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SOCIAL SECURITY AND PRIVATE SAVING: AN EXAMINATION OF FELDSTEIN"S NEW EVIDENCE

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I. Introduction

In a recent article in the Journal of Political Economy (Leimer and Lesnoy 1982), hereafter referred to as New Evidence, we presented new time series evidence that cast considerable doubt on earlier evidence presented by Martin Feldstein (1974) which implied that social security had a large and statistically significant negative effect on personal saving in the United States. Our results may be summarized as follows: First, the social security wealth variable used by Feldstein was seriously flawed as a result of a computer-programming error. Simply correcting this error substantially changes the estimated effect of social security on saving. Second, the statistical evidence depends upon assumptions which are embedded in the construction of the social security wealth variable. These assumptions relate, first, to how individuals form their expectations about the social security benefits they expect to receive and the social security taxes they expect to pay and, second, to estimates of the number of workers, dependent wives, and surviving widows who will receive benefits. Adopting reasonable assumptions that differ from those used by Feldstein leads to generally weaker estimates of the relationship between social security and saving. Finally, the estimated relationship between social security and saving is acutely sensitive to the period of estimation examined. We concluded that the time series evidence simply does not support the hypothesis that social security has substantially reduced personal saving in the United States.

In his reply to our paper, Feldstein (1982b), hereafter referred to as Reply, contends that our evidence ignored the 1972 amendments. He argues that if the analysis is limited to 1930-71, the results (although not significant by conventional standards) support his original conclusions. Alternatively, he argues that if the years after 1971 are included, the best way to incorporate the 1972 amendments is to compute a "revised" gross SSW series by simply increasing his corrected series by 20 percent beginning in 1972. When this revised variable is used, he finds that his original conclusion is supported for the period 1930-74. He dismisses our algorithm on the basis that our modifications are inappropriate if not perceived by workers. He similarly criticizes all of our alternative perception assumptions as introducing errors-in-variables biases if his perception assumption is correct. He argues that regressions using net social security wealth are inappropriate and that regressions using both prewar and postwar data are preferred to those using postwar data only. Finally, he argues that studies using other types of data, namely microeconomic household data and international cross-section data, support his original conclusion that social security substantially reduces private saving.

The concluding section of our J.P.E. article included a summary of our examination of Feldstein's new evidence. Because of space limitations, our discussion was quite brief and the statistical evidence supporting our comments was omitted. The purpose of this paper is to fill in the details, and to provide the statistical evidence underlying our summary comments. Our findings may be summarized as follows:

First, Feldstein's results are sensitive to revisions in data. If we reestimate the consumer expenditure function using Feldstein's revised SSW variable in conjunction with recently revised national income data for the other variables, the estimated SSW coefficients are smaller and no longer significant for any period. (See Section II.)

Second, Feldstein's assertion that we failed to incorporate the 1972 amendments is quite misleading. All of our perception assumptions, with the exception of the Feldstein constant-ratio perception, incorporate the effect of the 1972 amendments. (We differ in that we also incorporate the effect of all other amendments.) The Feldstein constant-ratio assumption is the same assumption Feldstein adopted when he first extended his SSW series and estimates to 1974. (See Feldstein 1978, 1979.) He now rejects this assumption. (See Section III.)

Third, our conclusions in New Evidence do not depend on the sample period including post-1972 data. Our results are essentially the same if we consider only data preceding the 1972 amendments and terminate the periods of analysis in 1971. (See Section IV.)

Fourth, Feldstein's characterization of the 1972 amendments is incorrect, and his 20 percent adjustment procedure is inconsistent with the actual postretirement, price-indexing provision of that legislation.

Correctly modeling this provision yields weaker and insignificant results. The 20 percent adjustment procedure is also inconsistent with Feldstein's own discussion of a gradual adjustment to the 1972 legislation. Modeling this gradual adjustment to the 1972 legislation also yields weaker and insignificant results. (See Section V.)

Fifth, our alternative algorithm for constructing social security wealth is technically superior and provides better estimates of the number of persons likely to receive benefits. Not only does the evidence based on this algorithm contradict Feldstein's results but also, if we use our algorithm to develop a variable analogous to Feldstein's revised variable, we obtain small, insignificant estimates of the SSW coefficient. Feldstein's conclusion depends not only on his revised perception assumption but also on his algorithm for computing social security wealth. (See Section VI.)

Sixth, his appeal to an errors-in-variables bias requires that he knows the conceptually appropriate perception of social security wealth. Despite Feldstein's arguments, we simply do not know how -- or even whether -- individuals form perceptions of social security wealth. We are skeptical, however, that individuals' perceptions of the benefit ratio were not altered by changes in legislation other than the 1972 legislation. If other major legislation is incorporated in Feldstein's revised SSW variable, his results are totally contradicted. His results are also contradicted if it is assumed that individuals differ in their perceptions of social security wealth. (See Section VII.)

Seventh, although time series analysis clearly has its limitations, the fact that the postwar evidence is inconsistent with Feldstein's position cannot be attributed to these limitations. As for the cross-country and household studies, in our evaluation, these bodies of evidence are inconclusive. (See Section VIII.)

Our conclusion remains that the time series evidence does not support the hypothesis that social security has reduced private saving.

II. NIPA Benchmark Revisions

The estimates in both our New Evidence and Feldstein's Reply are based on the national income and product accounts (NIPA) as revised in 1976. In December 1980 there was another benchmark revision of the national income and product accounts. Newly available and revised source data were incorporated, and certain definitions, classifications, and estimating procedures were improved. 1/

The estimates in this paper are based on these revised data. We begin by re-estimating the key regressions presented in Feldstein's Reply which use the Feldstein revised SSW variable. 2/ Table 1, Section A summarizes

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1/ See Bureau of Economic Analysis staff, "The National Income and Product Accounts of the United States: An Introduction to the Revised Estimates for 1929-80," Survey of Current Business, Volume 60, Number 12 (December 1980), pp. 1-37.

2/ Reply, Table 1, equations 1.3, 1.5, 1.7, p. 633. Note that the corrected and revised SSW variables are identical for 1930-71.

the SSW regression coefficients; complete regressions are presented in the Appendix, Tables A.1, A.4, and A.7. 3/

The coefficients presented by Feldstein in Reply are reproduced on line A.1. We first reestimated the consumer expenditure function using the data from New Evidence for all variables except social security wealth. The social security wealth variable is Feldstein's revised SSW variable (Reply, Appendix, p. 641). The reestimated SSW coefficients appear on line A.2 and are quite similar to those obtained by Feldstein. We then reestimated the consumer expenditure function, again using Feldstein's revised SSW variable, but using our data (which incorporate the recently revised NIPA data) for all other variables. These coefficient estimates appear on line A.3. For all three periods -- 1930-71, 1930-74, and 1930-76 -- the estimated SSW coefficients and t-ratios are smaller when we use the data set incorporating the recent NIPA revisions. None of the coefficients are significant. Thus, Feldstein's results are sensitive to data revisions.

3/ It should be noted that the period notation we have adopted differs from that of Feldstein and may cause some confusion. He refers to the full period as 1929-; we refer to this same period as 1930-. We both use official NIPA data which are available only since 1929. The 1929 value of disposable income is used as the lagged value of disposable income for 1930. All other variables therefore begin in 1930. The source of the confusion is that in his 1974 article, the period referred to as 1929-71 included 1929 NIPA data for all variables except lagged disposable income. The 1929 value of YD_{-1} was the 1928 value of disposable income published in Long Term Economic Growth, 1960-1970, Bureau of Economic Analysis, 1973, Series A39, pp. 188-89. The period notation used by Feldstein in his Reply (and in Feldstein 1978, 1979) is not consistent with the notation of the original article.

III. Recognizing the 1972 Legislation

Feldstein's discussion in Section II of his Reply may leave the reader with the impression that, by terminating sample periods in 1974, our analysis in New Evidence ignored the 1972 Social Security legislation.

> "Leimer and Lesnoy estimate a somewhat smaller effect of social security wealth with a larger standard error in their basic replication equation because of a difference in the sample period. As I explain in Section II, there was a fundamental change in the social security law in 1972. It is difficult to know how rapidly and in what way the public's perception of social security wealth altered in response to this change. It is wrong to include years after the initial sample period (which ended in 1971) without taking the law change into account but difficult to know how to do so. It is important, therefore, that the results for the pre-1972 period presented in Section I do support my earlier conclusion. Section II also presents estimates for a sample that includes post-1971 years with the social security wealth modified in a way that captures the most basic features of the 1972 legislative change. These estimates indicate a somewhat larger and statistically more significant effect of social security wealth than the corrected replication for the original period presented in Section I." (Reply, p. 631.)

> "Leimer and Lesnoy report results only for the period through 1974 and use a social security variable that completely ignores the major shift that occurred in 1972." (Reply, p. 636.)

First, our purpose in reporting results only for the period through 1974 (instead of for the original period ending in 1971) was to facilitate comparison with the then most recent results published by Feldstein (1978, 1979). In these studies, Feldstein updated his SSW series to 1974 and reestimated the consumer expenditure function using NIPA data as revised in January 1976. As noted by Feldstein, these revised estimates of national income and its components embodied a number of improvements, particularly in the measurement of corporate retained earnings. Based on this reestimated consumer expenditure function, Feldstein concluded: "The earlier estimate is thus affected hardly at all by extending the sample period [from 1971 to 1974] and using the newly revised national income account data." (Feldstein 1978, p. 42). Since the data used in Reply were also based on the revised NIPA concepts, it appeared most useful, for purposes of comparison, to report results for the sample period ending in 1974. In the following section, we present estimates for periods terminating in 1971. Our conclusions are unchanged.

Second, and more important, it should be clear that our social security wealth variables do incorporate the 1972 legislation. As we stated (New Evidence, p. 613):

> "For the Feldstein constant-ratio perception, we adopt the same assumption that Feldstein (1978, 1979) used in extending his SSW series to 1974; that is, the average benefit ratio for the period 1940-71 is used for the entire period 1937-74. All of the other perceptions assume that individuals continually adjust their benefit expectations in response both to changing income levels and to amendments to the social security law, including the major amendments in 1950 and 1972."

Indeed, one of the motivations prompting our research was that we questioned Feldstein's original assumption of a constant benefit ratio. It seemed unreasonable to assume, as he did, that individuals did not adjust their perceptions of social security wealth in response to the major changes in benefit legislation that had been enacted since the inception of the Social Security program.

Feldstein's statements in Reply are particularly misleading since as late as 1979, he had ignored the 1972 legislation in updating his variable to 1974. It was not until 1980, in reaction to our new evidence, that Feldstein realized that it was necessary to incorporate the effect of the 1972 legislation (Arenson, 1980). We have always assumed that individuals adjusted their valuation of social security wealth in response to the 1972 amendments. Where we differ from Feldstein's present position is that, first, we believe that individuals also responded to amendments in other years, and second, we do not presume to know how individuals adjusted their expectations in response to various legislated changes. That is why we developed measures of social security wealth which incorporated alternative benefit and tax perceptions. These ideas are developed in Section VII below. In addition, as discussed in Section V, we believe that Feldstein's interpretation and implementation of the 1972 legislation is incorrect and his new results are quite fragile.

