest expense. Capital income is measured in nominal terms; bondholders and household lenders are taxed on the portion of interest that compensates for inflation, and household borrowers deduct this interest. Stockholders similarly pay tax on the portion of capital gains that reflects inflation. Capital gains are taxed on accrual, and there are no front-loaded savings incentives.

TOTAL VALUE OF CAPITAL AND RATES OF RETURN

I define the value of capital as the consumption owners gain when they liquidate one unit of capital or, conversely, the consumption

households must sacrifice to obtain one unit. I now examine the equilibrium relationship between the value of capital and its production cost under different taxes by considering a small change, or perturbation, to the circular flow between a firm and its bondholders and stockholders. This analysis also explains the relationship between the marginal product of capital and the after-tax rate of return savers receive.

In the initial year, a firm produces one additional unit of capital, reducing its output of consumer goods as required by its production function. The firm issues bonds and stocks that represent claims on the cash flow from the new capital and sells them to a household.⁸ Since the firm is indifferent to small changes around the optimum, the equilibrium price at which it sells these securities must equal the after-tax receipts it would have obtained by selling the foregone consumer goods. The household purchasing the securities reduces its consumption by the purchase price. This reduction in consumption is the value of capital.

The capital stock remains one unit higher in each subsequent year. The output the additional capital produces, net of the portion required to replace depreciation, is sold as consumer goods. The firm distributes its after-tax proceeds from these sales to the household owning the securities. After paying any applicable taxes, the household consumes these proceeds. The after-tax rate of return equals the ratio of the increase in the household's consumption in each of these years to its consumption loss in the initial year.

Table 2 shows the results of this perturbation under the various tax systems.

Consumption Tax

The three consumption tax designs operate identically in this context. Let Q and MPK denote the equilibrium production cost of capital and its marginal product (both in terms of consumption). The firm receives a tax savings of $\tau_c Q$ by producing tax-exempt capital rather than taxable consumer goods. The equilibrium value of the securities and the reduction in the household's consumption must be $(1 - \tau_c)Q$, which is the value of capital.⁹

In each subsequent year, the capital yields MPK units of output, δQ units of which are invested to replace depreciation. The firm sells the remainder as consumer goods, paying tax of $\tau_c(MPK - \delta Q)$ on these sales. The household receives $(1 - \tau_c)(MPK - \delta Q)$ on its securities and consumes this amount. Dividing this annual consumption by the initial consumption reduc-

Table 2
Value of Capital and After-Tax Rates of Return

Effects in Initial Year

	(A) Price of foregone consumer goods	(B) Firm's tax savings	(C) Price of securities (A) – (B)	(D) Value of capital (C)
Sales tax and VATs	Q	$\tau_c Q$	$(1 - \tau_c)Q$	$(1 - \tau_c)Q$
Income tax	Q^*	ZQ^*	$(1 - Z)Q^*$	$(1 - Z)Q^*$

Effects in Each Subsequent Year

	(E) Additional consumer output	(F) Firm's tax	(G) Return on securities (E) – (F)	(H) Household's tax	(I) Additional consumption (G) – (H)	(J) Rate of return (I) / (D)
Sales tax and VATs	$MPK - \delta Q$	$\tau_c(MPK - \delta Q)$	$(1 - \tau_c)(MPK - \delta Q)$	0	$(1 - \tau_c)(MPK - \delta Q)$	$(MPK/Q) - \delta$
Income tax	$MPK^* - \delta Q^*$	$\tau_f[MPK^* - (1 - Z)\delta Q^*] - Z\delta Q^*$	$(1 - \tau_f)[MPK^* - (1 - Z)\delta Q^*]$	$\tau_p(1 - \tau_f)[MPK^* - (1 - Z)\delta Q^*]$	$(1 - \tau_p)(1 - \tau_f)[MPK^* - (1 - Z)\delta Q^*]$	$(1 - \tau_p)(1 - \tau_f)[MPK^*/Q^*(1 - Z) - \delta]$

tion of $(1 - \tau_c)Q$ reveals that the after-tax rate of return is $(MPK/Q) - \delta$, which is the same as the pretax rate of return. The consumption tax does not drive a wedge between the pretax and after-tax rates of return and therefore does not distort consumption-saving decisions.

