EB-2007-0606

Reference Materials of Union Gas Limited

For Robert Loube

Decision on Southern California Gas Company and San Diego Gas & Electric Company's Phase 2 Post-Test Year 2004 Ratemaking, Earnings Sharing, Incentive Proposals, and 2004 Incentive Proposals, California Public Utility Commission Decision 05-03-023, March 17, 2005

Pages 29-31

Z-Factor

In post-test year ratemaking the Commission has recognized the need to protect both the utility and the customers and allow a way to adjust for unexpected and uncontrollable events. SoCalGas and SDG&E propose that the previously adopted mechanism,[1] a Z-factor, should be continued. The nine criteria[2] for a Z-factor's occurrence are:

1. The event must be exogenous to the utility;
2. The event must occur after implementation of rates;
3. The costs are beyond the control of the utility management;
4. The costs are a normal part of doing business;
5. The costs must have a disproportionate impact on the utility;
6. The costs and event are not reflected in the rate update mechanism;
7. The costs must have a major impact on overall costs;
8. The cost impact must be measurable; and
9. The utility must incur the cost reasonably.

No one opposes the continued use of a Z-factor. Aglet has a different post-test year ratemaking proposal, but alternatively supports ORA who would maintain a $5 million "deductible" for all events before applying a Z-factor. SoCalGas and SDG&E would exclude the deducible for government mandates. ORA cites the SoCalGas example of a change in carbon monoxide inspection services.[3] We need not tinker with the Z-factor: SoCalGas and SDG&E are as randomly likely to have mandates change in their favor, as they are to incur unexpected increases. We will apply the deductible to all Z-factors.

SoCalGas and SDG&E propose, "providing sufficient detail for the Commission to conduct an examination"[4] of the event. Instead, we remind SoCalGas and SDG&E, that the ninth criterion, the reasonableness of the costs as incurred by the applicants,[5] clearly and squarely puts the full burden of proof on SoCalGas and SDG&E to show that they competently responded to the event in a reasonable and efficient manner before they can recover any costs in a Z-factor Memorandum Account.[6] There is no presumption of recovery of an identified event.

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[1] Ex. 155 cites to D.96-09-092 in A. 93-12-029 filed by Southern California Edison. It in turn cited and did not modify the Z-factors as adopted in D.94-06-011 and originally recognized in D.89-10-031. See Findings of Facts 24 and 25, D.96-09-092 (68 CPUC 2d, 275, 311).

[2] The restatement here is a further paraphrasing of SoCalGas and SDG&E's paraphrasing of prior decisions. The intention here is to avoid the specific jargon of PBR proposals by the applicants. The underlying analysis and the Commission's prior adoption of these criteria are found in the appropriate portions of D.89-10-031, D.94-06-011, and D.96-09-092.

[3] Ex. 333, p. 2-15, lines 1-13.

[4] Ex. 155 and 156 at p. 19 and 20, respectively.

[5] Or on an intervenor for any proposed rate decreasing Z-factor event noticed by ORA or others.

[6] See for example, D.02-08-064, dated August 22, 2002, mimeo, pp. 5-8, for a discussion on the standards for a reasonableness review.

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52. In post-test year ratemaking the Commission has recognized the need to protect both the utility and the customers and allow a way to adjust for unexpected and uncontrollable events. SoCalGas and SDG&E have a previously adopted Z-factor mechanism.

53. There are nine identified criteria for a Z-factor's occurrence: the event must be exogenous to the utility; the event must occur after implementation of rates; the costs are beyond the control of the utility management; the costs are a normal part of doing business; the costs must have a disproportionate impact on the utility; the costs and event are not reflected in the rate update mechanism; the costs must have a major impact on overall costs; the cost impact must be measurable; the utility must incur the cost reasonably. No party opposed the continued use of a Z-factor.

54. The Commission has previously adopted a $5 million "deductible" for all events before applying a Z-factor. SoCalGas and SDG&E are as randomly likely to have government mandates change in their favor, as they are to incur unexpected increases. We should apply the deductible to all Z-factors.

55. The sole burden of proof is on SoCalGas and SDG&E to show that they competently responded to the Z-factor event in a reasonable and efficient manner before they can recover any costs in a Z-factor Memorandum Account. There is no reasonable presumption of recovery of an identified event.

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Conclusions of Law

15. SoCalGas and SDG&E both have the burden of proof to justify any future recovery of a Z-factor exogenous event; there is no presumption of recoverability.

In the Matter of Policy and Rules Concerning Rates for Dominant Carriers, CC Docket No. 87-313, FCC 90-314, October 1990; 47 C.F.R §61.45(d)(1)(vi);

Exogenous costs

166. Exogenous costs are in general those costs that are triggered by administrative, legislative or judicial action beyond the control of the carriers. As stated in the Second Further Notice, these are costs that should result in an adjustment to the cap in order to ensure that the price cap formula does not lead to unreasonably high or unreasonably low rates. These costs are created by such events as separations changes; USOA amendments; changes in transitional and long term support; the expiration of amortizations; and the reallocation of regulated and non-regulated costs. Commenting parties sought to add to this list. We discuss below our reasons for treating certain costs as exogenous.

a. Separations changes

167. As with AT&T, we will require an exogenous cost adjustment for changes in interstate costs for LECs that are caused by changes in the Separations Manual. As we explained in the Second Further Notice, these changes are imposed by regulators and are outside the control of carriers. We disagree with Allnet's comment that separations changes should be viewed as a cost of doing business and should not affect the cap. Regulatory decisions that are designed to produce just and reasonable rates must affect the cap in order to ensure that the system results in rates that are just and reasonable. (n173)

> n173 To prevent excessive rate churn, carriers will not be permitted to adjust their PCIs to reflect changes in certain exogenous costs at the time these changes occur. Instead, they will be permitted to adjust their PCI to reflect these changes only once a year on July 1. Such costs are: (1) changes in long term support; (2) changes in transitional support; (3) changes in Subscriber Plant Factor (SPF); and (4) changes in Dial Equipment Minutes (DEM). See Appendix B at 61.45(d)(3).

g. Tax Law Changes

176. We find that tax law changes are presumptively endogenous, despite the arguments of a number of LECs that the GNP-PI will not reflect the costs of tax law changes. As explained in the Second Further Notice, the GNP-PI is a very broad-based price index that measures changes in all costs -- including tax costs -- that affect prices in the economy. To grant LECs exogenous treatment of tax changes that are already accounted for in the GNP-PI would be to "double-count" their effect, a result that is inconsistent with the goals of price cap regulation to encourage cost based rates. Indeed, we have tried to avoid the possibility of such "double-counting" in our treatment of tax law changes for AT&T by presuming such tax changes to be endogenous.

177. Nevertheless, if there are tax law changes imposed at any level of government that uniquely or disproportionately affect LECs (as a class or individually), LECs may request exogenous treatment. We note that a number of parties appear to advocate this treatment. As with AT&T, the LECs that request exogenous treatment for such changes must overcome the presumption that tax law changes are endogenous.