IV. The Sample Period with 1971 as the Terminal Year

Feldstein states that when he corrects the computer programming error and reestimates the consumption function for the original sample period using the "corrected Feldstein" SSW variable and new national income data (including the 1976 revisions but excluding the December 1980 revisions), he obtains a large and statistically significant SSW coefficient (see Table 1, line A.1, column 1):

> "The coefficient of the social security wealth variable is reduced to 0.015 with a standard error of 0.0095. The corresponding t-statistic [1.58] implies that the

> probability of observing such a large coefficient if the true value were not positive is less than 0.08...In short, correcting the programming error (as well as accepting the Department of Commerce's corrections in the national income data) reduces the coefficient of social security wealth from its original published value but implies an effect that is both statistically significant and economically very large." (Reply, pp. 132, 134.)

First, it should be noted that Feldstein's interpretation is based on a one-tailed hypothesis test. That is, the null hypothesis is that the true coefficient is zero; the alternative hypothesis is that the true coefficient is positive. This alternative hypothesis is not consistent with the hypothesis implied by Feldstein' original 1974 article. A summary of Feldstein's original position is found in Feldstein (1976):

> "Consider the example of social security. In the traditional life cycle model, the introduction of a public program that provides retirement benefits unambiguously reduces the amount of personal saving. However, in the extended life cycle, there is a second effect of social security that tends to increase personal saving. By providing transfer payments to older persons who retire, social security induces the aged to reduce their supply of labor. This reduction in working years and the resulting increase in the period of retirement induce additional saving. The net effect of social security on the saving of the non-aged is indeterminate and depends on the relative strength of the traditional "saving replacement effect" and the new "induced retirement effect." (p. 78, our underlining.)

This analysis suggests that a two-tailed hypothesis test should be used. That is, the alternative hypothesis should be that the true coefficient of SSW in the consumption function is either positive or negative. This more agnostic approach is also supported by the intergenerational bequest model developed by Barro (1974, 1978) and by the behavioral and learning explanations suggested respectively by Katona (1965) and Cagan (1965). If a two-tailed test is used, Feldstein's estimated type-I error doubles to .16, weakening his conclusion. It may also be noted that Feldstein's statement that the estimated coefficient is statistically significant somewhat stretches the conventional significance level of 5 percent. For the remainder of this paper, we will base our significance tests on a two-tailed hypothesis test and a 5-percent level of significance.

Second, as discussed above, the results are somewhat weaker if NIPA data based on the December 1980 revisions are used. The estimated coefficient of SSW is .013; the standard error is about the same, .094; the corresponding t-ratio is 1.35. (See table 1, line A3, column 1.)

Third, Feldstein insists on ignoring evidence for alternative sample periods. Consider the evidence for the sample periods 1931-71 and 1947-71. Estimates are based on our data (with revised NIPA data) for all variables except social security wealth. The social security wealth variable is Feldstein's revised SSW variable. If we shift the sample period one year to 1931-71, the estimated coefficient of SSW falls to .000; the t-ratio falls to .01. (See line A3, column 2.) If we use the post-war period, 1947-71, for our sample period, the estimated coefficient of SSW is -.057, and with a t-ratio of -3.55, is statistically significant. (See line A3, column 3.) The negative coefficient implies that social security has a very large positive effect on personal saving. The size of the effect is so large, however, that the result is implausible. 4/ However one chooses to interpret this result, it is clearly inconsistent with Feldstein's hypothesis that social security reduces personal saving.

Finally, as stated in New Evidence (pp. 616-617), the conclusions based on alternative SSW variables are essentially the same if we terminate our sample periods in 1971 instead of 1974. Estimated coefficients of the gross SSW variable using alternative perceptions and algorithms, with sample periods terminating in 1971, are summarized in Panels B and C of Table 1. (Detailed estimates of the consumer expenditure functions appear in Appendix A, Tables A.1-A.9.) To facilitate comparison, we have also used the revised NIPA data to reestimate consumer expenditure functions for the sample periods ending in 1974 and 1976.

For 1930-71, all estimates of the SSW coefficient are insignificant and, with the exception of the constant ratio and perfect foresight SSW variables constructed using our Feldstein replica algorithm, all estimates of the SSW coefficient are essentially zero. If we shift the initial year

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4/ For example, in 1971 the value of Feldstein's revised SSW variable was \$1,734.2 billion (in 1972 dollars). The coefficient of -.057 implies that personal saving was 98.8 billion larger in 1971 than it would have been if the value of social security wealth was zero. Actual saving in 1971 was \$62.9 billion. Thus, our result implies that in the absence of social security, personal saving would have been -\$35.9 billion.

one year, all SSW coefficient estimates are approximately zero and insignificant. And if we consider only the post-war period, 1947-71, not only do all SSW coefficient estimates become negative, but also, with the exception of the SSW variables based on the actuarial projection perception, all are clearly significant.

For the Feldstein replica (constant ratio) variable, it is true that if we consider the sample period 1930-71 instead of 1930-74, the estimated coefficient increases from .008 to .013, and its t-ratio increases from .75 to 1.22 -- still far from significant. It is also true that by simply dropping 1930 from the sample period, we obtain an estimated SSW coefficient of -.003 with a t-ratio of -.28. And, if we limit the sample period to the post-war years, 1947-71, we obtain an estimated coefficient of -.062 with a t-ratio of -3.50. This is the same pattern that we observed above when we used Feldstein's revised SSW variable in conjunction with our data set for the remaining variables. (See Table 1, lines A.2 and A.3.)

To sum up, if one believes that, because of the difficulty of incorporating the 1972 legislation in the social security wealth variable, the years after 1971 cannot usefully be included in a study of the effect of social security on saving -- a view that we do not share -- our conclusion remains unchanged. There is no statistically significant evidence that social security has reduced saving. Indeed, there is stronger evidence for the view that social security has increased saving. We are skeptical, however, that one should draw this conclusion.

V. Modeling the 1972 Legislation

Feldstein describes the 1972 legislation as follows:

> "In 1972, Congress voted a major change in the way benefits are calculated and adjusted. Starting in that year, benefits would no longer be based on an average of nominal earnings but would instead be based on the retiree's previous earnings relative to a national average of earnings in each previous year. In addition, an individual's benefits after retirement would be automatically increased each year by the percentage rise in the consumer price index. By these two indexing changes, Congress hoped to insulate social security from fluctuations in the price level and the inflation rate."
>
> "In the same 1972 legislation, Congress also raised social security benefits by approximately 20 percent. Since the indexing provisions would prevent this benefit increase from being eroded by future inflation, the change was intended by Congress as a permanent 20 percent rise in the level of benefits. In the future, real benefits would grow with the real growth of the economy and at a level 20 percent higher than it had been in the past." (Reply, p. 634.)

This description contains several errors. 5/ More important, even if one accepts Feldstein's interpretation of the 1972 amendments, the procedure adopted to implement the changes is questionable. This procedure is "to raise all social security benefits by 20 percent for the years beginning in 1972 and thus to calculate an aggregate SSW variable for all such years that is 20 percent greater than it would be if the old algorithm were used instead." (Reply, p. 635). That is, the "corrected" SSW series is simply increased by 20 percent beginning in 1972. This

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5/ First, basing benefits on an average of the retiree's previous earnings relative to a national average of earnings--referred to as "wage-indexed" earnings--instead of nominal earnings was part of the 1977 legislation, not the 1972 legislation. Second, the real increase in benefits from the date of the previous benefit increase, January 1971, to the effective date of the legislation, September 1972, was about 13 percent after adjusting for price changes over that period.

procedure assumes that retirees and prospective retirees adjusted immediately to the legislated change. But as Feldstein states:

> "It is difficult to say how rapidly employees and retirees learned about the new system and what they expected for the future. When the new legislation was initially passed, neither employees nor retirees could have anticipated the double indexing or the substantial CPI bias. At first, many may have recognized the general 20 percent increase, although this understatement may have been balanced by the greater certainty of real benefits that indexing implied. After a few years, however, retirees and prospective retirees undoubtedly became aware of the indexing feature and the permanently higher level of benefits." (*Reply*, p. 635, our underlining.)

Accepting Feldstein's general approach, assume that people adjusted more gradually to the legislated change. Suppose that beginning in 1972, the social security wealth variable is adjusted each year so that an increasing fraction of the gap between the "corrected" and "revised" SSW variables is eliminated. In particular, assume that the adjustment factor is increased each year by 50 percent of the remaining fractional gap. 6/

6/ Let SSW_t^C be the value of the corrected Feldstein SSW variable, SSW_t^R be the value of the revised Feldstein SSW variable, SSW_t^G be the value of the "revised Feldstein, gradual adjustment" SSW variable, and f_t be the degree of adjustment in period t. Assume that the adjustment procedure followed is given by $SSW_t^G = SSW_t^C + f_t(SSW_t^R - SSW_t^C)$ where $f_t = f_{t-1} + \delta(1 - f_{t-1})$. The value of δ is arbitratily set at .5 for a full year. Since the legislation did not become effective until September 1972, the adjustment factor for 1972 is assumed to be .125.

The following table compares this "revised Feldstein, gradual adjustment" SSW variable with Feldstein's revised variables for the years 1972-76.

Year	Corrected SSW Variable (1)	Revised SSW Variable (2)	Revised minus Corrected (3)	Degree of Adjustment (4)	Gradual Adjustment SSW Variable (5)
1972	1,841.50	2,209.80	368.30	12.50%	1,887.54
1973	2,018.90	2,422.68	403.78	56.25	2,246.03
1974	2,003.80	2,404.56	400.76	78.25	2,316.89
1975	1,932.30	2,318.76	386.46	89.06	2,276.49
1976	2,031.90	2,438.28	406.38	94.53	2,416.05

By 1976, after 4-plus years, workers and retirees have adjusted their perceptions so that 95% of the gap between the "corrected" and "revised" SSW variables has been eliminated.

If we use this revised Feldstein, gradual adjustment SSW variable to estimate the consumer expenditure function, we obtain the results presented on line 2 of Table 2. (Results using the Feldstein revised SSW variable are repeated on line 1). For the period 1930-74, the estimated coefficient of SSW falls to .005; the t-ratio becomes .51. If we shift the initial year to 1931, the estimated SSW coefficient is -.005; the t-ratio is -.50. And if we limit the sample to the post-war period, 1947-74, the estimated coefficient of SSW is -.037 with a t-ratio of -2.53. Analogous results are obtained if we terminate the sample periods in 1976. Our conclusion is that Feldstein's result for 1930-74 and 1930-76 requires the assumption that individuals adjusted immediately to the legislated change. Modeling the more realistic assumption of a gradual adjustment yields weaker and insignificant results.

In addition, Feldstein's procedure does not incorporate the post-retirement price-indexing provision of the 1972 legislation. That is, the computational algorithm used by Feldstein implicitly assumes that, after retirement, benefits grow at the same rate as income per capita. If the price-indexing provision is modeled so that, beginning in 1972, post-retirement benefits are expected to remain constant in real terms, the results are quite different than those obtained by Feldstein.