Income Tax

The effect of the income tax is described in the last row of each panel. Let Q^* and MPK^* denote the equilibrium production cost of capital and marginal product under the income tax. When the firm produces a unit of capital instead of Q^* units of consumption, it receives tax savings of ZQ^* from the investment tax credit. The securities must have an equilibrium value of $(1 - Z)Q^*$, which is the value of capital. In each subsequent year, both the firm and the household pay tax on the output, as the table shows. Since the after-tax rate of return is lower than the pretax rate of return, the income tax distorts consumption-saving decisions.

Tax Reform's Impact on Value of Capital

An immediate, unexpected replacement of the income tax with a consumption tax changes the value of capital from $(1 - Z)Q^*$ to Q . The result can be simplified by imposing two restrictive assumptions. First, an unlimited quantity of capital can be produced at constant cost, so $Q = Q^*$. Second, the income tax system provides no investment tax credit (or other front-loaded investment incentives), so Z is zero. Under these assumptions, tax reform reduces the value of capital by fraction τ_c ; the proportional decline equals the consumption tax rate.¹⁰

However, it is more realistic to assume the production cost of capital increases as more is produced. Since tax reform is likely to increase investment for most types of capital, $Q > Q^*$. Also, the current income tax includes many front-loaded investment incentives, so $Z > 0$. The proportional decline in value is then less than τ_c and may vary across different types of capital. Some types of capital may even rise in value.

In the analysis below, I consider three hypothetical firms, each of which holds capital with a value of 400 prior to tax reform. The first firm holds capital that is produced at constant cost and receives no front-loaded incentives, so replacing the income tax with a 25 percent consumption tax reduces its value by 25 percent, from 400 to 300. The second firm holds capital that is produced at increasing cost and receives some front-loaded investment incentives. Tax reform reduces its value by 10 percent, from 400 to 360. The third firm holds capital for which increasing costs and front-loaded incentives are even more pronounced. The value of this capital is unchanged by tax reform.

Tax Reform's Impact on After-Tax Rate of Return

Before tax reform, the after-tax rate of return is lower than the pretax rate of return. Since the rates are equal after reform, either the pretax rate must decline or the after-tax rate must rise, or both. If the real pretax rate of return was 6 percent per year and the real after-tax rate was 4 percent per year, what is likely to happen after reform eliminates the 2 percent wedge the income tax imposes?

In the long run, the rate of return (pretax and after tax) may be close to 4 percent. Even a modest rise in the 4 percent after-tax return would probably prompt additional saving that eventually results in a large expansion of the capital stock. The expansion of the capital stock drives down its marginal product, lowering the pretax rate of return well below 6 percent. However, because this expansion of the capital stock is the cumulative effect of the increased flow of savings each year, it occurs only gradually. In the short run, therefore, the capital stock has not expanded significantly and the rate of return is likely to be close to 6 percent. The after-tax rate of return rises by nearly the full 2 percentage points.¹¹

Asset owners' well-being depends on the equilibrium after-tax rate of return, as well as the value of their assets. An asset's value merely measures the current consumption the owner would receive from immediately liquidating it. However, an owner who intends to consume over an extended period benefits from the increase in after-tax rates of return, to an extent that depends on the length of his or her consumption horizon.¹²

Conversely, the well-being of a borrowing household depends (negatively) on the after-tax rate of return, as well as on the value of its liabilities. A liability's value merely measures the current consumption the borrower would have to sacrifice to immediately retire it. However, a borrower who intends to repay over an extended period is harmed by the increase in the after-tax rate of return that must be paid on the liability until it is repaid.

Debt Structure

I assume each of the three hypothetical firms issues bonds with a value of 100, one-quarter of its capital. The value of each firm's stock is 300, or three-quarters of capital. (These ratios are close to the averages for nonfinancial corporations.) I also consider a household that makes a loan of 100 (Lender) and one that receives the loan (Borrower).