178. LECs argue that tax law changes should be given expedited treatment as exogenous because they are reflected only gradually in the GNP-PI when they should be recognized at the time they change. The timing and extent to which tax law changes are reflected in the GNP-PI are empirical questions that are unknowable. As stated in the Second Further Notice, the flow-through of corporate taxes to prices, and thus to price indexes, has long been a complex and controversial topic in the literature of public finance that cannot, and need not, be resolved as part of this price cap proceeding. (n194)

> n194 Second Further Notice, 4 FCC at 3009 (para. 274). BellSouth argues that investment tax credit amortizations, and the flow back of excess deferred taxes under Section 203(e) of the Tax Reform Act of 1986, should be given immediate exogenous treatment. See BellSouth Comments at 45-46. We note that neither of these tax requirements were made exogenous in the case of AT&T price caps, and that BellSouth has offered no showing as to why these tax requirements should be made exogenous for LECs.

> *Furthermore, BellSouth is the only company that has requested this treatment. Accordingly, we reject BellSouth's argument.*

179. Finally, we deny BellSouth's request to provide specific recitation of the various Internal Revenue Code sections that are referenced by a statement that we made in the Second Further Notice to the effect that nothing in the price cap proceeding is intended to place carriers in violation of the Internal Revenue Code. Listing some code sections might create the mistaken impression that we have somehow selected certain sections of the code that we do not intend to cover. This is not our intention. Rather, our intention is that no section of the Internal Revenue Code, including those specifically noted by BellSouth, be violated by our price cap rules.

A Z factor provides for non-routine rate adjustments intended to safeguard customers and the gas utility against unexpected events that are outside of management's control. Examples include changes in tax rules and natural disasters.

Footnote: It should be noted that changes to federal tax laws would already be incorporated into the inflation factor (GDP IPI FDD).

Investigation by the Department of Telecommunications and Energy on its own motion pursuant to General Laws c 164, § 94, and 220 C.M.R §§ 5.00 et seq. as to the propriety of the rates and charges set forth in the following tariffs: M.D.T.E. Nos. 34 through 68, filed with the Department on April 27, 2005 by Bay State Gas Company, Order No. D.T.E. 05-27, November 30, 2005.

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iii. Exogenous Cost

(A). Introduction

Bay State proposes to recover (or return) exogenous (or Z-factor) costs that are not reflected in the inflation and productivity differential components of the X-factor (Exh. BSG/LRK-1, at 15). The Company has defined exogenous costs to include, but be not limited to, the following: (1) changes in tax laws, accounting principles, and regulatory, judicial, or legislative actions uniquely affecting the local gas distribution industry; and (2) cost changes that are beyond the Company's control and not accounted for in the GDP-PI term used in the Company's PBR plan (id.). According to Bay State, the proposed Z factor is consistent with the Department's precedent and its definition of exogenous costs (id., at 16). Under the Company's proposal, individual exogenous costs will have to exceed a $600,000 threshold in a particular calendar year in order for the Company to request recovery (id., at 15; BSG/JAF-2, at 29). (n224) In its brief, Bay State reiterated the importance of having an exogenous cost and reiterated the threshold of $600,000 (Bay State Brief at 166, citing Exhs. BSG/JAF-1, at 28, BSG/JAF-2, at 29). No other party commented on this issue.

n224 Bay State determined the 224 threshold for the recovery of exogenous costs by multiplying the Company's 2004 test year operating revenues of $481,909,253 by a factor of 0.001253, which the Department established in D.T.E. 98-128 and D.T.E. 01-56, and approved recently for Boston Gas in D.T.E. 03-40 (Exhs. BSG/LRK-1, at 15; BSG/JAF-2, at 29).

(B) Analysis and Findings

The Department has now reviewed definitions of exogenous costs in several ratemaking contexts. D.P.U. 96-50 (Phase I) at 292; D.T.E. 98-31, at 17; D.T.E. 98-27, at 19; D.T.E. 98-128, at 54-55; D.T.E. 01-56, at 25; D.T.E. 03-40, at 488-492. The 1998 and later cases follow D.P.U. 96-50's definition of exogenous costs. Exogenous costs are defined as follows:

> [E]xogenous costs shall be defined as positive or negative cost changes actually beyond the Company's control and not reflected in the GDP-PI, including but not limited to cost changes resulting from:
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> - changes in tax laws that uniquely affect the local gas distribution industry;
> - accounting changes unique to the local gas distribution industry; and
> - regulatory, judicial, or legislative changes uniquely affecting the local gas distribution industry.
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> D.P.U. 96-50 (Phase I) at 292.

Proponents of exogenous cost recovery will bear the burden of demonstrating that the cost was (1) beyond the company's cost control, and (2) not reflected in the GDP-PI. We note that Bay State's proposed definition of exogenous costs is the same as that approved for Boston Gas in D.T.E. 03-40, at 488-492 and D.P.U. 96-50 (Phase I), at 292 (Exh. BSG/LRK-1, at 15). Therefore, the Department accepts the Company's definition.

Bay State has proposed an exogenous cost threshold of $600,000 in the instant proceeding. In D.P.U. 98-128, at 53-56 and D.T.E. 01-56, at 22-26, the Department established the method by which the threshold level for recovery of exogenous costs must be set. We determined that the exogenous cost threshold must be the result of multiplying a company's operating revenues by a factor of 0.001253.225 Applying this ratio to Bay State's operating revenues of $481,909,253 results in an amount slightly over $600,000 (Exhs. BSG/JAF-1, Sch. JAF-1-1 at 2; BSG/JAF-2, at 29).226 We find that this is a reasonable amount for a company with operating revenues of $481,909,253 that is implementing a multi-year PBR plan. Accordingly, we set the threshold for exogenous cost recovery for the term of the PBR plan at $600,000 for each individual event in the preceding calendar year.

A Review of Incentive Regulation
by
Robert Loube[1]

I.   Introduction

Many discussions of incentive regulation assert that current
incentive proposals are superior to traditional regulation because
traditional regulation does not incorporate utility executives
reactions to regulatory constraints into the design of the
regulatory mechanisms.   This assertion is clearly wrong.   Any
history of regulation would reveal that regulators have been aware
of the incentives embedded in traditional regulation and have
attempted to offset these incentives in the design of regulatory
mechanisms.[2] On the other hand, changing circumstances may cause
regulators to alter the regulatory environment. For example, in
response to problems associated with over capacity and high costs
of new plants, regulators developed the least cost planning
paradigm.   Currently,   regulators   are   investigating   several
incentive mechanisms.   These mechanisms will allegedly direct
utilities to provide services in a more efficient manner.   The
purpose of this paper is, first, to establish criteria to evaluate
incentive schemes, and second, to evaluate two new incentive
schemes, price caps and demand side incentives, in light of the
criteria.