Since we cannot modify the variable constructed by Feldstein, we begin by "revising" our Feldstein replica SSW variable, which is constructed using our replica of the Feldstein algorithm and the "constant ratio" perception. That is, following Feldstein's procedure, the Feldstein replica SSW variable is increased by 20 percent beginning in 1972 to obtain a replica of the revised Feldstein SSW variable which we refer to as the "revised Feldstein replica" SSW variable. SSW coefficient estimates and t-ratios are presented on line 3 of Table 2. For 1930-74, the estimated coefficient of SSW is .014 and the t-ratio is 1.59. It is clear that the result obtained using our replica of Feldstein's revised variable is similar to that using Feldstein's own revised SSW variable. (See line 1.) The post-retirement benefit perception is then modified so that after retirement individuals expect benefits to be constant in real terms. We refer to this version of the revised Feldstein replica SSW variable as the "revised, price-indexed Feldstein replica" SSW variable. Re-estimating the consumption function for the period 1930-74 using this variable, the estimated coefficient of SSW falls to .010 and the t-ratio is .86. (See line 4.) If we shift the initial year to 1931, the estimated SSW coefficient is -.006; the t-ratio is -.42. And if we limit the sample period to the postwar years, 1947-74, the estimated SSW coefficient becomes significantly negative: the coefficient is -.058; the t-ratio is -2.59. Similar results are obtained if we use 1976 as the terminal year. Thus, incorporating the post-retirement price-indexing feature of the 1972 amendments substantially weakens the results obtained by Feldstein.

In sum, Feldstein's result appears to depend on the assumption of a discrete jump in the SSW series beginning in 1972. If a gradual adjustment to the 1972 benefit increase is assumed, or if in computing the SSW variable, the post-retirement price-indexing feature of the 1972 legislation is explicitly incorporated, weaker and clearly insignificant results are obtained. Shifting the initial year to 1931 further weakens the estimates. And shifting the sample period to the postwar years yields negative estimates of the SSW coefficient.

VI. Alternative Algorithms

Feldstein gives short shrift to the alternative algorithm we developed to estimate social security wealth (the Leimer-Lesnoy algorithm). He states:

> "How appropriate these modifications [in the actuarial assumptions incorporated in the algorithm] are depends on the extent to which they were perceived and anticipated by employees. In the same way, the calculation of social security wealth might be improved by incorporating such potentially important things as the age-specific probabilities of divorce and the remarriage probabilities of divorced people, widows, or widowers. Similarly, neither the Leimer-Lesnoy calculation nor my own reflects the value of Medicare, Medicaid, and Supplemental Security Income benefits, all of which can be regarded as supplementing potential retirement assets. I point to these omissions not only to emphasize the actuarial limitations of both my own SSW variable and that of Leimer-Lesnoy but also to show that any measurement of SSW is at best only an approximation. More important, since what matters are the perceptions of future retirees rather than the actual outlays that will eventually be made, an exact actuarial calculation may be further from the appropriate variable than a less inclusive approximation." (Reply, pp. 637-638).

We agree, of course, that certain elements of wealth are excluded from the specification -- wealth associated with the SSA Medicare and

Disability programs, Unemployment Insurance and other social programs, as well as the sizable amounts of wealth represented by the unfunded portion of private, state, local and federal civil service, and military pension programs. It is quite possible that the model estimated is mis-specified -- or, to use Feldstein's terminology, is a "false model" (Feldstein 1982a, pp. 828-31; Feldstein 1982b, p. 640). It would not be correct, however, to simply lump in all such wealth, even "retirement wealth" with social security wealth. The issue raised by Feldstein is the effect on saving of the pay-as-you-go Social Security retirement benefits program. Social security wealth measures this program. If other forms of wealth should be included, they should be explicitly measured and added to the specification.

The critical question is whether the Feldstein algorithm or the Leimer-Lesnoy algorithm produces better estimates of Social Security retirement wealth. The Feldstein algorithm has technical deficiencies and incorporates certain actuarial assumptions that, in our view, are unsatisfactory. 7/

There are a number of major technical deficiencies. Some individuals are not counted at all while others are double-counted. For example, workers receiving benefits who are age 62-64 ("early retirees") are not counted as current beneficiaries. On the other hand, for workers over age 65, there is only a crude adjustment to avoid double-counting such workers as both current and future beneficiaries. Some aspects of the Social

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7/ See Leimer and Lesnoy (1980) for a complete discussion comparing the Leimer-Lesnoy algorithm with our replica of the Feldstein algorithm. Our replica algorithm is considerably more complete and more sophisticated than the original Feldstein algorithm.

Security legislation are incorrectly implemented. For example, no allowance is made for the fact that under the original 1935 legislation, benefits were scheduled to begin in 1942, not 1940. More important, in implementing the 1939 legislation, the Feldstein algorithm introduces benefits for dependent wives and surviving widows in 1939. The correct year is 1940. This error is not corrected in the revised SSW series computed by Feldstein; as a result, his 1939 SSW value is grossly overstated. The programming error associated with the 1956 law providing for full benefits for surviving widows retiring at age 62 has been corrected, but there is no indication that the 1961 and 1972 legislative changes for surviving widows have been incorporated in the revised algorithm.

Among the questionable actuarial assumptions incorporated in the Feldstein algorithm, three are of particular importance. First, no distinction is made between the benefits received by current retirees and new beneficiaries, although benefits received by new beneficiaries are substantially higher than those received by current retirees. (See Figure 1. 8/ Second, the Feldstein algorithm estimates the number of future dependent wives and surviving widows as a constant proportion of the number of male workers. This proportion has declined over time as, corresponding to the increasing labor force participation of women, an increasing proportion of women claim benefits as retired workers. In addition, the procedure gives rise to a number of technical

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8/ The distinction between current retirees and new beneficiaries was incorporated in our replica of the Feldstein algorithm, but was suppressed for the Feldstein replica variable.

inconsistencies. Third, the Feldstein algorithm assumes a constant conditional probability, given the individual's current covered employment status, of eventually receiving a retirement benefit. With now almost universal coverage, reduced requirements to achieve insured status, and sizable increases in the lifetime labor force attachment of women, this conditional probability has increased since the program's inception. 9/

Our alternative algorithm unquestionably provides better estimates of the number of persons likely to receive retired worker, dependent wife and surviving widow benefits and more accurately incorporates various features of the Social Security program--such as actuarial reductions for early retirement, surviving widow benefit factors, etc. We, of course, do not know how well our estimates correspond to the expectations of current and prospective retired workers. Presumably, those already retired know the benefits to which they are entitled. But there are undoubtedly many prospective retirees who are uninformed about the provisions of the Social Security retirement income program. Nevertheless, in the absence of

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9/ The decision to develop the Leimer-Lesnoy algorithm was in large measure accidental. We were unable to obtain the original Feldstein algorithm. We therefore constructed, using published and unpublished sources, our own replica of the Feldstein algorithm. Using the "replica Feldstein SSW variable" based on this algorithm, we were unable to reproduce Feldstein's 1974 results. Our immediate interpretation was that we had failed to reproduce one or more key assumptions underlying Feldstein's construction of social security wealth. As it turned out, we had reproduced Feldstein's main assumptions fairly well, but the original Feldstein SSW series was incorrect because of the programming error in his construction. In the interim, we had decided that the best approach was to start from scratch and develop our own algorithm.

specific historical information about how the public perceived various provisions of the Social Security program, the most reasonable approach is to proceed on the basis that people are reasonably well informed. It is difficult to accept the position that because, to an unknown extent, part of the public is uninformed, it is preferable to assume that not only is the public perception incorrect, but that we can quantify the public's misperceptions.

In using SSW variables based on both the (replica) Feldstein and Leimer-Lesnoy algorithms to estimate the consumer expenditure function, our objective was to examine the sensitivity of SSW coefficient estimates to the differing approaches and actuarial assumptions underlying both algorithms. It is clear from the results presented in New Evidence and updated in Table 1 of this paper that when we use SSW variables based on the Leimer-Lesnoy algorithm, the evidence is even less supportive of the Feldstein position that social security reduces private saving. For sample periods including the prewar years beginning in 1930, some estimated SSW coefficients are positive (but insignificant) when the SSW variable is based on the (replica) Feldstein algorithm; all coefficients are essentially zero or negative when the SSW variable is based on the Leimer-Lesnoy algorithm. For the sample periods beginning in 1931 or 1947, all estimated coefficients of the SSW variable are negative, whether the SSW variable is based on the Feldstein algorithm or on the Leimer-Lesnoy algorithm.

This sensitivity analysis is extended by considering the effect of Feldstein's ad hoc procedure for incorporating the 1972 amendments when the SSW variable is based on the Leimer-Lesnoy algorithm. We begin with the Leimer-Lesnoy constant ratio SSW variable. Following Feldstein's procedure, the value of this variable is increased by 20 percent beginning in 1972. The "revised" Leimer-Lesnoy constant ratio variable thus obtained is analogous to the Feldstein revised SSW variable. The estimated coefficient of this SSW variable for various sample periods is shown on line 5 of Table 2. For the sample period including the prewar years beginning in 1930 -- the period focused on by Feldstein -- coefficient estimates are essentially zero. For the sample periods including the prewar years but beginning one year later in 1931, coefficient estimates are negative, but insignificant. For the sample periods including only the postwar years, coefficients estimates are negative; they are significant for the period ending in 1971 and insignificant for the periods ending in 1974 or 1976. Thus, even if one accepts Feldstein's revised assumption of how individuals perceived benefits, weak evidence of a possible positive effect of SSW on consumption is found only if the revised SSW variable is based on the technically inferior Feldstein algorithm (and the sample period used includes the prewar years beginning in 1930). Feldstein's conclusion depends not only on his revised perception assumption but also on his algorithm for computing social security wealth. This alone must cast doubt on Feldstein's interpretation of the time series evidence.

VII. Alternate Perceptions

In his 1974 article and subsequent update, Feldstein (1974, 1978, 1979) assumed that beginning in 1937, current and prospective retirees projected that the ratio of benefits per retired worker to disposable personal income per capita would remain constant at .41, the average ratio for the period 1940-71. Our position in New Evidence was that this assumption was both arbitrary and unrealistic. We suggested and examined four reasonable and consistent alternatives: the current ratio perception, which assumes current and prospective retirees are myopic; the adaptive expectations perception, which assumes that individuals take into account the current benefit ratio and the past history of benefit ratios; the actuarial projection perception, which assumes that individuals modify the current ratio by considering information available in actuarial studies, and the perfect foresight perception, which assumes individuals were able to predict the future history of benefit ratios (to the extent presently known). 10/

In his Reply, Feldstein rejects our alternative perceptions and argues that his revised perception -- that until 1971, individuals assumed a constant ratio of .41; after the 1972 law change, they revised their expectations upwards by 20 percent -- is the best assumption:

> "...Such constancy [of the benefit-income ratio] was intended to reflect the assumption that, although year-to-year fluctuations occurred, individuals could not predict them and therefore used the same average value for each year.

10/ Leimer and Lesnoy (1980) considered an even broader range of perception assumptions.

> Although Leimer and Lesnoy suggest that there was substantial variability in the ratio, their own figure 1 shows that most of the variation was associated with the war years and with the period after 1971. I have omitted the war years 1941-46 from the sample and, as Section II [of Reply] indicated, treated the period after the 1972 law change as a distinct one. Between 1947 and 1971, the ratio of average benefits to per capita income had a mean of 0.41 and a standard deviation of 0.07..." (Reply, p. 138).