Let r^* denote the nominal after-tax rate of return prior to reform. Each debt instrument (firm bond or household loan) provides a nominal pretax interest payment of $r^*/(1 - \tau_p)$ each year until it matures and a nominal principal repayment of unity at maturity. Since nominal interest payments are taxed at rate τ_p under the income tax, the holder of each instrument receives net payments of r^* . Consider a debt instrument that matures M years after the reform. Its price immediately before the unexpected

reform, denoted P^* , is the present discounted value of its after-tax payments, which is unity.

$$(1) \quad P^* = \sum_{t=1}^M r^* (1 + r^*)^{-t} + (1 + r^*)^{-M} = 1.$$

I now examine how an immediate, unexpected tax reform changes the value of bonds and household loans. Subtracting the change in the value of each firm's bonds from the change in the total value of its capital yields the change in the value of its stock. The change in the value of household loans controls the allocation of wealth between lending and borrowing households.

Since nominal debt payments are fixed, an important issue is whether the consumer price level changes when the reform occurs. Since the price level depends on money supply and demand, it remains unchanged if the money supply is adjusted to offset any changes in money demand resulting from tax reform.¹³ I now consider the effects of tax reform on asset values, under the assumption this monetary policy is pursued and the consumer price level is unchanged.

ASSET VALUES WITH UNCHANGED CONSUMER PRICE LEVEL

What happens to the value of outstanding debt immediately after a 25 percent consumption tax unexpectedly replaces the income tax? The reform has two conflicting effects. First, the price rises to reflect the tax savings bondholders receive (the elimination of income tax on interest payments). Second, the price is reduced because future payments are discounted at a higher equilibrium after-tax interest rate. In general, the new price of the debt instrument is

$$(2) \quad P = \sum_{t=1}^M \frac{r^*}{(1 - \tau_p)} (1 + r)^{-t} + (1 + r)^{-M},$$

where r is the nominal after-tax (and pretax) interest rate after reform.

For simplicity, I assume the pretax interest rate is constant during the M years after tax reform, so the after-tax interest rate rises by the amount of the former tax on interest income.¹⁴ In other words, r equals $r^*/(1 - \tau_p)$, the nominal pretax interest rate before reform. Substituting into Equation 2 reveals that under this assumption, the debt instrument's price remains equal to unity because the tax savings offset the loss from the higher discount rate.¹⁵

As Table 3 shows, the value of each firm's bonds remains equal to 100. The decline in the value of each firm's capital falls entirely on stockholders as residual claimants. As the value

Table 3
Impact of Tax Reform with Unchanged Consumer Price Level

		Allocation of Decline in Value of Capital		
		Capital	Bonds	Stock
Before tax reform				
Each firm	Value	400	100	300
After tax reform				
First firm	Value (% change)	300 (-25%)	100 (0)	200 (-33%)
Second firm	Value (% change)	360 (-10%)	100 (0)	260 (-13%)
Third firm	Value (% change)	400 (0)	100 (0)	300 (0)
Wealth Reallocation Between Household Lenders and Borrowers				
		Combined	Lender	Borrower
Before tax reform		0	100	-100
After tax reform		0	100	-100

Table 4
Impact of Tax Reform with Unchanged Consumer Price Level:
Existing Debt Grandfathered

		Allocation of Decline in Value of Capital		
		Capital	Bonds	Stock
Before tax reform				
Each firm	Value	400	100	300
After tax reform				
First firm	Value (% change)	300 (-25%)	89 (-11%)	211 (-30%)
Second firm	Value (% change)	360 (-10%)	89 (-11%)	271 (-10%)
Third firm	Value (% change)	400 (0)	89 (-11%)	311 (+4%)
Wealth Reallocation Between Household Lenders and Borrowers				
		Combined	Lender	Borrower
Before tax reform		0	100	-100
After tax reform		0	89	-89

of the first firm's capital declines by 25 percent, from 400 to 300, the value of its stock declines by 33 percent, from 300 to 200. As the value of the second firm's capital declines by 10 percent, from 400 to 360, the value of its stock declines by 13 percent, from 300 to 260. Because stockholders own only three-quarters of the firm but bear the full wealth decline, their proportional loss is four-thirds times the proportional decline in capital value. For the third firm, whose capital value remains unchanged, neither bondholders nor stockholders experience any wealth decline. The impact on stockholders varies, depending on the type of capital their firms hold. Also, although not shown in the table, the impact is more (less) severe if firms are more (less) leveraged.