II.   Criteria for Evaluating Incentive Schemes

Three general criteria for evaluating incentive schemes are:
(1) there must be a direct link between the incentive offered and
the performance desired, (2) the size of the incentive must be set
high enough to promote the desired action, but not so high that the
owners benefit at the expense of the customers, and (3) counter-
productive tendencies induced by the scheme must be recognized and
eliminated.[3]

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[1]   The author is the Acting Director of the Office of
Economics of the Public Service Commission of the
District of Columbia. The views expressed in this paper
are the views of the author and do not necessarily
reflect the views of the Public Service Commission of the
District of Columbia or its Staff.

[2]   Harry M. Trebing, "Towards an Incentive System of
Regulation," Public Utilities Fortnightly, July 18, 1963,
LXXII:22.

[3]   Daniel Demlow, "Putting Incentives in Public Utility
Regulation," Tenth Annual Conference of the Institute of
Public Utilities, 1978.

An analysis of an incentive plan aimed at increasing power plant availability illustrates these criteria. The plan allowed the rate of return to increase (decrease) depending on the plant availability. The desired result of the plan was to decrease fuel and purchased power costs through the improved operation of low cost base load plant. The counter productive tendencies that might be induced by such a plan include: (1) increases in maintenance costs, and (2) gold-plated plant designs.

This type of plan directly links that the incentive to the desired results. However, no guidelines are available that regulate the size of the award (penalty) needed to change utility behavior. Finally, the plan does contain counterproductive tendencies related to increased maintenance costs and investments.

III. Price Caps

Under price cap regulation, individual service prices are no longer tied to cost of service studies. Instead, prices are allowed to rise with inflation and decline due to productivity offsets. Specific allowances are also made for extraordinary items that can affect utilities in a manner different from the rest of the economy. These items are referred to as exogenous factors.

It is claimed that price cap regulation will reduce cross-subsidies and lead to efficiency gains because (1) it allegedly eliminates the incentive to shift costs among services, and (2) it allows cost reducing behavior to increase profits. The FCC has also determined "that the adoption of price cap regulation for the LECs constitutes an effective complement to cost allocation, reporting and enforcement safeguards, to reduce BOC incentives to cross-subsidize."[4]

This section of the paper will examine (1) whether the theoretical arguments in favor of price cap regulation for the purpose of limiting cross-subsidization are reasonable; (2) whether price cap regulation as it has been established by the FCC can eliminate cross-subsidization in practice; (3) is price cap regulation useful once alternative firms are allowed to enter selective markets.

A. Price Caps and the Incentive to Cross-Subsidize

Cross-subsidization is the support of one service by other services. Throughout the history of telephony there have been many claims that cross-subsidies are used to support universal service or suppress competition. Local Exchange Carriers (LECs) currently

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[4] Computer III Remand Proceedings: Bell Operating Company Safeguards and Tier I Local Exchange Company Safeguards, Report and Order, CC Docket No. 90-623, released December 20, 1991, para. 13.

Price Cap Regulation: Problems and Solutions

Robert Loube

ABSTRACT. *The problems of price cap regulation include: the transformation from rate-of-return regulation, the adoption of a price cap formula, cross-subsidization, and the relationship between regulation and competition. The experience of price cap regulation reveals that it does not protect monopoly customers, and it allows utilities to engage in cross-subsidization. These results imply that the regulator must periodically review price cap results to realign prices with the cost of service and to ensure that a level playing field that would nurture competition develops in every market.* (JEL L9)

I. INTRODUCTION

Price cap regulation will soon be the dominant form of regulation in the telecommunications industry. Various academic economists claim that price caps will improve the economic performance of the telephone industry (Braeutigam and Panzer 1989; Brown, Einhorn, and Vogelsang 1989). They believe that price cap incentives drive companies to operate more efficiently than they do under rate-of-return regulation. Telephone industry representatives assert that the industry requires a more flexible scheme of regulation to meet a tidal wave of competition (USTA 1994a). To the industry, price cap regulation is the optimal path for moving away from the antiquated visible hand of regulation and towards a competitive telecommunications market.

Social policy requires an examination of whether price cap plans in practice fulfill these promises. The following questions must be addressed: First, do the nuts and bolts of each plan comply with the theory of price cap regulation? Second, do utilities in fact operate more efficiently under these new plans? Third, will price cap regulation advance or stifle the growth of competition?

To address these questions, this article reviews the early development and application of price cap regulation. The second section provides a brief history and description of price cap regulation. The third section discusses the transformation from rate

of return to price cap regulation. The fourth section compares alternative methods of constructing the price cap formula, focusing on the Federal Communications Commission's (FCC) experience. Regulatory problem areas are examined in Sections V–VII. In each of these areas, the price cap remedy is compared either to the price cap experience or to price cap proposals. The three regulatory problem areas include technical efficiency, cross-subsidization, and the relationship between regulation and emerging competitive markets.

The paper will show that the FCC's price cap approach has not constrained utility pricing strategies. Utilities have cross-subsidized selected markets. These strategies along with the lack of other safeguards allow telephone companies to stifle competition and do not adequately protect consumers.

II. THE HISTORY AND STRUCTURE OF PRICE CAP REGULATION

The march to price cap regulation in the United States began with the FCC adoption of price caps for AT&T in 1990 and for the interstate access charges of local exchange carriers (LECs) in 1991 (FCC 1989, 1990).[1] Nine states have approved price cap plans

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[1] In the interstate access market, long-distance carriers purchase originating and terminating access to network of local telephone companies. The access market is subdivided into the switched and special markets. The switched market contains three major items. First, common line access charges recover costs associated with the outside plant that connects the customer to

for local service rates (Davis 1994). Many other states are contemplating a similar transformation. Legislation pending before Congress (HR 3636) would dictate that states adopt price cap regulation for telecommunications. In addition, there are proposals to regulate the electric and gas industries via price cap schemes.

The structure of price cap regulation includes a price cap formula (including inflation measures, a productivity offset, exogenous factors), price cap indices, actual price indices, and service baskets. The formula determines the allowed average change in the regulated rates. Rates are allowed to increase according to the inflation measure and to decrease with the productivity offset. Price cap plans differ according to the measures of inflation and the productivity offset included in the formula. For example, the FCC plan uses changes in the Gross National Product Price Index as the measure of inflation, while the Office of Telecommunications plan uses changes in the residential price index as the measure of inflation to regulate British Telecom (Littlechild 1983). The measure of the productivity offset can be (1) the productivity change of a specific company, (2) the industry average productivity change, (3) the industry average productivity change less the national productivity change, or (4) the productivity change that represents the best practices of the industry.[2]

Rates can also change because of changes in exogenous factors. However, the exogenous factors should have a singular impact on the telephone industry. For example, a change in the federal excise tax on telephone services is considered to be an exogenous factor, while a change in the corporate income tax rate would not be considered an exogenous factor because it has a similar effect on all industries.