Before the introduction of automatic price indexing of the benefit formula there was a distinct tendency for the benefit-income ratio to decline between successive amendments to the benefit formula. That is, each cohort of new retirees tends to have higher average earnings than preceding cohorts. Because the benefit formula is characterized by declining marginal benefit rates, in the absence of legislated benefit increases, the benefit-income ratio of successive cohorts of new beneficiaries tended to decline. 11/

11/ The "trigger" for increases in the benefit formula was generally declining real benefits of workers already receiving benefits. That is, after retirement, benefits were fixed in nominal terms. Thus as prices rose over time, each cohort experienced declining real benefits. This decline of post-retirement real benefits does not, necessarily explain the declining average benefit-income ratio. In steady state -- that is, with constant growth of workers, retirees, real wages and prices -- the average benefit-income ratio depends only on the benefit-income ratio of the cohort of workers entering retirement. The benefit-income ratio for the economy will rise, be constant or decline depending on whether the cohort benefit-income ratio rises, is constant, or declines. Whether post-retirement benefits are unindexed, indexed to prices, or indexed to real wages determines the level not the trend of the average benefit-income ratio. Of course, in non steady state conditions, changes in the rate of growth of population, prices, real wages, or the relative number of retirees and workers may affect the overall benefit-income ratio.

Feldstein assumes that individuals expected the Congress to adjust the benefit formula every few years so that benefit-income ratios would oscillate around a long-run constant trend. Figure 1 plots the actual benefit ratios for men currently receiving benefits and for new awards to men for the years 1940-1977. 12/ It seems clear that the variations in the benefit ratio do not simply represent random fluctuations around a long-term trend. From 1939 to 1950, the law was unchanged, and benefit ratios declined steadily. With the comprehensive revision of the benefit formula in the 1950 legislation, and further changes in 1952 and 1954, benefit ratios rose substantially. Although there was a legislated increase in 1958, benefit ratios were fairly stable from 1955-1960. Despite legislation in 1965 and 1967, benefit ratios declined by about 15 percent from 1960 to 1969. The legislation of 1969, 1971, 1972 and 1973 more than offset this decline; benefit ratios increased about 25 percent from 1969 to 1974, and remained stable from 1974 through 1977. The benefit ratio for 1972-1977 was about 15 percent above its average value for 1954-1971.

The omission of the war years from the sample does not eliminate the effect of these years on the perception by current and future beneficiaries of the future benefit-income ratio. One might accept this position if Social Security legislation had been introduced shortly after

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12/ To avoid clutter, benefit ratios for women have not been plotted. The patterns for women are similar to those of men.

the end of World War II. But the 1939 legislation was not amended until 1950, five years after World War II had ended. 13/

The assumption that in 1937 workers somehow formed a perception of the average benefit ratio that would apply beginning in 1940, that successive cohorts somehow expected the same benefit ratio, and that prospective retirees expected the same benefit ratio as that observed by current retirees is simply inconsistent with historical experience. Moreover, the assumption of a constant benefit ratio ignores the substantive differences between the original 1935 legislation, the 1939 legislation and the 1950 and succeeding legislation. 14/

13/ Between 1947 and 1971, the ratio of average benefits to per capita income was .43, not .41. The value .41 is the ratio of average benefits to per capita income for the years 1940 to 1971, that is, since the payment of initial benefits in 1940. It may be noted that this average benefit ratio value is for beneficiaries in current payment status. For new benefit awards, the average benefit ratio for the period 1940-1971 was .44, about 8 percent more than the ratio for beneficiaries in current payment status.

14/ The 1935 benefit formula was based on cumulative lifetime earnings. Thus, benefit-income ratios would increase until the system reached maturity. Benefits were to begin in 1942. As a result of the 1939 legislation, the 1935 formula never became effective. The 1939 benefit formula was based on average lifetime earnings. With the shift to a family perspective, benefits for the individual worker were reduced. A one percent increment for each year of coverage still implied gradually increasing benefit ratios. The initial year of benefit payment was moved up to 1940. As a result of the slide in benefit ratios during and after World War II, the benefit formula was totally revised in 1950. Benefit levels were increased more than 50 percent. Beginning with awards in 1952, earnings before 1951 were not included in the lifetime average. The increment for experience was frozen at 14 years. The 1954 legislation fixed the form of the benefit formula. Until 1977, all subsequent benefit formulas were modifications of the 1954 formula.

It is difficult to believe that current and prospective retirees ignored all legislated changes in the benefit structure through 1971, including the fundamental changes enacted in 1939, 1950 and 1954, and then immediately and permanently reacted to the 1972 amendments. 15/ Consider the following perception which is at least as plausible as that underlying Feldstein's revised perception. Assume that workers and retirees generally expected that the benefit-income ratio would be constant, but revised the level following the major legislation of 1939, 1950, and 1972: Beginning in 1937, male workers assumed a constant benefit-income ratio of .412, the average value for 1940-1971. In 1940, following the 1939 legislation, they revised the expected benefit-income ratio to .312, the average value for 1940-1949. With the 1950 amendments, they revised the expected benefit-income ratio upwards to .457, the average value for 1950-1971. And with the 1972 legislation, they again revised the expected benefit-income ratio upward to .536, the average value for 1972-1977. 16/

Coefficient estimates of SSW based on this alternative perception appear on line 6, Table 2. The estimated SSW coefficients, depending on the sample period, are sometimes positive and sometimes negative, but

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15/ We remind the reader that the 1972 legislation was passed in July 1972, and did not become effective until September 1972. Feldstein's revised SSW variable implicitly assumes that the 20 percent adjustment occurred (or was anticipated) in January 1972.

16/ The SSW variable corresponding to this perception was obtained by modifying the revised Feldstein variable. Following Feldstein, benefit ratios for both active and retired workers were assumed to be equal. The adjustment procedure took account of the unequal levels of the benefit ratios for men and women.

generally small and insignificant. The only large and significant coefficient, as before, is for the 1947-1971 sample period, but it is negative.

Other ad hoc modifications of the SSW variable can be developed corresponding to scenarios which are as plausible as that considered by Feldstein. 17/ In the absence of specific information about how individuals incorporate information about legislation and other changes in the development of expectations about future benefits, we believe that it is preferable to assume specific, predetermined rules for constructing alternative benefit perceptions.

In addition to claiming that his revised perception better reflects individuals' perceptions of the benefit-income ratio, Feldstein asserts that our alternative perceptions give rise to an errors-in-variable problem.

> "...Moreover, what matters is not the ex post constancy or variability of the benefit-income ratio but how employees treated such variation in predicting the future ratio. If employees implicitly assumed a constant ratio, a regression based on a varying ratio (even if the "correct" one) would cause an errors-in-variables problem that biased the coefficient of SSW toward zero." (Reply, p. 638)

17/ A number of ad hoc perceptions incorporating different legislative adjustments were examined. For example: the perceived benefit ratio for 1937-1939 was set equal to the 1940-1949 average ratio; the initially perceived benefit ratio was held until 1946, one year after the end of World War II; additional major legislation, such as that of 1954, was incorporated, etc. Every modification considered yielded results similar to those obtained for the ad hoc perception discussed in the text.

Feldstein then goes on to discuss why he believes his constant ratio assumption is better than the alternative perceptions that we proposed. Essentially he argues that if the constant ratio assumption is correct, the variation in the benefit ratios associated with the alternative perceptions is really random, and if so, there is an errors-in-variables problem that biases the coefficient estimates.

> "My common objection to all of these proposed perceptions is thus that they introduce essentially random variations in SSW that cause a downward bias in its estimated coefficient." (Reply, p. 639.)

The empirical evidence provides little support for Feldstein's assertion. As pointed out in the preceding section, if the SSW variable is constructed using the technically superior Leimer-Lesnoy algorithm, the SSW variable based on the constant ratio perception (whether "revised" or not) yields results similar to those obtained using our alternative perceptions. There is no evidence of a positive effect of SSW on consumption. If the SSW variable is constructed using the corrected Feldstein algorithm, the SSW variable based on the (revised) Feldstein perception does yield positive coefficients for sample periods that include the prewar years. But the coefficient estimates are insignificant, particularly for sample periods beginning in 1931. Indeed, for the period 1931-1971, the estimated coefficient of SSW is essentially zero. Moreover, if there is any clear suggestion of possible bias, it attaches to the estimated coefficient of the revised Feldstein SSW variable for the sample period 1947-1971. The size of that negative coefficient is clearly implausible.

More important, Feldstein's appeal to an errors-in-variable bias assumes that the conceptually appropriate variable is known. Despite Feldstein's arguments, we simply do not know how individuals form perceptions of future benefits. Indeed, surveys show that many individuals have no idea of what their future benefits will be.

Since we do not know how individuals form their expectations, our approach is to consider several alternative assumptions about how individuals perceive future benefits. Feldstein argues that our alternatives are unrealistic -- particularly the current ratio assumption and the perfect foresight assumption -- and that his revised perception is best. As discussed above, we believe Feldstein's assumption that individuals expected a constant benefit ratio until 1972, and then immediately and permanently revised their expectations upward, is both unrealistic and arbitrary. Further, a number of sensitivity experiments have indicated that evidence based on this revised perception is fragile. The alternative perceptions we have considered are clearly at least as realistic as that adopted by Feldstein. 18/

18/ The construction of social security wealth in Feldstein-Pellechio (1979) uses a microeconomic analogue of the current ratio assumption. The actuarial projection perception is a modification of the current ratio assumption that incorporates the projected effect of current legislation. It was intended as the macroeconomic analogue of the benefit assumption implicit in those microeconomic studies which use the current law to estimate future benefits and taxes. The adaptive expectations perception takes into account both the current benefit ratio and the past history of benefit ratios. The perfect foresight assumption was first proposed by Feldstein (1974), who used it to project future taxes. Indeed, our purpose in using the perfect foresight assumption for benefits was to develop a net SSW variable that used consistent perception assumptions for benefits and taxes.

Our final sensitivity experiment recognizes that it is unrealistic to assume that any single assumption about how individuals perceive future benefits captures the diversity of ways in which individuals form their expectations. Consider the assumption that 75 percent of individuals act as if they base SSW on the revised Feldstein perception, and 25 percent are myopic and act as if they base SSW on the current ratio. Coefficient estimates based on this "mixed perceptions" assumption appear on line 7 of Table 2. 19/ It is again clear that this evidence provides no statistically significant support for Feldstein's contention that social security has reduced saving.

It seems clear that even if we were to accept Feldstein's new evidence as reasonable, at best the time series evidence would have to be viewed as inconclusive since we do not know which assumption describing individuals' perceptions of social security wealth, if any, is most appropriate. Our view is that Feldstein's new evidence is weak by conventional standards and also very fragile, and that the overwhelming weight of time series evidence does not support the hypothesis that social security reduces saving.

VIII. Limitations of Time-Series Analysis

Our work should not be interpreted as a claim that social security does not reduce saving. We are simply claiming that the present time series evidence does not support the hypothesis that social security reduces saving.

19/ The SSW variable is computed as a weighted average of our "revised" Feldstein replica "constant ratio" and Feldstein replica "current ratio" SSW variables.

The models we have estimated in this and other papers may be mis-specified. No allowance is made for changes in age structure, distribution of wealth, the distribution of income, as well as a host of other factors influencing consumption. All of the variables used -- consumption, expected income, retained earnings, household wealth, and social security wealth -- are measured with error. 20/ To use

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20/ The correct theoretical construct for consumption is a measure of the flow of consumer services, not consumer expenditures. A 2-period lag on disposable personal income may inadequately measure expected income. Moreover, as discussed below, disposable personal income may be the wrong income measure. It is not clear that the national income measure of retained earnings is relevant for consumption decisions. Indeed, Feldstein (1973) originally introduced the variable as a proxy for the permanent component of capital gains. Not only is household wealth difficult to measure, but no consistent series is available for the full sample period including the prewar years. The difficulty of defining an appropriate measure of social security wealth has been expounded on at length.