Because the value of debt is unchanged when $r = r^*/(1 - \tau_p)$, there is no redistribution of wealth between lending and borrowing households. As the second panel of Table 3 shows, both the wealth of Lender and the liability of Borrower remain equal to 100.

Transition Relief: Grandfather Existing Debt

Depending on their consumption horizons, stockholders may be either better or worse off because of tax reform. Although their initial wealth declines, they benefit from earning the higher equilibrium after-tax rate of return. Bondholders and household lenders, however, clearly gain because they avoid any loss of initial wealth—under the assumption $r = r^*/(1 - \tau_p)$ —and benefit from the higher equilibrium after-tax rate of return if they do not immediately liquidate their assets and consume. Household borrowers are harmed because their initial liability is unchanged but they face higher future after-tax borrowing rates.¹⁶

Some believe these results are too generous to bondholders and household lenders and too harsh on stockholders and household borrowers.¹⁷ These observers often advocate grandfathering debt instruments that are outstanding on the reform date. Bondholders and household lenders would continue to pay tax on interest income from these instruments, although at rate τ_c rather than τ_p , and firms and household borrowers would deduct their interest expense from these instruments at the same rate. In principle, total revenues would be unchanged.¹⁸

Under this policy, the value of outstanding debt would be

$$(3) \quad P = \sum_{t=1}^M \frac{r^*(1 - \tau_c)}{(1 - \tau_p)} (1 + r)^{-t} + (1 + r)^{-M}.$$

Substituting in $r = r^*/(1 - \tau_p)$ yields the price $1 - \tau_c[1 - (1 + r)^{-M}]$. For debt nearing maturity, the value would still be close to unity. (The treatment of interest is unimportant because most of the present value consists of the imminent principal repayment.) For debt far from maturity, the proportional decline in value would approach the tax rate. If the nominal pretax interest rate r were 6 percent, with a 25 percent consumption tax rate the decline in the price of debt with ten years to maturity would be 11 percent.

The top panel of Table 4 shows the impact of debt grandfathering on bondholders and stockholders, using this 11 percent estimate. Bondholders suffer an 11 percent loss at all firms. Stockholders at the first firm suffer a 30 percent rather than a 33 percent loss, and those at the second firm suffer a 10 percent rather than a 13 percent loss. The third firm's stockholders now gain wealth. Although the impact differs across firms holding different types of capital (or with different degrees of leverage), debt grandfathering tends to make the proportional losses of bondholders and stockholders more similar in the aggregate.

Table 5
Equilibrium Wage Rates

	(A) Payment received from households	(B) Firm's tax	(C) Wage payment to worker (A) – (B)	(D) Worker's tax	(E) Worker's net wage (C) – (D)
Sales tax, traditional VAT	MPL	$\tau_c MPL$	$(1 - \tau_c)MPL$	0	$(1 - \tau_c)MPL$
Two-part VAT	MPL	0	MPL	$\tau_c MPL$	$(1 - \tau_c)MPL$
Income tax	MPL^*	0	MPL^*	$\tau_p MPL^*$	$(1 - \tau_p)MPL^*$

As the bottom panel of Table 4 shows, the household lender now suffers a 11 percent wealth decline while the household borrower enjoys an 11 percent decline in its liability. Wealth is reallocated from lenders to borrowers.

If this policy is desired, it can be administered most easily under a two-part VAT because working households can report interest income and expense on the same tax returns they use to report wages. The policy is less convenient under a sales tax or traditional VAT because households must file new tax returns solely to report interest income and expense.¹⁹

COULD TAX REFORM INDUCE AN INCREASE IN CONSUMER PRICES?

The above analysis assumes the consumer price level is unchanged by tax reform. The asset pricing implications are different if the consumer price level rises in response to tax reform. Some argue that the labor-market effects of adopting a sales tax or traditional VAT may prompt a monetary policy response that raises the consumer price level.