Due to the fact that telephone companies produce multiple services, the price cap formula focuses on price cap indices rather than an individual price. A price cap index is a weighted average of allowed rates. As with all indices, the construction of the price cap index suffers from problems such as (1) the specification of weights, (2) a means of

combining new services with existing services, and (3) the identification of new services, especially when new services appear to be old services with new names and different prices.

The FCC price cap model does not construct just one price cap index. Instead, it develops an index for each price cap service basket. These baskets are groups of services. The baskets are designed to prevent unreasonable price discrimination and predatory pricing. Within each basket, the prices charged by the utility are combined into an actual price index. The actual price index is allowed to fluctuate between an upper and lower limit. The limits are defined as the price cap index for the basket plus and minus a given percentage. Finally, the task of the regulator is to ensure that the actual price index is within the basket limits. An example of the relationship between the actual price index and the limits is shown in Table 1.

III. THE TRANSFORMATION TO PRICE CAP REGULATION

Currently most Commissions approve rates that allow utilities the opportunity to recover warranted expenses and to earn a fair return on their investments. The transformation from this environment to price caps involves changing the utilities incentive structure, evaluating the reasonableness of existing rates, and modifying regulatory books and records to reflect the earnings of

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the local market. Second, switched charges recover costs associated with use of central office switches. Third, transport charges recover the costs associated with connecting the local central office to the long-distance carrier. Special access is a direct connection from the customer to the long-distance carrier that does not pass through a local switch. Currently, local telephone companies face competition from competitive access providers in the transport and special access markets. Alternative providers will soon provide switched access service.

[2] The change in productivity associated with the best practices in the industry is probably the most desired offset to use because competition forces firms to match the industry leader or suffer the consequences. However, no regulatory commission has adopted this rule.

Input Price Changes

The realism of the price cap formula depends on the assumption that changes in the input prices of the telephone industry match changes in input prices for the entire economy. A measure of U.S. input price change is the sum of the changes in the GNP_PI and the total factor productivity. During a long period prior to divestiture, it appeared that there was a close relationship between the long-run trend in changes in the U.S. input prices and telephone input prices (Christensen 1981). An update of the long-term analysis shows that the relationship appears to be stable (NERA 1994).

However, a recent review of the long-term trend exposes several problems with the assertion of similar trends in telephone and U.S. input prices. First, the annual percentage change in telephone input prices is not explained by the annual percentage change in the total economy input prices. If the price cap formula does not include an offset for this effect, then profits will vary significantly from year to year according to the differences between the annual changes in the two price indices. This variance in profits could jeopardize the financial health of the utility, reduce its access to the capital markets, and retard infrastructure investment.

More importantly, the long-term trend in relative input prices does not appear to continue in the postdivestiture era. From 1984 to 1989, the total economy input prices increased by 24.8 percent while New York Telephone input prices increased by only 4.2 percent. A decline in the price of electronic switches was a major contributing factor to the relatively low rate of growth in telephone input prices (Norsworthy et al. 1993).

This post-divestiture price pattern was also observed in a study of California local exchange carriers. The reported average annual growth rate for telephone input prices was 2.1 percent for the period 1984 to 1991. This rate was 1.6 percent below the average annual increase in the GNP_PI (Roddy 1993). Comparing the GDP_PI to the producer price index for switching and tele-

phone and telegraph apparatus indices further confirms the postdivestiture pattern. Producer price indices reflect the changes only in capital equipment prices. However, these are important indicators in a capital intensive industry. For the period 1986 to 1993, the producer price index for switching equipment increased by 1 percent, and the index for telephone and telegraph apparatus increased by only 10 percent. However, over the same time period, the GDP_PI increased by 30 percent (Kahn 1994).

There is also a growing perception that the costs of telephone equipment and telephone services are, and will be, decreasing. The industry uses equipment produced by the electronics industry. Cost reductions in the electronics industry have led to reductions not only in the price of computers but also in telephone equipment prices. A study of depreciation practices revealed that the economic value of existing telephone equipment has declined precipitously due to the reduced cost of new equipment (Rohlfs 1989). Furthermore, an incremental cost study showed that the monthly loop cost decreased from \$44.66 in 1984 to \$17.11 in 1993, and exchange usage cost decreased from \$3.68 to \$1.11 over the same time period (Gabel 1994). Engineering economic studies of the cable and telephone industries predict that costs will continue to decrease in the future (Reed 1992).

If telephone industry input prices are decreasing or increasing at a slower rate than economy-wide input prices, reflection of that difference in the price cap formula reduces allowed price changes. Removing this term, which is the general practice, creates a price cap mechanism that contains a bias toward excessive price increases.

Bias in the Specification of the Instrumental Variables

The second problem with the derivation of the price cap formula involves a lack of correspondence between the GNP_PI and the total factor productivity measure. The GNP_PI is measured across all goods and

ONTARIO ENERGY BOARD

IN THE MATTER OF *the Ontario Energy Board Act*, 1998, S.O. 1998, c. 15.

AND IN THE MATTER OF an Application by Union Gas Limited for an order approving or fixing rates for the sale, distribution, transmission and storage of gas in accordance with a performance-based rate mechanism commencing in the year 2000.

AND IN THE MATTER OF an Application for an order approving the unbundling of certain rates charged by Union Gas Limited for the sale, distribution and storage of gas.

EVIDENCE OF
JOHANNES M. BAUER
ON BEHALF OF THE
CONSUMERS' ASSOCIATION OF CANADA (CAC) AND THE
VULNERABLE ENERGY CONSUMERS COALITION (VECC)

East Lansing, Michigan, April 11, 2000

specifications. The GDPPI has been as a proxy for input price inflation in other price cap plans. However, rather than a five-year forecast, annual inflation data should be used. In addition, the cap should be annually trued-up to reflect the actual inflation data. Triangulation of the proposed productivity offset against other existing plans as well as against Union's own past performance has raised doubts as to the accuracy of the estimate. A reasonable X-factor would likely have to be in the range of 1.4-1.8%.

5. Pass-trough items need to be defined more narrowly. In particular, the proposed ROE adjustment contradicts the intention of price cap regulation and should be eliminated. The QRAM mechanism for the treatment of certain pass-through items is compatible with a price cap environment and can thus be retained. However, there is no compelling reason to abandon the existing treatment of unaccounted for gas (UFG).

6. Non-routine adjustments need to be limited to legislative and regulatory changes affecting specifically the natural gas industry, changes in generally accepted accounting principles, and structural changes in the scope of utility operations (e.g., the elimination of billing from utility operations). Stranded costs should only qualify as a non-routine adjustment after a full hearing. Costs for additional deliverability or of lawsuits also should not qualify for the streamlined non-routine adjustment process, but only be approved in a more detailed review process.