There is another issue in the measurement of social security wealth that should be noted. is gross or net social security wealth the correct concept? Feldstein argues that gross wealth is correct since the payroll taxes deducted in computing disposable personal income are a proxy for the capitalized value of future payroll taxes. (Reply, p. 639). We have argued in Lesnoy and Leimer (1981) that neither gross wealth nor net wealth is conceptually correct for the model as specified. That is, just as payroll taxes deducted in computing disposable personal income are a proxy for the capitalized value of future payroll taxes of current workers, the social security benefits added in computing disposable personal income are a proxy for the capitalized value of future benefits -- i.e., gross social security wealth -- of current beneficiaries.

The problem arises because disposable personal income is not the correct variable. The correct variable in a life cycle model is disposable labor income. (see Ando and Modigliani 1963). If disposable labor income is used, the choice between net and gross social security wealth depends on whether labor income is measured before or after deducting social security payroll taxes.

Since disposable personal income is used instead of disposable labor income, the choice, however, is unclear. Fortunately, the issue has little empirical significance since regression results are quite similar whether we use gross or net social security wealth.

Feldstein's terminology, "we are forced to estimate 'false models' that do not provide a complete or correct picture of reality. "(Reply, p. 640)

He goes on to say:

> "A parameter estimate based on a false model can be useful if the data have a strong enough and clear enough story to tell. But even a completely true model will not yield useful parameter estimates if there is too little information in the data. In my original 1974 paper, I found that estimated coefficients of SSW for the postwar period alone were generally less than their standard errors, implying that there was too little independent variation of SSW in the postwar period alone to permit useful inferences. In contrast, the longer period since 1929 [sic] has the advantage of a number of years before the social security program began (and in which SSW was therefore zero) as well as substantial independent variation in income, in the value of wealth, and in retained earnings." (Reply, p. 640.)

As we discussed in New Evidence, we strongly disagree with Feldstein's position on the relevance of estimates based on the postwar period alone. Feldstein's finding in his original 1974 paper that the estimated coefficient of SSW for the postwar period, 1947-1971, was generally less than its standard error is the result of using his incorrectly programmed SSW variable. When the correctly programmed Feldstein SSW variable (the "correct" or "revised" Feldstein SSW variable) is used, the estimated coefficient of SSW for the 1947-1971 period is several times as large as its standard error -- but the coefficient is negative. (Table 1, lines A.2 and A.3). Although the absolute value of the SSW coefficient is implausible, the result does not support Feldstein's interpretation.

Moreover, as we have pointed out, estimates for sample periods including the prewar years are quite fragile, varying considerably depending on the initial year selected. Simply shifting the initial year one year from 1930 to 1931 results in a frequently dramatic drop in both the (algebraic) value and t-ratio of the estimated SSW coefficient. (See Tables 1 and 2.) The fragility of SSW coefficient estimates for sample periods including the prewar years may be partly explained, as pointed out in New Evidence (p. 616), by the unreliability of SSW estimates for the prewar years. 21/ In addition, because of the changing and uncertain economic environment and introduction of new socio-economic institutions, it is possible that a single model cannot be fit to both prewar and postwar data. Whatever the explanation, coefficient estimates for the postwar period alone are quite different than for sample periods including both the prewar years and postwar years.

The main point that Feldstein tries to make is that one must consider the totality of evidence in drawing inferences about the effect of social security on saving.

> "...no single study can be regarded as a definitive test of a theory in the way that studies are in the experimental sciences. Instead, inferences must be made by weighing the results of different studies and by understanding the basic data and the relevant institutions..."
>
> "...The limitations of time-series analysis make it important to use other types of data to examine the effect of social security. Although each type has its own problem, the biases that arise in one framework are not the same as those that arise in another. When a variety of different types of estimates point to the same conclusion, it is more likely that the estimates reflect underlying reality rather than statistical artifact." (Reply, p. 640.)

21/ Besides the general problems associated with estimating social security wealth, the 1939 value of the Feldstein SSW variable is, as noted earlier, grossly overstated.

Feldstein then presents a brief review of studies using international cross-section data and microeconomic household data which he argues supports his original conclusion that social security substantially reduces private saving. Our interpretation of these other bodies of evidence is somewhat different. 22/

Studies using cross-country data have been completed by Feldstein (1977, 1980a), Barro and MacDonald (1979), and Kopits and Gotur (1980). The results of such international comparisons are contradictory. Feldstein finds (for both studies) that social security has a significant negative effect on the saving ratio. Barro and MacDonald find that the effect of social security depends on the specification used. Using a simple cross-section specification, social security increases saving; using a time series-cross section specification, social security has a

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22/ Feldstein is careless in his citation of studies. The studies by Munnell (1974a and 1974b), Darby (1979), and Barro (1978) are time series studies which used the incorrectly programmed original Feldstein SSW variable, and are therefore no longer relevant. We have reexamined the Munnell, Darby, and Barro specifications in Lesnoy and Leimer (1981) and find that our conclusions in New Evidence are unchanged. The volume edited by von Furstenberg (1979) -- which Feldstein cites as supporting his original conclusion -- includes six papers which examine the empirical evidence concerning the effect of social security on saving in the United States and five industrialized nations. Among these, only the studies for the United States and Sweden suggest a possible negative effect of social security on saving. The papers dealing with Canada, Great Britain, France and Germany conclude that there is no evidence that social security reduces private saving.

negative effect on saving. Kopits and Gotur find that saving is positively related to retirement social security, but negatively related to other social security programs. 23/

This body of evidence has many flaws. The sample of industrialized countries is quite small, and lacks homogeneity with respect to economic structure and institutions, as well as social security systems (particularly programs other than retirement). The best data have substantial weaknesses and lack comparability. There are questions of causality and simultaneity that simply cannot be addressed with the limited data available.

The other major body of evidence that has been examined consists of cross-sections of individual households. Feldstein (1983), Blinder, Gordon and Wise (1983), and Friedman (1980) specify asset accumulation models which are estimated using data from the Retirement History Study. Feldstein finds that the value and significance of the coefficient measuring the substitution of social security wealth for private accumulation depends upon the specification and method of estimation, but concludes that the results provide strong support for the hypothesis that social security reduces saving. Blinder, Gordon and Wise develop a

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23/ In an interesting study included as the appendix to Feldstein (1980), Horioka (1980) examines reasons for the different findings reported in Feldstein (1977) and Barro and MacDonald (1979). He finds that the differing results are explained by differences in (1) specification, (2) countries included in the sample, (3) definitions of variables, (4) data sources, and (5) the time period.

complex specification and, using a nonlinear estimation technique, estimate that each dollar of social security wealth replaces 39 cents of privately accumulated assets. The standard error, however, is larger than the estimated coefficient. Further doubt about this result is raised by the fact that the (insignificant) coefficient on pension wealth is positive, implying that pension saving and private saving by individuals are complementary. Friedman's specification is based on Feldstein-Pellechio (1979). Using Zellner's seemingly unrelated regression technique, he obtains positive coefficients for social security wealth, suggesting that social security has increased asset accumulation. None of the coefficients, however, are significantly different from zero. Thus, although these studies use the same body of data, the results differ depending upon the specification and method of estimation. 24/

Feldstein and Pellechio (1979) also estimate an asset accumulation model using data from the Federal Reserve Survey of Financial Characteristics of Consumers. They find that social security wealth substitutes for privately accumulated wealth, with the coefficient not significantly different from one. Again, the estimated effect is sensitive to the specification.

24/ The data used were not identical. Blinder, Gordon and Wise use asset data from the 1971 interview wave; information from the 1969, 1973 and 1975 interview waves is used to construct several variables. Feldstein uses data from the 1969 interview wave matched to Social Security earnings records. Friedman uses data mainly from the 1969 and 1975 interview waves. In addition, each researcher screened the full sample differently.

Kotlikoff (1979) and Diamond and Hausman (1982) estimate asset accumulation models using the National Longitudinal Surveys (commonly referred to as the Parnes data). 25/ Kotlikoff finds that private accumulation is significantly reduced by the accumulated value of social security taxes, but the estimated coefficient is consistent with either a life-cycle or Keynesian consumption function. He also finds that the coefficient for the lifetime wealth increment (net social security wealth less accumulated social security taxes) is positive and insignificant, a finding which is counter to the life cycle theory. He concludes that his findings lend little support to the notion that Social Security has reduced the capital stock. Diamond and Hausman use a pooled time series-cross section approach which recognizes both uncertainty and simultaneous retirement planning. They find that social security benefits significantly reduce private saving. They estimate that each dollar of social security wealth reduces private wealth accumulation by between 30 and 50 cents.

David and Menchik (1981) test both the Feldstein and Barro hypotheses using data from the Wisconsin Assets and Income Study. 26/ They conclude that neither the Feldstein hypothesis nor the Barro hypothesis is supported by their results.

25/ Kotlikoff uses the 1966 interview wave. Diamond and Hausman use the 1966, 1968, 1971 and 1976 interview waves.

26/ This data file matches state income tax records, Social Security earnings records, and bequests from probate records for a sample of Wisconsin males born between 1890 and 1900.

Kurz (1981) estimates an asset accumulation model using data from the survey conducted for the President's Commission on Pension Policy (PCPP). He finds that social security wealth has no effect on private saving. More generally, he concludes that the evidence does not support the life cycle model of saving. In a second study which uses the PCPP survey data, Kurz (1982) directly estimates a model based on the intergenerational model. He obtains contradictory results, depending on whether the sample consists of those receiving transfers or those giving transfers.

Thus, the microeconomic evidence is quite mixed, depending on the data source used, the specification of the models, and the choice of econometric methods. All of the data sets have weaknesses stemming, in part, from the fact that the surveys were generally not designed to address the issue of asset accumulation determinants, particularly the effect of social security. Good data on wealth holdings, social security wealth, pension wealth, and intergenerational transfers are generally lacking. 27/

Finally, an important issue raised by Robert Barro has been largely overlooked. Barro (1978) argues that if the intergenerational transfer model holds, cross-section estimates of the effect of social security

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27/ More detailed surveys of studies examining the effect of social security on saving may be found in Kessler, Masson and Strauss-Kahn (1980), Cartwright (1981), Haveman, Danziger and Plotnick (1981), and Aaron (1982).

wealth on saving have no implications for the impact of the social security programs on aggregate saving. That is, tests of aggregate saving effects require data reflecting variation in the scale of the social security program and such variation is absent if we examine a cross-section of individuals.

IX. Conclusion

Feldstein concludes:

> "each reader must evaluate the body of evidence and a priori analysis for himself. I believe that the evidence as a whole supports my original conclusion that the current level of social security benefits substantially depresses private saving. I believe, moreover, that the aggregate time-series evidence based on the corrected social security wealth algorithm strengthens this conclusion." (Reply, p. 641.)

We agree that each reader must evaluate the evidence for himself, but our conclusion is quite different. An examination of the full spectrum of evidence suggests only that evidence can be found that either supports or contradicts the hypothesis that social security reduces private saving. The aggregate time-series evidence -- and we remind the reader that this was the focus of New Evidence -- is quite clear, however. Feldstein's new evidence is quite fragile, exhibiting sensitivity to minor NIPA data revisions, to reasonable modifications in the procedures used to estimate the social security wealth variable, and to changes in the period of estimation. The weight of the body of time series evidence that we have examined in this and other papers does not support the hypothesis that social security has reduced private saving.