Labor Markets under Alternative Tax Systems

To understand this argument, I consider a simple perturbation to the circular flow between firms and workers (*Table 5*). A firm purchases one additional unit of labor from a household and produces additional consumption. Let MPL and MPL^* denote the marginal product of labor under a consumption tax and the income tax, respectively. For the firm to be indifferent to this perturbation, its after-tax receipts from selling the additional consumption must equal its wage payment. After paying any applicable taxes, the household consumes its additional wages.

Under the sales tax and the traditional VAT, the firm pays an additional tax of $\tau_c MPL$ on its additional consumption output. For the firm to

be indifferent to the perturbation, the equilibrium value of its wage payment to the household must be $(1 - \tau_c)MPL$. Since the household pays no tax, its consumption increases by this amount.

Under the two-part VAT (which taxes the firm on value added minus wage payments), the perturbation does not change the firm's tax liability because its value added and wage payments rise by the same amount. For the firm to be indifferent to this perturbation, the equilibrium value of its wage payment must be MPL . However, the household pays tax of $\tau_c MPL$ on its wage income, so its consumption increases by only $(1 - \tau_c)MPL$.

Under the income tax, this perturbation does not change the firm's tax liability because its receipts and wage expenses increase by the same amount. For the firm to be indifferent to the perturbation, the equilibrium value of its wage payment must be MPL^* . However, the household pays tax of $\tau_p MPL^*$ on its wage income, so its consumption increases by only $(1 - \tau_p)MPL^*$.

Each of the three consumption tax designs distorts the labor-leisure decision by driving a wedge at rate τ_c between the marginal product of labor and the after-tax wage rate. The income tax also distorts this decision by driving a similar wedge at rate τ_p .

To consider the transitional impact of tax reform on labor markets, I make a few simplifying assumptions. Although tax reform is likely to greatly increase the marginal product of labor in the long run by significantly expanding the capital stock, the short-run change in marginal product should be small because (as discussed above) the capital stock expands only gradually. So I assume the marginal product of labor is initially unchanged, $MPL = MPL^*$.²⁰ I consider a worker with a marginal product of twelve consumer goods per hour, who earns \$12 per hour when these goods sell for \$1 each, and I assume

the consumption and personal income tax rates are both 25 percent.

The replacement of the income tax with a two-part VAT has little impact on labor markets because these taxes are similar in form as well as substance. Table 5 implies that under either tax, the firm pays the worker \$12 and the worker pays \$3 tax. Under the current income tax, firms withhold the worker's wage tax, so the paycheck is actually \$9, with a stub noting that the worker is being paid \$12, \$3 of which is withheld for taxes. Hall and Rabushka (1995, 145) propose similar withholding under a two-part VAT.

The treatment of wages under a sales tax or traditional VAT differs in form, but not in substance, from that under an income tax because the tax is imposed on the firm rather than the worker. In accordance with Table 5, the firm now pays a wage rate of only \$9 because it retains only 75 cents after tax for each of the twelve goods the worker produces. The paycheck amount is still \$9, but the stub is now different, showing \$9 as the wage with no tax withheld. The worker owes no additional tax, and disposable income is still \$9. This wage-rate adjustment illustrates the public-finance principle that imposing a tax on the seller rather than the buyer has no real economic effect because the equilibrium price adjusts by the amount of the tax.

Potential Nominal-Wage Rigidity and Monetary Accommodation

Some argue that this adjustment may not easily occur. They note the longstanding literature suggesting that workers resist nominal-wage reductions and argue that this resistance applies to reductions in the wage rate listed on the paycheck stub, not reductions in take-home pay.²¹ Even if such resistance does not exist, they note that the Fair Labor Standards Act (FLSA) prohibits the necessary adjustment for lower-paid workers. This law prescribes a minimum value (currently \$5.15 per hour) for the wage rate shown on the paycheck stub.

If the listed wage rate remains rigid, the adoption of a sales tax or traditional VAT has problematic labor-market consequences. After paying sales tax or VAT, firms retain only 75 cents for each unit produced and they can profitably hire workers at a \$12 wage rate only if their marginal product is fifteen units, rather than the twelve units possible before reform. The implied hiring reduction and unemployment could be substantial.