7. An earnings-sharing mechanism should be introduced as a safeguard against misspecification of the plan parameters. The details of this mechanism will depend on the choice of the productivity offset. A higher upfront productivity offset would warrant a sharing formula attributing a higher share of earnings variances to shareholders. A lower upfront productivity offset would require an earnings-sharing formula that attributes a higher share of variances to ratepayers.
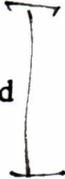
utility more flexibility to adjust prices to market conditions.[5] It also uses a simplified process in determining the benchmark against which the utility needs to perform.

3.2   Price cap plans as proxies for market outcomes

Price cap regulation takes advantage of the basic insight that in a competitive market *(ceteris paribus*, that is, all other things equal) the equilibrium market price will increase if the suppliers are affected by input price inflation (I). On the other hand, it will decrease if suppliers are forced by competition to increase their productivity (X). If both effects are present, the variation of prices over time will be determined by the net effect between inflation and productivity changes ($I-X$). If the entire industry is affected by one-time changes, for example, a tax reduction (tax increase), the market outcome will reflect this event in lower (higher) prices. These relations hold for the entire industry and, hence, reflect average developments. In each period, individual firms may perform better or worse than the average firm.[6] Before we proceed to discuss how price cap plans mimic the outcomes of competitive markets, it may be helpful to illustrate the dynamic relations between market equilibrium and the position of individual firms in more detail.

In a market with multiple suppliers, the equilibrium price is determined by the aggregate performance of all firms. If a firm is able to purchase inputs at prices that are more advantageous than the average procurement prices of the industry it will be rewarded with higher profits. Conversely, if a firm happens to buy at prices that are higher than the industry average its profits will be below the industry average or it may even incur a loss. In the medium and long-run, it is the firms that perform better than the average ("best practice" suppliers) that pressure management of the less efficient firms to improve their performance. Likewise, a firm that is able

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[5] COS with a future test year or regulatory lag models that provide longer time spans between rate cases have similar features.

[6] Somewhat misleadingly, economists refer to the firm that represents the market outcome as the "marginal firm." Firms that perform worse are termed "infra-marginal."

3. Significant cost impacts from lawsuit against the utility related to "judgments against Union respecting the past assessment and collection of delayed payment revenue" and lawsuits related to Y2K issues.

4. Costs related to provide East-end deliverability on the Dawn-Trafalgar transmission system at Parkway for customers who are returned to system gas after being served under direct purchase contracts.

5. Under certain circumstances, costs to provide to provide additional flexibility for customers respecting the amount of volume subject to the 22 day call at Parkway.

6. Rate decreases due to the unbundling of the billing function.

Z-factors in PBR plans are intended to provide a safeguard against factors that are entirely outside of management's control and against which no meaningful precautions exist. As changes that affect the entire economy are generally reflected in the inflation rate, one of the drivers of the price cap index, only factors affecting the natural gas distribution industry ought to be considered. In deviation from other price cap designs, Union bases its price cap plan on a five-year inflation forecast. Nevertheless this inflation measure should reflect anticipated changes to the overall economy. In addition, non-routine adjustments are justified if there are structural changes to the operations of the utility that affect its cost level.

From this perspective, several of the proposed non-routine adjustment factors are too broad-based. The main legitimate non-routine adjustment factors are related to legislative and regulatory change as well as changes in generally accepted accounting principles. However, only changes affecting specifically gas distribution utilities (and not changes affecting the entire economy) should be considered. Should the customer billing function be separated from the utility, the resulting cost impact would also qualify as a non-routine adjustment. It is important

Equity, Efficiency, and the U.S. Corporation Income Tax

J. Gregory Ballentine

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Equity, Efficiency, and the U.S. Corporation Income Tax, by J. Gregory Ballentine, examines the little-understood effects of the corporation income tax, a mainstay of the U.S. federal revenue system. Although the tax legally falls on the incomes of those who own corporate stock, the actual burden is shared by everyone in the economy. Given the diffusion of the burden shown in this study, it is difficult to argue that the corporation income tax meets any well defined goals of equity. Its effect on economic efficiency is also shown to be undesirable. It distorts the allocation of capital in our economy away from its most productive uses, causing a waste of capital; by reducing investment below an efficient level, it causes a capital shortage. Although all taxes induce some inefficiency in the economy, the corporate tax is shown to be the most inefficient of the major taxes. The value of the efficiency lost may, in fact, be equivalent to as much as half the revenue raised by the tax.

J. Gregory Ballentine received his Ph.D. from Rice University in 1974. His major field of study has been the economics of taxation. This book was written while he was associate professor of economics at Wayne State University. He is currently a member of the economics faculty at the University of Florida.

The Incidence of the
Corporate Tax Revisited

John Whalley
Universities of Western Ontario
and Warwick, and NBER

October 1997

WORKING PAPER 97-7

To many, this conclusion was counter-intuitive, and much debate followed as to whether or not there was spurious causation in their analysis in linking the different levels of tax rates to the levels of corporate profits across the sample period. One of the sceptics was Arnold Harberger, who used a completely different methodology to analyse the incidence of the corporate tax. In 1959, and then later in 1962, Harberger produced one of the earliest examples of numerical general equilibrium modelling to analyse corporate tax incidence.

To Harberger, the corporate tax was best viewed as a tax on income received from capital used only in the incorporated sector of the economy. The other non-taxed unincorporated sector contained family businesses and small unincorporated firms, and was particularly concentrated at that time in agriculture, housing and service-related areas, including retailing. Under Harberger's view of the world, the corporate tax applied to the use of one input (capital) in one sector (the incorporated sector); and the tax could be avoided by moving capital into the other non-taxed sector. But, as this occurred, the rate of return on capital in the unincorporated sector would fall. In equilibrium, the net of tax rate of return on capital across the two sectors would be the same, and the corporate tax caused there to be reduced capital in the corporate sector, and more capital in the unincorporated sector.

The incidence question was the extent to which the owners of capital throughout the economy would be affected if the corporate tax were to be eliminated (or changed), i.e. where capital throughout the economy bore the burden of a tax applying to capital use in only one sector. Harberger formulated a model in which there were two separately produced goods, reflecting corporate and non-corporate activity, with demand functions and production functions in the model incorporating elasticity and other parameters. Harberger calibrated the elasticities used in his model to the then-available literature estimates, and combined them with an early benchmark equilibrium data set for the U.S. economy to examine a counterfactual situation showing what would happen if the corporate tax were to be replaced by a lump sum neutral tax raising the same revenue.

Harberger came to the conclusion, based on the parameters then available to him, that the corporate tax was borne fully by capital; i.e. that the corporate tax was shifted backward onto owners of capital income after all general equilibrium adjustments in the economy were complete. It is important to point out that the Harberger model, as constructed and subsequently elaborated on by other authors, was based on an assumption of perfect competition; and hence, the market structure features that Kryzaniak and Musgrave had been concerned about were excluded in his analysis. On the other hand, the logic linking taxes and the incidence conclusion was explicit in the Harberger analytical structure, while missing in the Kryzaniak and Musgrave framework.