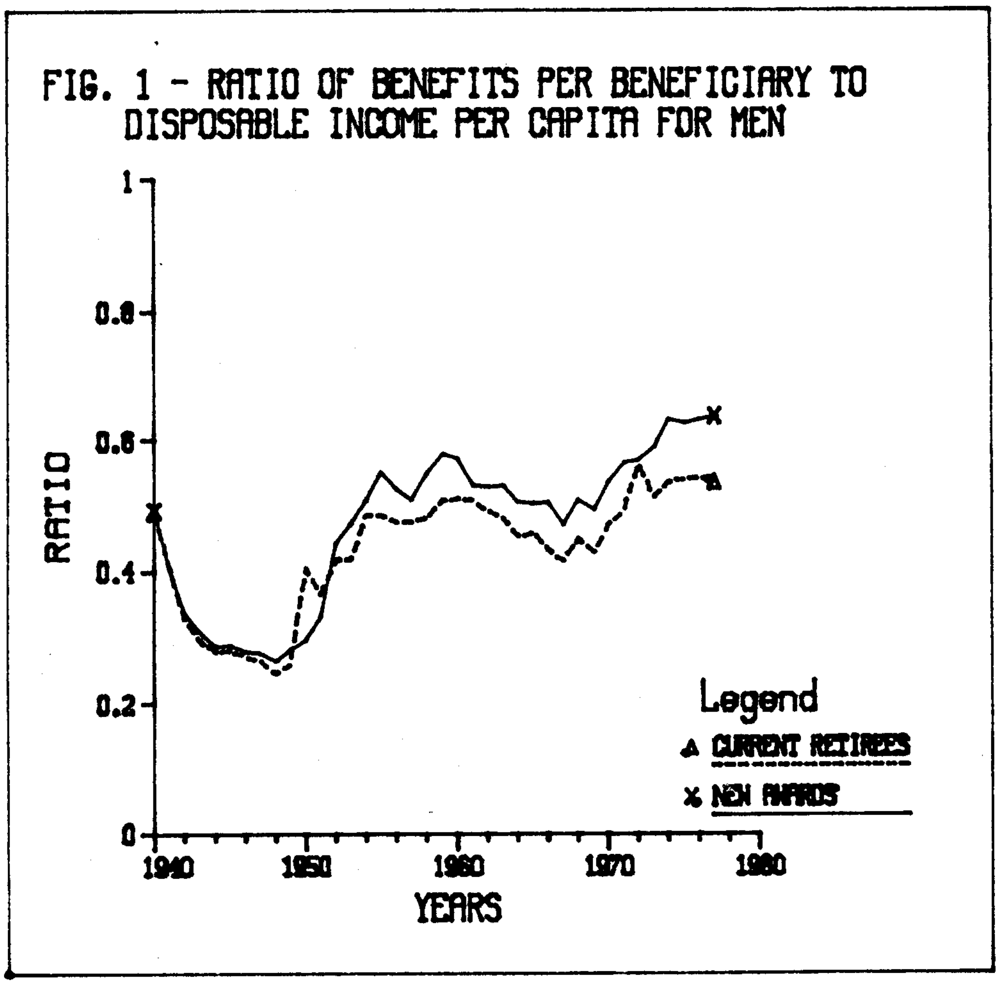
FIG. 1 - RATIO OF BENEFITS PER BENEFICIARY TO
DISPOSABLE INCOME PER CAPITA FOR MEN
1
0.8
0.6
0.4
0.2
0
RATIO
1940
1950
1960
1970
1980
YEARS
Legend
CURRENT RETIREES
NEW AWARDS

Table 1

Estimated Coefficients of Alternative Gross Social Security Wealth Variables

SSW Variables	Terminal Year: 1971 1930-71 (1)	1931-71 (2)	1947-71 (3)	Terminal Year: 1974 1930-74 (4)	1931-74 (5)	1947-74 (6)	Terminal Year: 1976 1930-76 (7)	1931-76 (8)	1947-76 (9)
A. Feldstein revised variable									
1. Feldstein Reply	.015 (1.58)	a/	a/	.017 (2.13)	a/	a/	.018 (2.00)	a/	a/
2. Estimates with Leimer-Lesnoy data used in New Evidence	.017 (1.76)	.004 (.37)	-.053 (-3.10)	.018 (2.39)	.013 (1.73)	.007 (.63)	.019 (2.17)	.015 (1.66)	.009 (.71)
3. Estimated with revised NIPA data	.013 (1.35)	.0001 (.01)	-.057 (-3.55)	.013 (1.69)	.009 (1.06)	.0003 (.02)	.014 (1.61)	.010 (1.09)	.001 (.11)
B. Feldstein replica algorithm variables									
1. Constant ratio	.013 (1.22)	-.003 (-.28)	-.062 (-3.50)	.008 (.75)	-.008 (-.57)	-.061 (-2.85)	.005 (.40)	-.012 (-.80)	-.068 (-2.83)
2. Current ratio	-.001 (-.33)	-.005 (-1.09)	-.010 (-2.13)	-.002 (-.34)	-.004 (-.91)	-.009 (-1.61)	.0001 (.02)	-.002 (-.37)	-.006 (-.98)
3. Adaptive expectations, $\delta = .5$	-.001 (-.21)	-.005 (-1.10)	-.011 (-2.24)	-.001 (-.24)	-.004 (-.92)	-.010 (-1.69)	.001 (.26)	-.001 (-.18)	-.005 (-.86)
4. Perfect foresight	.010 (1.20)	-.003 (-.28)	-.047 (-3.54)	.009 (.97)	-.003 (-.27)	-.039 (-2.24)	.007 (.68)	-.005 (-.42)	-.042 (-2.14)
5. Actuarial projection	-.001 (-.15)	-.002 (-.71)	-.007 (-1.62)	.001 (.27)	-.001 (-.19)	-.003 (-.76)	.001 (.20)	-.001 (-.19)	-.004 (-.74)
C. Leimer-Lesnoy algorithm variables									
1. Constant ratio	-.002 (-.25)	-.009 (-1.59)	-.020 (-3.37)	-.003 (-.49)	-.010 (-1.67)	-.018 (-2.49)	-.006 (-1.01)	-.014 (-2.15)	-.022 (-2.80)
2. Current ratio	-.002 (-.53)	-.005 (-1.27)	-.009 (-2.20)	-.002 (-.54)	-.005 (-1.09)	-.008 (-1.67)	-.001 (-.14)	-.002 (-.49)	-.006 (-1.02)
3. Adaptive expectations, $\delta = .5$	-.002 (-.41)	-.005 (-1.29)	-.010 (-2.30)	-.002 (-.40)	-.005 (-1.07)	-.009 (-1.67)	.001 (.16)	-.001 (-.25)	-.005 (-.79)
4. Perfect foresight	-.001 (-.17)	-.008 (-1.50)	-.019 (-3.34)	-.002 (-.28)	-.008 (-1.42)	-.016 (-2.27)	-.005 (-.79)	-.012 (-1.88)	-.019 (-2.57)
5. Actuarial projection	-.001 (-.38)	-.003 (-.95)	-.007 (-1.78)	.0000 (.01)	-.002 (-.45)	-.004 (-.97)	.0001 (.02)	-.001 (-.35)	-.004 (-.85)

Source: Appendix A.

Note : Figures in parentheses are t-statistics. Regressions for periods beginning in 1930 or 1931 exclude the years 1941-46.

a/ Coefficient not estimated.

Table 2

Sensitivity Analysis of Feldstein's Revised Results: Estimates Coefficients of Social Security Wealth Variables

SSW Variables	Terminal Year: 1971 1930-71 (1)	Terminal Year: 1971 1931-71 (2)	Terminal Year: 1971 1947-71 (3)	Terminal Year: 1974 1930-74 (4)	Terminal Year: 1974 1931-74 (5)	Terminal Year: 1974 1947-74 (6)	Terminal Year: 1976 1930-76 (7)	Terminal Year: 1976 1931-76 (8)	Terminal Year: 1976 1947-76 (9)
1. Revised Feldstein (estimated with revised NIPA data)	.013 (1.35)	.0001 (.01)	-.057 (-3.55)	.013 (1.69)	.009 (1.06)	.0003 (.02)	.014 (1.61)	.010 (1.09)	.001 (.11)
2. Revised Feldstein - gradual adjustment	.013 (1.35)	.0001 (.01)	-.057 (-3.55)	.005 (.51)	-.005 (-.50)	-.037 (-2.53)	.009 (.88)	.002 (.15)	-.020 (-1.20)
3. "Revised" Feldstein replica	.013 (1.22)	-.003 (-.28)	-.062 (-3.50)	.014 (1.59)	.008 (.93)	.001 (.08)	.018 (1.97)	.014 (1.48)	.008 (.65)
4. "Revised", price-indexed" Feldstein replica	.013 (1.22)	-.003 (-.28)	-.062 (-3.50)	.010 (.86)	-.006 (-.42)	-.058 (-2.59)	.007 (.58)	-.008 (-.55)	-.062 (-2.44)
5. "Revised" Leimer-Lesnoy constant ratio	-.002 (-.25)	-.009 (-1.59)	-.020 (-3.37)	.002 (.26)	-.004 (-.56)	-.009 (-1.20)	.001 (.14)	-.004 (-.55)	-.009 (-1.07)
6. Revised Feldstein - alternative perception (incorporating 1939, 1950 & 1972 legislation)	.003 (.37)	-.007 (-.88)	-.035 (-3.83)	.006 (.82)	.001 (.13)	-.010 (-1.01)	.005 (.62)	.0002 (.02)	-.012 (-1.01)
7. "Mixed perceptions" (weighted average of constant ratio and current ratio SSW)	.005 (.55)	-.006 (-.72)	-.029 (-2.77)	.007 (.89)	.002 (.21)	-.007 (-.67)	.011 (1.29)	.007 (.80)	-.0003 (-.02)

Source: Appendix B.

Note : Figures in parentheses are t-statistics. Regressions for periods beginning in 1930 or 1931 exclude the years 1941-46.