The literature on nominal-wage rigidity generally assumes workers do not resist real-

wage reductions achieved through inflation. Similarly, since the FLSA minimum wage is not indexed, its real value can be reduced through inflation. If nominal-wage rigidity otherwise impedes the necessary adjustment, a possible response is a monetary policy that rapidly increases the consumer price level by a factor of $1/(1 - \tau_c)$.²² I refer to this policy as “full accommodation” of the consumption tax and to a smaller price increase as partial accommodation.

Full accommodation raises the price of consumer goods to \$1.33. Since firms retain \$1 after paying sales tax or VAT, they can profitably hire workers at a \$12 wage rate if their marginal product is twelve units, the same as before reform. The necessary real-wage adjustment occurs without any reduction in nominal wages.

It is unclear whether nominal-wage rigidity poses a problem. Workers who resist isolated reductions in their nominal wage rate may accept an economywide reduction made in response to a highly visible change in tax policy, particularly when take-home pay is unaffected. Congress can also amend the FLSA when it adopts tax reform. Accommodation may be unnecessary.

I make no prediction about whether monetary policy would accommodate all, some, or none of a sales tax or traditional VAT. Instead, I compare the asset-price effects of tax reform under the different possibilities. I have already described the effects without accommodation and now describe them with full accommodation. Intermediate effects occur under partial accommodation.

ASSET PRICE EFFECTS WITH FULL ACCOMMODATION

With accommodation, the nominal interest rate (and the inflation rate) is extremely high during the brief period when the price level is rising. If $r = r^*/(1 - \tau_p)$ thereafter, full accommodation reduces the real value of debt by factor τ_c .

As the top panel of Table 6 shows, bond values fall from 100 to 75 at each firm. At the first firm, as total value falls from 400 to 300, stock values fall from 300 to 225, which is also a 25 percent decline. At the second firm, however, as total value declines from 400 to 360, stock values fall only from 300 to 285, a mere 5 percent. At the third firm, where total firm value is unchanged at 400, stock values actually rise, from 300 to 325. Overall, bondholders now bear heavier burdens than stockholders, reversing the pattern seen in Table 3.

The value of the household loan also falls from 100 to 75. As the bottom panel of Table 6 shows, the household lender suffers a 25 percent wealth decline while the household borrower enjoys a 25 percent decline in the value of its liability.²³

Although this analysis generally ignores consumer-owned capital, it should be noted that accommodation benefits homeowners with mortgages at the expense of mortgage lenders, in the same way it benefits stockholders of leveraged firms at bondholders' expense. Consider a homeowner with a \$120,000 house and an \$80,000 mortgage, and assume that tax reform reduces the home's real value to \$110,000.²⁴ If the consumption tax is not accommodated, the real value of the mortgage is still \$80,000 and the homeowner suffers a 25 percent decline in home equity, from \$40,000 to \$30,000. But if the tax is fully accommodated, the real value of the mortgage falls to \$60,000 and the homeowner's equity rises from \$40,000 to \$50,000, as the mortgage lender bears more than the full burden of the decline in value. (Of course, accommodation is irrelevant if the homeowner does not have a mortgage.)

Some believe an accommodated consumption tax would be too harsh on bondholders and household lenders and too favorable to stockholders and household borrowers, the opposite of the concerns expressed with no accommodation. If accommodation is considered undesirable, it can be avoided by adopting a two-part VAT. Or if a sales tax or traditional VAT is adopted, steps can be taken to facilitate rapid nominal-wage adjustment. Or if nominal-wage rigidity is considered inevitable, the need for accommodation can be avoided by phasing in the sales tax or VAT and phasing out the income tax over an extended period. With a smooth ten-year phase-in, for example, nominal wages need fall only 2.5 percent per year from their prereform path; if they had been growing 4 percent per year, they can still grow 1.5 percent per year during the phase-in, avoiding outright reductions. However, since firms have an incentive to delay investment while a consumption tax is phased in, it may be better to immediately replace the income tax with a two-part VAT and then phase in a sales tax or traditional VAT and phase out the two-part VAT.