Later literature has discussed analytically the link between the market structure and tax shifting (see the discussion in Myles (1995), Chapter 11). Much of this has been in the context of possible commodity tax shifting. A key piece is that by Seade (1985), which shows that the degree to which taxes may be shifted depends on firm strategies, the form of the demand function a firm faces, and the shape of firm cost functions. The choice of strategies reflects the conjectures that firms make as to how other firms may respond to their own actions, and whether these responses are quantity- or price-based. In simple cases, such as linear demand and constant costs, it is possible to show that one half of any commodity tax will be shifted forward; and the intuition suggested by this literature is that market structure matters for any discussion of corporate tax incidence. Seade showed that a

tax could increase after-tax profit in an oligopolistic industry. A more recent piece by Alm (1994) that is relevant to this debate examines the effects of taxes on the number of firms in an industry.

In the 1960s, the Harberger conclusion tended to carry the day in the corporate tax incidence debate because of the internally logically consistent analytical structure used. And for several years following, successive attempts to elaborate and embellish the Harberger model failed to change its basic conclusion. With more sectors or analyses with partially mobile factors, the conclusion remained the same; that capital throughout the economy bore the burden of the corporate tax. Indeed, for a period of nearly 15 years after Harberger's original paper in 1962, the consensus view portrayed by the academic research community was that, despite the Kryzaniak-Musgrave empirical conclusion, the corporate tax was borne largely by capital.

This Harberger conclusion only came under attack in the late 1970s, and then because of the changing focus of public finance research toward the effects of taxation on savings, and especially so in open economies. In a now somewhat neglected 1979 paper, Feldstein et al. offered the analytics that implied that in the Harberger model, the key to finding that capital bears the tax burden is the assumption that, in aggregate, capital is in fixed supply. Put differently, the inter-industry features of the Harberger model have relatively little effect on the final result that capital bears the corporate tax burden. If instead, say an international economy is assumed in which the economy's capital market is fully integrated with world markets, then capital is in perfectly elastic supply internationally, it is impossible for capital to bear the burden of the tax. Hence, the implicit assumption on aggregate capital supply elasticity for the economy under investigation is central to the incidence conclusion as to whether or not the corporate tax is shifted backward onto capital or forward onto consumers, whatever the type of analysis used (econometric or counterfactual model based). In the case of a small open economy participating in an integrated international capital market in which capital is mobile, the conclusion seems inescapable that capital cannot bear the burden of the tax.

This argument changed the perception of the results from the Harberger model from the late 1970s on, and for smaller economies such as Canada, the view has been that international capital mobility issues are central in analysing corporate tax incidence. The discussion subsequently became more complicated because of the role potentially played by the foreign tax credit in the source country in affecting incidence conclusions in the home country.[8] In a similar line of argument to that stressing the importance of integration of international capital markets, if a large portion of capital income accrues to foreign owners of capital used in the country (as in Canada), and if the source countries involved (principally the United States) give credits to investors located there for taxes paid abroad, a portion of the host country corporate tax will, in effect, be borne by the source country's Treasury through the foreign tax credit. As a result, the question of who bears the burden of the corporate tax becomes further obscured because the answer may be, in part, the Treasury of foreign countries because of foreign tax credits.

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[8] See Damus, Hobson, and Thirsk (1991).

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Technical Committee on Business Taxation

The Technical Committee was established by the Minister of Finance, at the time of the March 1996 federal budget, to consider ways of:

- improving the business tax system to promote job creation and economic growth,
- simplifying the taxation of businesses to facilitate compliance and administration, and
- enhancing fairness to ensure that all businesses share the cost of providing government services.

The report of the Technical Committee was released in April 1998, with public consultations to follow the release of the report.

The Technical Committee was composed of a panel with legal, accounting and economic expertise in the tax field. The members are:

Mr. Robert Brown
Price Waterhouse
Toronto, Ontario

Mr. James Cowan
Stewart McKelvey Stirling Scales
Halifax, Nova Scotia

Mr. Wilfrid Lefebvre
Ogilvy Renault
Montreal, Quebec

Professor Nancy Olewiler
Department of Economics
Simon Fraser University
Burnaby, British Columbia

Mr. Stephen Richardson
Tory Tory Deslauriers & Binnington
Toronto, Ontario

Professor Bev Dahlby
Department of Economics
University of Alberta
Edmonton, Alberta

Mr. Allan Lanthier
Ernst & Young
Montreal, Quebec

Professor Jack Mintz, Chair
Joseph L. Rotman School of Management
University of Toronto
Clifford Clark Visiting Economist (1996-1997)
Department of Finance
Ottawa, Ontario

Mr. Norm Promislow
Buchwald Asper Gallagher Henteleff
Winnipeg, Manitoba

The Technical Committee commissioned a number of studies from outside experts to provide analysis of many of the issues being considered as part of its mandate. These studies were released as working papers to make the analysis available for information and comment. The papers received only limited evaluation; views expressed are those of the authors and do not necessarily reflect the views of the Technical Committee.

A list of research studies follows. They may be requested from:

Distribution Centre
Department of Finance
300 Laurier Avenue West
Ottawa, Ontario K1A 0G5
Telephone: (613) 995-2855
Facsimile: (613) 996-0518

They are also available on the Internet at http://www.fin.gc.ca/

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Technical Committee on Business Taxation
Research Studies *(Cont'd)*

☐ **WORKING PAPER 97-1**
The Sensitivity of the Corporate Income Tax to the Statutory Rate
Peter Dungan, Steve Murphy, Thomas A.Wilson (University of Toronto)

☐ **WORKING PAPER 97-2**
The Income Tax Compliance Burden in Canadian Big Business
Brian Erard (Carleton University)

☐ **WORKING PAPER 97-3**
Taxes, the Cost of Capital, and Investment:
A Comparison of Canada and the United States
Kenneth J. McKenzie (University of Calgary)
Aileen J. Thompson (Carleton University)

☐ **WORKING PAPER 97-4**
Tax Policy and the Dynamic Demand for Domestic and Foreign Capital
by Multinational Corporations
Rosanne Altshuler (Rutgers University)
Jason G. Cummins (New York University)

☐ **WORKING PAPER 97-5**
Tax-exempts and Corporate Capital Structure
Thomas A. Wilson and *Steve Murphy* (University of Toronto)

☐ **WORKING PAPER 97-6**
A Critical Review of the Empirical Research on Canadian Tax Compliance
Brian Erard (Carleton University)

☑ **WORKING PAPER 97-7**
The Incidence of the Corporate Tax Revisited
John Whalley (Universities of Western Ontario and Warwick, and NBER)

☐ **WORKING PAPER 97-8**
Efficiency Considerations in Business Tax Reform
John Whalley (Universities of Western Ontario and Warwick, and NBER)

☐ **WORKING PAPER 97-9**
Tax-exempt Organizations and the Financing of Taxable Businesses
Thomas E. McDonnell (The McDonnell Consulting Corporation, Toronto)

☐ **WORKING PAPER 97-10**
Tax-exempts and Corporate Capital Structure: An Analysis of Efficiency
and Revenue Implications
James Pesando, Michael Smart and *Thomas A. Wilson* (University of Toronto)

Working Paper Series
Congressional Budget Office
Washington, D.C.