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Appendix A

Consumer Expenditure Functions Estimated Using Alternative Gross SSW Variables

Table	Period
A.1	1930-71
A.2	1931-71
A.3	1947-71
A.4	1930-74
A.5	1931-74
A.6	1947-74
A.7	1930-76
A.8	1931-76
A.9	1947-76

Table A.1 - Consumer Expenditure Function Estimated Using Alternative Gross SSW Variables

1930-1971

Equation	SSW Variable	YD	YD_{-1}	RE	W	SSW	Constant	$\bar{R}^2$	D-W Statistic	SSR
	A. Feldstein revised variable									
(A.1.1)	1. Feldstein Reply	.648 (11.17)	.109 (2.42)	.118 (1.33)	.011 (2.20)	.015 (1.58)	236 (4.29)	.99+	1.23	14,000
(A.1.2)	2. Estimated with Leimer-Lesnoy New Evidence data	.642 (11.10)	.108 (2.44)	.109 (1.24)	.012 (2.09)	.017 (1.76)	230 (4.11)	.9987	1.20	13,610
(A.1.3)	3. Estimated with revised NIPA data	.651 (11.31)	.109 (2.42)	.112 (1.25)	.010 (1.78)	.013 (1.35)	229 (4.26)	.9987	1.15	13,690
	B. Feldstein replica algorithm									
(A.1.4)	1. Constant ratio	.655 (11.34)	.106 (2.29)	.115 (1.28)	.010 (1.79)	.013 (1.22)	228 (3.97)	.9987	1.16	13,850
(A.1.5)	2. Current ratio	.697 (12.64)	.118 (2.57)	.139 (1.54)	.010 (1.66)	-.001 (-.33)	153 (3.10)	.9986	1.17	14,480
(A.1.6)	3. Adaptive expectations, δ = .5	.694 (12.83)	.118 (2.57)	.143 (1.59)	.010 (1.60)	-.001 (-.21)	157 (3.01)	.9986	1.16	14,510
(A.1.7)	4. Perfect foresight	.654 (11.13)	.107 (2.32)	.126 (1.42)	.010 (1.73)	.010 (1.20)	233 (3.75)	.9987	1.16	13,870
(A.1.8)	5. Actuarial projection	.694 (12.14)	.118 (2.56)	.140 (1.50)	.009 (1.63)	-.001 (-.15)	160 (3.34)	.9986	1.16	14,520
	C. Leimer-Lesnoy algorithm									
(A.1.9)	1. Constant ratio	.694 (13.06)	.120 (2.58)	.150 (1.63)	.010 (1.65)	-.002 (-.25)	156 (3.25)	.9986	1.16	14,500
(A.1.10)	2. Current ratio	.700 (12.97)	.118 (2.57)	.137 (1.52)	.010 (1.72)	-.002 (-.53)	145 (2.95)	.9986	1.19	14,400
(A.1.11)	3. Adaptive expectations, δ = .5	.696 (13.15)	.118 (2.58)	.142 (1.59)	.010 (1.67)	-.002 (-.41)	149 (2.96)	.9986	1.17	14,450
(A.1.12)	4. Perfect foresight	.693 (12.87)	.119 (2.57)	.147 (1.62)	.010 (1.61)	-.001 (-.17)	158 (2.92)	.9986	1.15	14,520
(A.1.13)	5. Actuarial projection	.699 (12.52)	.117 (2.56)	.134 (1.45)	.010 (1.67)	-.001 (-.38)	151 (3.12)	.9986	1.19	14,460

Note: The years 1941-46 are excluded. The Durbin-Watson statistic is adjusted for this gap. Figures in parentheses are t-statistics.

Table A.2 - Consumer Expenditure Function Estimated Using Alternative Gross SSW Variables

1931-1971

Equation	SSW Variable	YD	YD_{-1}	RE	W	SSW	Constant	$\bar{R}^2$	D-W Statistic	SSR
	A. Feldstein revised variable									
(A.2.1)	1. Feldstein Reply	No equation estimated for this period.								
(A.2.2)	2. Estimated with Leimer-Lesnoy New Evidence data	.625 (11.25)	.157 (3.25)	.173 (1.95)	.015 (2.71)	.004 (.37)	160 (2.53)	.9988	1.33	11,890
(A.2.3)	3. Estimated with revised NIPA data	.632 (11.39)	.159 (3.23)	.182 (1.98)	.013 (2.38)	.0001 (.01)	162 (2.67)	.9988	1.27	11,960
	B. Feldstein replica algorithm									
(A.2.4)	1. Constant ratio	.637 (11.54)	.166 (3.21)	.194 (2.09)	.013 (2.41)	-.003 (-.28)	145 (2.19)	.9988	1.28	11,930
(A.2.5)	2. Current ratio	.646 (12.14)	.164 (3.66)	.171 (2.06)	.015 (2.65)	-.005 (-1.09)	119 (2.58)	.9988	1.39	11,490
(A.2.6)	3. Adaptive expectations, $\delta = .5$	.642 (12.25)	.165 (3.67)	.180 (2.19)	.016 (2.68)	-.005 (-1.10)	115 (2.32)	.9988	1.36	11,480
(A.2.7)	4. Perfect foresight	.638 (11.41)	.166 (3.24)	.191 (2.15)	.014 (2.41)	-.003 (-.28)	143 (2.00)	.9988	1.29	11,930
(A.2.8)	5. Actuarial projection	.646 (11.63)	.161 (3.56)	.166 (1.92)	.014 (2.48)	-.002 (-.71)	135 (3.01)	.9988	1.36	11,750
	C. Leimer-Lesnoy algorithm									
(A.2.9)	1. Constant ratio	.637 (12.58)	.181 (3.96)	.231 (2.69)	.016 (2.88)	-.009 (-1.59)	99 (2.13)	.9989	1.40	11,000
(A.2.10)	2. Current ratio	.645 (12.33)	.164 (3.68)	.170 (2.07)	.016 (2.74)	-.005 (-1.27)	113 (2.48)	.9989	1.41	11,330
(A.2.11)	3. Adaptive expectations, $\delta = .5$	.640 (12.40)	.166 (3.72)	.183 (2.24)	.017 (2.78)	-.005 (-1.29)	110 (2.33)	.9989	1.38	11,310
(A.2.12)	4. Perfect foresight	.640 (12.54)	.179 (3.91)	.218 (2.59)	.017 (2.88)	-.008 (-1.50)	91 (1.72)	.9989	1.38	11,100
(A.2.13)	5. Actuarial projection	.648 (11.92)	.161 (3.59)	.162 (1.90)	.014 (2.57)	-.003 (-.95)	126 (2.81)	.9988	1.40	11,600

Note: The years 1941-46 are excluded. The Durbin-Watson statistic is adjusted for this gap. Figures in parentheses are t-statistics.

Table A.3 - Consumer Expenditure Function Estimated Using Alternative Gross SSW Variables

1947-1971

Equation	SSW Variable	YD	YD_{-1}	RE	W	SSW	Constant	$\bar{R}^2$	D-W Statistic	SSR
	A. Feldstein revised variable									
(A.3.1)	1. Feldstein Reply	No equation estimated for this period.								
(A.3.2)	2. Estimated with Leimer-Lesnoy New Evidence data	.700 (8.83)	.230 (3.13)	.065 (.51)	.032 (4.01)	-.053 (-3.10)	-146 (-1.55)	.9980	1.91	5,576
(A.3.3)	3. Estimated with revised NIPA data	.687 (8.99)	.256 (3.49)	.130 (1.04)	.029 (3.72)	-.057 (-3.55)	-144 (-1.66)	.9982	1.93	5,291
	B. Feldstein replica algorithm									
(A.3.4)	1. Constant ratio	.697 (8.93)	.257 (3.48)	.106 (.84)	.028 (3.63)	-.062 (-3.50)	-151 (-1.68)	.9982	1.92	5,350
(A.3.5)	2. Current ratio	.616 (7.40)	.199 (2.40)	.055 (.37)	.023 (2.65)	-.010 (-2.13)	55 (1.04)	.9976	1.72	7,097
(A.3.6)	3. Adaptive expectations, $\delta = .5$	.601 (7.38)	.209 (2.54)	.082 (.56)	.025 (2.83)	-.011 (-2.24)	39 (.68)	.9976	1.64	6,966
(A.3.7)	4. Perfect foresight	.698 (8.98)	.259 (3.52)	.070 (.55)	.029 (3.72)	-.047 (-3.54)	-174 (-1.83)	.9982	1.95	5,307
(A.3.8)	5. Actuarial projection	.621 (7.03)	.201 (2.32)	.074 (.47)	.018 (2.18)	-.007 (-1.62)	76 (1.37)	.9974	1.68	7,727
	C. Leimer-Lesnoy algorithm									
(A.3.9)	1. Constant ratio	.611 (8.42)	.202 (2.77)	.098 (.77)	.030 (3.68)	-.020 (-3.37)	21 (.46)	.9981	1.71	5,508
(A.3.10)	2. Current ratio	.611 (7.42)	.196 (2.37)	.061 (.41)	.024 (2.73)	-.009 (-2.20)	60 (1.19)	.9976	1.68	7,016
(A.3.11)	3. Adaptive expectations, $\delta = .5$	.594 (7.36)	.206 (2.52)	.080 (.55)	.026 (2.91)	-.010 (-2.30)	50 (.96)	.9976	1.62	6,877
(A.3.12)	4. Perfect foresight	.617 (8.45)	.204 (2.78)	.088 (.68)	.031 (3.71)	-.019 (-3.34)	-4 (-.08)	.9981	1.68	5,543
(A.3.13)	5. Actuarial projection	.618 (7.15)	.198 (2.31)	.074 (.48)	.020 (2.31)	-.007 (-1.78)	7 (1.44)	.9974	1.68	7,537

Note: Figures in parentheses are t-statistics.

Table A.4 - Consumer Expenditure Function Estimated Using Alternative Gross SSW Variables

1930-1974

Equation	SSW Variable	YD	YD_{-1}	RE	W	SSW	Constant	$\bar{R}^2$	D-W Statistic	SSR
	A. Feldstein revised variable									
(A.4.1)	1. Feldstein *Reply*	.645 (11.32)	.103 (2.51)	.132 (1.83)	.011 (2.20)	.017 (2.13)	247 (4.94)	.99+	1.31	15,000
(A.4.2)	2. Estimated with Leimer-Lesnoy *New Evidence* data	.640 (11.37)	.103 (2.50)	.126 (1.79)	.012 (2.14)	.018 (2.39)	239 (4.67)	.9990	1.29	15,110
(A.4.3)	3. Estimated with revised NIPA data	.653 (10.92)	.100 (2.24)	.144 (1.85)	.010 (1.74)	.013 (1.69)	238 (4.49)	.9988	1.27	17,150
	B. Feldstein replica algorithm									
(A.4.4)	1. Constant ratio	.688 (11.71)	.097 (2.03)	.100 (1.15)	.009 (1.51)	.008 (.75)	199 (3.39)	.9987	1.38	18,320
(A.4.5)	2. Current ratio	.716 (12.66)	.106 (2.29)	.117 (1.39)	.009 (1.48)	-.002 (-.34)	144 (2.73)	.9987	1.40	18,570
(A.4.6)	3. Adaptive expectations, $\delta = .5$	.713 (12.89)	.106 (2.28)	.122 (1.49)	.009 (1.44)	-.001 (-.24)	148 (2.65)	.9987	1.39	18,600
(A.4.7)	4. Perfect foresight	.679 (11.40)	.095 (2.00)	.102 (1.24)	.009 (1.50)	.009 (.97)	217 (3.38)	.9988	1.36	18,110
(A.4.8)	5. Actuarial projection	.703 (12.48)	.106 (2.28)	.131 (1.60)	.009 (1.42)	.001 (.27)	170 (3.69)	.9987	1.34	18,590
	C. Leimer-Lesnoy algorithm									
(A.4.9)	1. Constant ratio	.713 (13.57)	.110 (2.33)	.146 (1.63)	.010 (1.52)	-.003 (-.49)	142 (3.19)	.9987	1.40	18,500
(A.4.10)	2. Current ratio	.719 (13.03)	.106 (2.29)	.113 (1.36)	.010 (1.54)	-.002 (-.54)	136 (2.59)	.9987	1.42	18,470
(A.4.11)	3. Adaptive expectations, $\delta = .5$	.714 (13.26)	.107 (2.29)	.121 (1.50)	.010 (1.49)	-.002 (-.40)	141 (2.64)	.9987	1.40	18,540
(A.4.12)	4. Perfect foresight	.712 (13.37)	.108 (2.29)	.135 (1.56)	.009 (1.46)	-.002 (-.28)	148 (2.87)	.9987	1.39	18,590
(A.4.13)	5. Actuarial projection	.708 (12.78)	.106 (2.28)	.126 (1.54)	.009 (1.43)	.0000 (.01)	160 (3.39)	.9987	1.38	18,630

Note: The years 1941-46 are excluded. The Durbin-Watson statistic is adjusted for this gap. Figures in parentheses are t-statistics.