CONCLUSION

Replacing the income tax with a consumption tax—whether in the form of a sales tax, traditional VAT, or two-part VAT (“flat

Table 6
Impact of Tax Reform with Full Accommodation

		Allocation of Decline in Value of Capital		
		Capital	Bonds	Stock
Before tax reform				
Each firm	Value	400	100	300
After tax reform				
First firm	Value (% change)	300 (–25%)	75 (–25%)	225 (–25%)
Second firm	Value (% change)	360 (–10%)	75 (–25%)	285 (–5%)
Third firm	Value (% change)	400 (0)	75 (–25%)	325 (+8%)
Wealth Reallocation Between Household Lenders and Borrowers				
		Combined	Lender	Borrower
Before tax reform		0	100	–100
After tax reform		0	75	–75

tax”)—is likely to reduce the total value of the capital stock. The division of this reduction between bondholders and stockholders and the effects on household lenders and borrowers largely depend on whether the tax is accommodated in the form of a higher consumer price level. Accommodation is unlikely under a two-part VAT, but observers disagree about its likelihood under a sales tax or traditional VAT.

If the consumption tax is not accommodated, the real value of debt changes little. The decline in the value of capital is largely borne by stockholders, and there is little reallocation of wealth between household borrowers and lenders. With full accommodation, the real value of debt is sharply reduced. Bondholders bear heavier burdens than stockholders, and household borrowers gain at the expense of household lenders.

These transitional effects deserve careful attention in the evaluation and implementation of tax reform.

NOTES

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- ¹ For pedagogical purposes, I compare the application of the various tax systems to a fixed level and composition of output. This does not imply that equilibrium output is the same under the different taxes. As discussed elsewhere in this article, the income tax equilibrium differs from the consumption tax equilibrium.
- ² Koenig and Huffman (1998, 25–26), Congressional Budget Office (1997, 7–16), Gravelle (1996, 1422–28), Auerbach (1996, 43–46), and Joint Committee on Taxation (1995, 51–52, 57–58) also describe these tax designs. Another tax system is a personal consumption tax in which each household is taxed on its consumption and firms are not taxed. This design, which has received little attention in the past few years, is not considered here.