International Burdens of the Corporate Income Tax

William C. Randolph (email: william.randolph@cbo.gov)
Congressional Budget Office
Washington, D.C.

Table 8: Corporate Tax Burden Shares and Relative Economy Size, Burdens Measured on a Per Capita Basis[a]

	Share of World Output	Per Capita Burden Shares			
		Labor	Capital	Land	Total
Domestic	1%	104.3%	2.6%	-2.1%	104.8%
Foreign	99%	-1.0%	1.0%	0.0%	0.0%
Domestic	5%	100.0%	6.8%	-2.1%	104.7%
Foreign	95%	-5.1%	5.2%	-0.1%	0.0%
Domestic	10%	94.7%	12.0%	-2.2%	104.5%
Foreign	90%	-10.3%	10.4%	-0.1%	0.0%
Domestic	20%	84.1%	22.3%	-2.3%	104.1%
Foreign	80%	-20.4%	20.7%	-0.3%	0.0%
Domestic	30%	73.7%	32.5%	-2.5%	103.7%
Foreign	70%	-30.5%	30.9%	-0.4%	0.0%
Domestic	50%	52.9%	52.7%	-2.7%	103.0%
Foreign	50%	-50.5%	51.2%	-0.7%	0.0%
Domestic	70%	32.5%	72.7%	-3.0%	102.2%
Foreign	30%	-70.3%	71.2%	-0.9%	0.0%
Domestic	90%	12.3%	92.4%	-3.2%	101.5%
Foreign	10%	-89.7%	90.9%	-1.2%	0.0%
Domestic	~100%	2.3%	102.2%	-3.3%	101.2%
Foreign	~0%	0.0%	0.0%	0.0%	0.0%

[a] Local per capita burdens divided by domestic per capita revenue.

Economic Report
of the
President
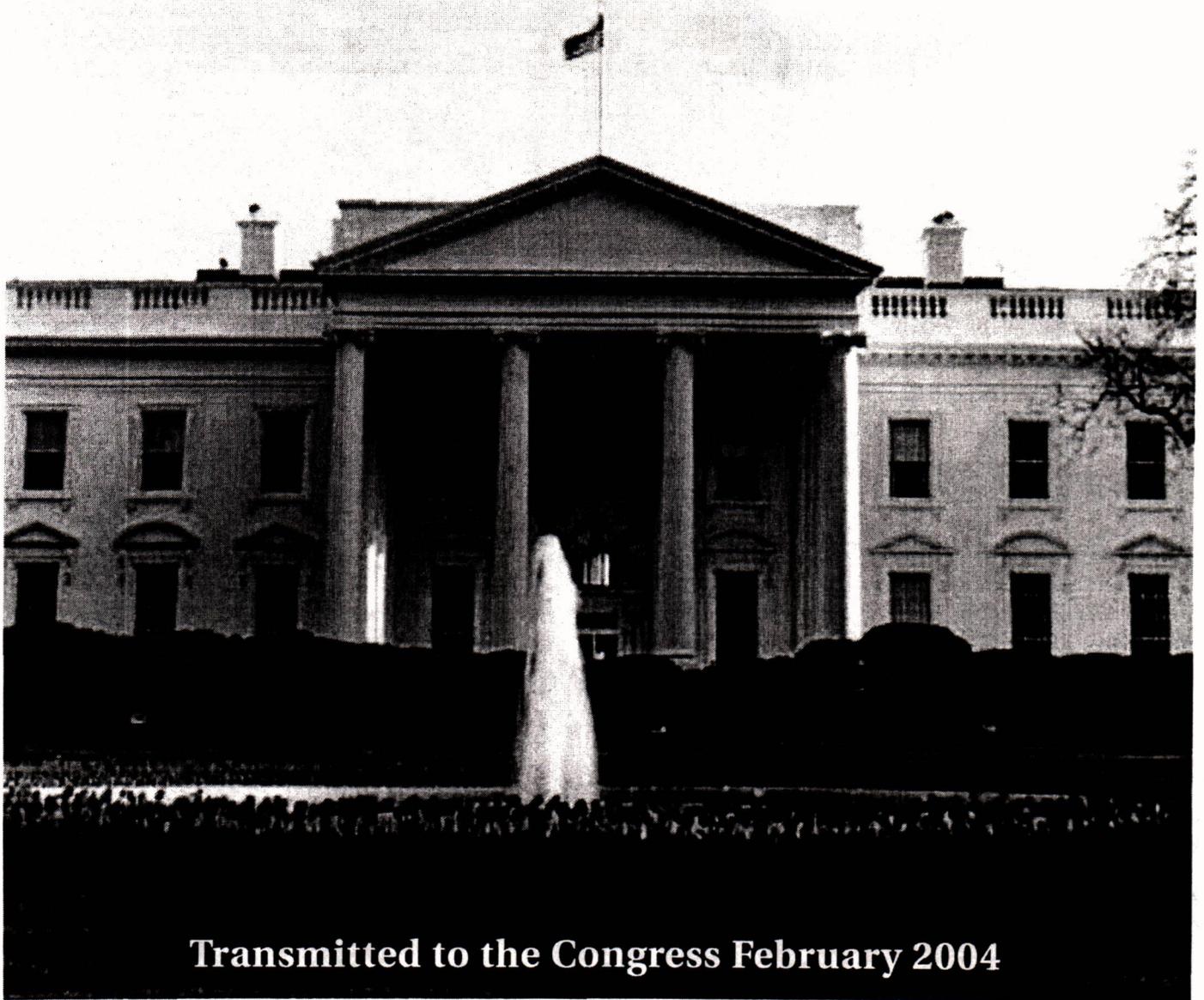
For example, the corporate income tax is likely to be shifted across sectors. This tax applies only to the corporate sector, but the above analysis suggests that the burden is shared by owners of capital in both the corporate and noncorporate sectors. Similarly, tax provisions that apply to only a single industry are likely to ultimately affect owners of capital in all industries.

Shifting to Workers

Shifting across sectors may not be the most important way in which the burden of capital income taxes is shifted. In the long run, much of the burden of capital income taxes (whether imposed at the firm or individual level) is likely to be shifted to workers. The reason is that such taxes reduce investment, which diminishes the capital stock. With a smaller capital stock, the before-tax rate of return to capital is higher, offsetting part of the burden that the owners of capital would otherwise bear. Also, workers are less productive because they have a smaller capital stock to work with and earn lower real wages. Part of the tax burden is therefore shifted to workers.

In accordance with the insights obtained by studying the incidence of excise taxes, owners of capital bear less of the burden if the supply of capital is more responsive to changes in its after-tax rate of return. This responsiveness, and hence the extent to which capital income taxes are shifted, depends upon several factors, including the amount of time that has elapsed since the tax was imposed, the willingness of consumers to substitute between current and future consumption, and the extent to which capital can escape the tax by relocating abroad.

The time frame is very important. The shifting of the tax burden to workers is likely to occur slowly because it takes time for large changes in the capital stock to occur. In the short run, the tax causes little change in the capital stock, because most of the capital on hand was already in existence when the tax was adopted. With little change in the capital stock, very little of the burden is shifted from owners of capital to workers. Over time, however, the tax has a greater impact on the capital stock as it discourages the accumulation of new capital. As a result, more of the tax burden falls on workers and less falls on owners of capital.

Under certain assumptions, the entire burden of the capital income tax is shifted to workers in the long run, although owners of capital bear much of the burden in the short run. A textbook model of economic growth, called the Ramsey model, provides an illustration of this effect. (The Appendix to Chapter 5, *Dynamic Revenue and Budget Estimation*, explains the basic features of this model.) Using plausible values for the key inputs to the Ramsey model demonstrates that the economy adjusts only gradually to a capital tax increase. Initially, 100 percent of the burden of a capital tax increase is borne by the owners of capital, since they have already invested

in the capital currently in place. Five years after the tax increase, about a quarter of the tax burden has shifted to workers. Ten years after the tax increase, workers have taken on over 40 percent of the burden. It takes 50 years for the burden to shift nearly completely—by that time, capital owners bear only 6 percent of the burden and workers bear 94 percent.

If consumers are more willing to substitute between present consumption and the future consumption made possible by their savings, saving is more responsive to the after-tax rate of return and more of the capital income tax is shifted. The responsiveness of saving to the after-tax rate of return also depends on consumers' planning horizons. The Ramsey model assumes that consumers consider the impact of their saving decisions on their descendants. If, instead, consumers plan only for their own lifetimes, saving is less responsive to changes in its after-tax rate of return and less of the capital income tax burden is shifted to workers.

International capital flows also play a role. If the tax applies only to capital located in the United States and capital is mobile across international boundaries, the tax is more likely to be shifted to workers. The above example assumes that there are no international capital flows; incorporating such flows would increase the speed at which the tax is shifted.

Empirical work provides some evidence that capital income taxes are shifted to some extent: studies find that the before-tax return to capital income is higher when the tax rate on capital income is higher. However, the picture is not entirely clear, because other factors may cause tax rates and before-tax rates of return to move together.

The belief that a large portion of the capital income tax burden is shifted in the long run is common in the economics profession. In a 1996 survey, public finance economists were asked to state "the percentage of the current corporate income tax in the United States that is ultimately borne by capital." The average response was 41 percent, and three-quarters of the respondents gave answers of 65 percent or less. This survey indicates that the average public finance economist believes that more than half of the tax is eventually shifted from the owners of capital to workers or other groups.

Because labor income is more evenly distributed across taxpayers than capital income is, recognizing that part of the burden of capital income taxes is shifted to workers reveals that high income taxpayers bear a smaller share of the burden than is often assumed. Chart 4-1 classifies households by their levels of total income and tabulates the share of national labor income and national capital income earned by different groups. The chart shows, for example, that the 10 percent of households with the highest total incomes receive 37 percent of labor income and 62 percent of capital income. If half of capital taxes are shifted to workers in the long run, the fraction of the burden falling on this high-income group is reduced from 62 percent to 49 percent; if all capital taxes are shifted to workers in the long run, the high-income share of the burden falls to 37 percent.

among models, a set of models could be applied to clearly defined and relatively simple hypothetical policies. This would allow the different models' results to be compared and would make it easier to attribute any variation among their results to differences in their assumptions. As mentioned above, the JCT did such an exercise in 1997 when exploring the possible effects of fundamental tax reform. The CBO and the JCT also used a variety of models in their dynamic analyses in 2003. Presenting dynamic revenue estimates as supplementary information rather than as part of the official revenue estimates facilitates the use of a variety of models.

One reason that dynamic revenue estimation is subject to so much uncertainty is that fiscal changes may have important effects that are left out of standard models of economic growth. For example, standard growth models take the rate of technological progress as given. Some research, however, has suggested that technological progress may be a by-product of capital accumulation; if so, changes in capital income taxes can alter the rate of technological progress. As another example, standard models take the economy's equilibrium level of unemployment as given. Yet some research has indicated that the equilibrium unemployment rate depends on productivity growth, which can also be influenced by changes in capital taxation. Incorporating such nonstandard effects into dynamic revenue estimation is undoubtedly a formidable challenge, but if initial results on these effects are confirmed by future research, this challenge should not be avoided.

Conclusion

Fully dynamic revenue estimation that incorporates macroeconomic behavioral changes is an important step forward in applying economic insights to policy analysis. Significant progress has been made on this front; continued progress is essential to sound policy making.

Appendix: The Model Used in the Capital-Tax Example

The model underlying the capital-tax example is the growth model developed by Frank Ramsey in 1928. It is a leading textbook model, and most of its assumptions are standard among models of economic growth. For instance, output is produced by combining capital and labor, and productivity growth increases how much output a given amount of capital and labor can produce. Consumers maximize their welfare by deciding how much of their income to save. Businesses maximize profit and compete when hiring workers and selling products. Over the long term, the saving rate determines the capital stock and, thus, the level of output in the economy. The Ramsey

model allows consumers to choose their saving rate, while simpler models impose a constant saving rate estimated from historical data.

Unlike some other models, the Ramsey model assumes that consumers are members of families comprised of an infinite number of generations and that they care about the well-being of their descendants. This means that consumers consider the effects of their choices on their children and subsequent generations. Some critics of the Ramsey model view this assumption as unreasonable. However, the results presented in the text do not change substantially if we assume that people care less about each successive generation and, for generations far enough into the future, hardly consider their welfare at all.

In the Ramsey model, the long-run equilibrium for the economy can be described by two relationships. Firms invest in capital equipment until the value of the output produced by the last unit of capital equipment just equals the interest rate—the cost borne by the firm to invest. The interest rate is, in turn, determined by consumers' choices about their consumption and savings. These choices depend on the growth rate of technology, the discount rate (a measure of how much consumers prefer having a dollar today compared to a dollar in one year), and consumers' flexibility with regard to spending in different time periods. To solve the model, we must make an assumption about how the government finances policy changes in the long run. In the capital-tax example, we assume that the government adjusts transfer payments accordingly.

Knowing this long-run equilibrium allows us to calculate the impact of a cut in tax rates on tax revenue taking into account the aggregate dynamic effects that this chapter has described. In particular, we can summarize the difference between a dynamic analysis and a static analysis with a few key parameters, or inputs, to the model. We assume that the tax rates on labor and capital income are each 25 percent, capital's share of total income is one-third, and the elasticity of substitution between capital and labor is one. Then, if dynamic effects are considered, a capital tax cut reduces tax revenue in long-run equilibrium by half as much as a static analysis would indicate.