- ³ See Viard (2000, 6, 19 note 5) and the references cited therein.
- ⁴ Viard (2000, 7), Bradford (2000, 68), Koenig and Huffman (1998, 26), Congressional Budget Office (1997, 66), Gravelle (1996, 1425), Auerbach (1996, 30–31), and Joint Committee on Taxation (1995, 55) note this equality.
- ⁵ The name is particularly misleading because this tax has the potential to be less flat than the sales tax or traditional VAT. Hall and Rabushka (1995, 55) propose that the household component include a nonrefundable exemption, and another prominent academic supporter, Bradford (2000, 67–70), suggests that it have a progressive rate structure. Bradford calls this tax the X-tax. Koenig and Huffman (1998) and Joint Committee on Taxation (1995, 57) call it the Hall–Rabushka tax, while Hall (1996) calls it the Hall–Rabushka VAT. Congressional Budget Office (1997) calls it the bifurcated VAT.
- ⁶ Intermediate inputs remain outside the tax base because they do not add to net national product. Since they are immediately used up, depreciation always equals production.
- ⁷ Sections 263 and 263A of the Internal Revenue Code prohibit firms from deducting purchases of capital or the costs of producing internal-use capital, while section 162 allows a deduction for intermediate inputs. Litigation has increased in the past decade as the IRS has become more vigilant, albeit selectively, in denying deductions for intangible capital. Section 168 sets fixed depreciation schedules for tangible capital, and section 197 sets a fifteen-year schedule for many purchases of intangible capital. However, section 167 requires that internally produced intangible capital be depreciated over its “useful life,” which is another source of litigation.
- ⁸ If the “new view” of corporate financial policy is valid, firms are at a corner solution in which they issue no new stocks. The perturbation in the text must be modified to have the firm reduce dividends rather than issue securities. Since the imposition of a higher personal tax rate on dividends than on capital gains then has effects similar to those of front-loaded investment incentives, Z can be viewed as including this tax rate differential. Viard (2000, 14–16), Congressional Budget Office (1997, 67), Gillis, Mieszkowski, and Zodrow (1996, 748), and Auerbach (1996, 37, 69) discuss the new view and its implications.
- ⁹ The perturbation reduces production of consumer goods by one unit, but the securities-owning household reduces its purchases by only $(1 - \tau_c)Q$ units. A household that receives lower transfer payments (due to the revenue loss) reduces consumption purchases by $\tau_c Q$, closing the circle.
- ¹⁰ Viard (2000, 8–11) presents this simplified analysis in greater detail.
- ¹¹ Huffman and Koenig (1998, 25), Auerbach (1996, 58–59), and Kotlikoff (1996, 174–76) provide more detail on how tax reform may affect rates of return.
- ¹² Viard (2000, 10), Congressional Budget Office (1997, 67), Gillis, Mieszkowski, and Zodrow (1996, 748), Auerbach (1996, 60), and Joint Committee on Taxation (1995, 87) make this point.
- ¹³ Tax reform is likely to initially reduce the real quantity of money demanded by raising after-tax interest rates and temporarily lowering consumption. So keeping consumer prices unchanged may require slowing money growth.
- ¹⁴ The assumption that the pretax interest rate is unchanged shortly after tax reform is inspired by the previous conclusion that the marginal product of capital is little changed at that time. However, this reasoning is simplistic. Before reform, the pretax interest rate may not equal the net-of-depreciation marginal product because bonds and stocks receive different firm-level tax treatment. Congressional Budget Office (1997, 33–34) and Auerbach (1996, 48–49) discuss this difficult issue.
- ¹⁵ Municipal bonds, which this article does not consider, clearly decline in value because they receive no tax savings (they are already tax-exempt) but are subject to the higher discount rate.
- ¹⁶ Recall the assumption that the current income tax allows borrowers to deduct interest expense. If interest is nondeductible (as it is for some loans), tax reform does not change borrowing costs.
- ¹⁷ For example, Bradford (2000, 111), Koenig and Huffman (1998, 26), and Pearlman (1996, 421) describe this outcome as a “windfall” for bondholders and household lenders. Bradford (2000, 101) and Gravelle (1996, 1445) note that leverage magnifies the impact on stockholders.
- ¹⁸ Variants of this policy are proposed or discussed by Bradford (2000, 110–11), Koenig and Huffman (1998, 26), Pearlman (1996, 420–23), and Hall and Rabushka (1995, 79–80). Pearlman argues that in practice, this policy could reduce total revenue.
- ¹⁹ Pearlman (1996, 408, 413) notes that transition relief is less likely to be offered under a sales tax. Another form of transition relief allows firms to deduct depreciation on existing capital. This relief is most beneficial to short-lived types of capital, as Viard (2000, 11) and Bradford (2000, 110) note. The tax savings flow to stockholders as residual claimants, with no effects on bondholders or household lenders and borrowers. The resulting revenue loss raises the revenue-neutral tax rate.
- ²⁰ With endogenous labor supply, tax reform may initially reduce the marginal product of labor. See Huffman and Koenig (1998, 25), Auerbach (1996, 57–58), and Kotlikoff (1996, 175).
- ²¹ Taylor (1999, 1013–21) surveys the literature on nominal-wage rigidity.
- ²² Bradford (2000, 100–102), Congressional Budget Office (1997, 65–66), Gillis, Mieszkowski, and Zodrow

(1996, 752–53), Hall (1996, 77–78), Auerbach (1996, 44 fn. 29), Gravelle (1996, 1441–42), and Viard (1994) discuss these issues. Most, but not all, of these authors suggest that nominal-wage rigidity will require some accommodation of a sales tax or traditional VAT.

²³ Accommodation also lowers the real value of the \$3 trillion of nominal debt the U.S. Treasury owes to the public, thereby lowering the tax rate required for long-run budget neutrality.

²⁴ Tax reform is likely to reduce the value of consumer-owned capital, such as owner-occupied homes, along with the value of business capital, but for different reasons, reflecting the distinctive tax treatment of consumer capital. See Viard (2000, 11–13), Bradford (2000, 107), and Congressional Budget Office (1997, 66–67).

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