Table A.5 - Consumer Expenditure Function Estimated Using Alternative Gross SSW Variables

1931-1974

Equation	SSW Variable	YD	YD_{-1}	RE	W	SSW	Constant	$\bar{R}^2$	D-W Statistic	SSR
	A. Feldstein revised variable									
(A.5.1)	1. Feldstein Reply	No equation estimated for this period.								
(A.5.2)	2. Estimated with Leimer-Lesnoy New Evidence data	.623 (11.13)	.131 (2.99)	.137 (1.97)	.014 (2.51)	.013 (1.73)	208 (3.85)	.9990	1.37	13,980
(A.5.3)	3. Estimated with revised NIPA data	.635 (10.64)	.129 (2.70)	.156 (2.05)	.013 (2.09)	.009 (1.06)	206 (3.68)	.9989	1.35	15,970
	B. Feldstein replica algorithm									
(A.5.4)	1. Constant ratio	.672 (11.82)	.154 (2.84)	.179 (1.94)	.013 (2.07)	-.008 (-.57)	115 (1.64)	.9988	1.46	16,360
(A.5.5)	2. Current ratio	.677 (12.03)	.143 (3.04)	.129 (1.62)	.014 (2.19)	-.004 (-.91)	112 (2.15)	.9989	1.53	16,110
(A.5.6)	3. Adaptive expectations, $\delta = .5$	.673 (12.19)	.144 (3.05)	.137 (1.77)	.015 (2.23)	-.004 (-.92)	108 (1.94)	.9989	1.51	16,110
(A.5.7)	4. Perfect foresight	.668 (11.51)	.146 (2.69)	.160 (1.85)	.013 (2.03)	-.003 (-.27)	133 (1.72)	.9988	1.45	16,490
(A.5.8)	5. Actuarial projection	.666 (11.69)	.139 (2.93)	.147 (1.87)	.012 (2.02)	-.001 (-.19)	146 (3.20)	.9988	1.47	16,510
	C. Leimer-Lesnoy algorithm									
(A.5.9)	1. Constant ratio	.659 (12.56)	.166 (3.44)	.230 (2.60)	.016 (2.56)	-.010 (-1.67)	89 (1.95)	.9989	1.57	15,210
(A.5.10)	2. Current ratio	.677 (12.25)	.144 (3.07)	.127 (1.62)	.014 (2.28)	-.005 (-1.09)	105 (2.04)	.9989	1.54	15,940
(A.5.11)	3. Adaptive expectations, $\delta = .5$	.671 (12.36)	.146 (3.10)	.140 (1.83)	.015 (2.30)	-.005 (-1.07)	103 (1.95)	.9989	1.53	15,960
(A.5.12)	4. Perfect foresight	.664 (12.51)	.161 (3.31)	.206 (2.42)	.016 (2.48)	-.008 (-1.42)	86 (1.60)	.9989	1.57	15,550
(A.5.13)	5. Actuarial projection	.669 (11.90)	.141 (2.96)	.143 (1.83)	.013 (2.06)	-.002 (-.45)	136 (2.92)	.9988	1.50	16,430

Note: The years 1941-46 are excluded. The Durbin-Watson statistic is adjusted for this gap. Figures in parentheses are t-statistics.

Table A.6 - Consumer Expenditure Function Estimated Using Alternative Gross SSW Variables

1947-1974

Equation	SSW Variable	YD	YD_{-1}	RE	W	SSW	Constant	$\bar{R}^2$	D-W Statistic	SSR
	A. Feldstein revised variable									
(A.6.1)	1. Feldstein Reply	No equation estimated for this period.								
(A.6.2)	2. Estimated with Leimer-Lesnoy New Evidence data	.623 (7.01)	.166 (2.01)	.173 (1.07)	.013 (1.41)	.007 (.63)	159 (2.10)	.9977	1.37	11,670
(A.6.3)	3. Estimated with revised NIPA data	.645 (6.73)	.167 (1.86)	.225 (1.26)	.010 (.97)	.0003 (.02)	148 (1.88)	.9974	1.41	13,390
	B. Feldstein replica algorithm									
(A.6.4)	1. Constant ratio	.761 (8.85)	.211 (2.72)	.197 (1.30)	.022 (2.36)	-.061 (-2.85)	-144 (-1.36)	.9981	1.81	9,785
(A.6.5)	2. Current ratio	.673 (7.86)	.173 (2.05)	.132 (.75)	.015 (1.50)	-.009 (-1.61)	56 (.88)	.9977	1.67	11,980
(A.6.6)	3. Adaptive expectations, $\delta = .5$	.661 (7.87)	.181 (2.14)	.155 (.90)	.017 (1.66)	-.010 (-1.69)	41 (.59)	.9977	1.63	11,850
(A.6.7)	4. Perfect foresight	.740 (8.18)	.212 (2.56)	.181 (1.12)	.020 (2.01)	-.039 (-2.24)	-115 (-.96)	.9979	1.81	10,900
(A.6.8)	5. Actuarial projection	.660 (7.37)	.170 (1.93)	.200 (1.13)	.011 (1.10)	-.003 (-.76)	110 (1.95)	.9975	1.58	13,050
	C. Leimer-Lesnoy algorithm									
(A.6.9)	1. Constant ratio	.660 (8.39)	.169 (2.15)	.208 (1.33)	.023 (2.25)	-.018 (-2.49)	41 (.81)	.9980	1.73	10,450
(A.6.10)	2. Current ratio	.668 (7.89)	.171 (2.03)	.136 (.78)	.016 (1.57)	-.008 (-1.67)	59 (.98)	.9977	1.64	11,880
(A.6.11)	3. Adaptive expectations, $\delta = .5$	.654 (7.80)	.178 (2.12)	.158 (.92)	.017 (1.68)	-.009 (-1.67)	54 (.86)	.9977	1.62	11,880
(A.6.12)	4. Perfect foresight	.663 (8.26)	.174 (2.16)	.203 (1.27)	.023 (2.15)	-.016 (-2.27)	25 (.41)	.9979	1.73	10,840
(A.6.13)	5. Actuarial projection	.661 (7.48)	.170 (1.94)	.193 (1.10)	.012 (1.18)	-.004 (-.97)	102 (1.85)	.9975	1.61	12,840

Note: Figures in parentheses are t-statistics.

Table A.7 - Consumer Expenditure Function Estimated Using Alternative Gross SSW Variables

1930-1976

Equation	SSW Variable	YD	YD_{-1}	RE	W	SSW	Constant	$\bar{R}^2$	D-W Statistic	SSK
	A. <u>Feldstein revised variable</u>									
(A.7.1)	1. Feldstein <u>Reply</u>	.671 (10.32)	.090 (1.88)	.067 (.87)	.009 (1.50)	.018 (2.00)	240 (4.14)	.99+	1.29	22,000
(A.7.2)	2. Estimated with Leimer-Lesnoy <u>New Evidence</u> data	.660 (10.33)	.091 (1.92)	.069 (.91)	.011 (1.77)	.019 (2.17)	232 (3.92)	.9988	1.26	21,350
(A.7.3)	3. Estimated with revised NIPA data	.666 (10.30)	.093 (1.90)	.097 (1.22)	.010 (1.61)	.014 (1.61)	228 (3.93)	.9988	1.30	21,810
	B. <u>Feldstein replica algorithm</u>									
(A.7.4)	1. Constant ratio	.713 (11.40)	.093 (1.79)	.062 (.67)	.009 (1.36)	.005 (.40)	168 (2.67)	.9987	1.38	23,330
(A.7.5)	2. Current ratio	.724 (11.76)	.098 (1.94)	.080 (.90)	.009 (1.33)	.0001 (.02)	147 (2.59)	.9987	1.38	23,430
(A.7.6)	3. Adaptive expectations, $\delta = .5$	.719 (11.95)	.098 (1.94)	.086 (1.00)	.008 (1.23)	.001 (.26)	159 (2.68)	.9987	1.37	23,380
(A.7.7)	4. Perfect foresight	.703 (11.02)	.090 (1.73)	.059 (.67)	.009 (1.36)	.007 (.68)	188 (2.72)	.9987	1.37	23,130
(A.7.8)	5. Actuarial projection	.720 (11.91)	.098 (1.94)	.083 (.98)	.009 (1.32)	.001 (.20)	154 (3.09)	.9987	1.36	23,400
	C. <u>Leimer-Lesnoy algorithm</u>									
(A.7.9)	1. Constant ratio	.731 (13.20)	.107 (2.12)	.130 (1.37)	.010 (1.59)	-.006 (-1.01)	109 (2.38)	.9987	1.42	22,760
(A.7.10)	2. Current ratio	.728 (12.10)	.098 (1.95)	.075 (.85)	.009 (1.34)	-.001 (-.14)	139 (2.48)	.9987	1.39	23,420
(A.7.11)	3. Adaptive expectations, $\delta = .5$	.722 (12.31)	.098 (1.94)	.083 (.97)	.008 (1.23)	.001 (.16)	154 (2.70)	.9987	1.37	23,410
(A.7.12)	4. Perfect foresight	.733 (13.03)	.105 (2.06)	.111 (1.22)	.010 (1.54)	-.005 (-.79)	110 (2.06)	.9987	1.42	23,020
(A.7.13)	5. Actuarial projection	.724 (12.14)	.098 (1.94)	.079 (.94)	.009 (1.32)	.0001 (.02)	146 (2.87)	.9987	1.38	23,430

Note: The years 1941-46 are excluded. The Durbin-Watson statistic is adjusted for this gap. Figures in parentheses are t-statistics.

Table A.8 - Consumer Expenditure Function Estimated Using Alternative Gross SSW Variables

1931-1976

Equation	SSW Variable	YD	YD_{-1}	RE	W	SSW	Constant	$\bar{R}^2$	D-W Statistic	SSR
	A. Feldstein revised variable									
(A.8.1)	1. Feldstein Reply	No equation estimated for this period.								
(A.8.2)	2. Estimated with Leimer-Lesnoy New Evidence data	.649 (10.03)	.112 (2.19)	.073 (.96)	.012 (1.97)	.015 (1.66)	207 (3.25)	.9988	1.29	20,650
(A.8.3)	3. Estimated with revised NIPA data	.652 (9.98)	.117 (2.22)	.105 (1.32)	.012 (1.85)	.010 (1.09)	199 (3.22)	.9988	1.35	20,920
	B. Feldstein replica algorithm									
(A.8.4)	1. Constant ratio	.697 (11.39)	.152 (2.54)	.144 (1.44)	.012 (1.88)	-.012 (-.80)	88 (1.07)	.9988	1.45	21,250
(A.8.5)	2. Current ratio	.692 (11.01)	.130 (2.47)	.084 (.98)	.012 (1.81)	-.002 (-.37)	121 (2.11)	.9987	1.44	21,570
(A.8.6)	3. Adaptive expectations, $\delta = .5$	.687 (11.14)	.129 (2.45)	.092 (1.09)	.012 (1.73)	-.001 (-.18)	130 (2.15)	.9987	1.43	21,630
(A.8.7)	4. Perfect foresight	.693 (11.02)	.140 (2.34)	.115 (1.24)	.012 (1.82)	-.005 (-.42)	106 (1.24)	.9988	1.44	21,540
(A.8.8)	5. Actuarial projection	.687 (11.08)	.129 (2.45)	.093 (1.13)	.012 (1.78)	-.001 (-.19)	132 (2.61)	.9987	1.44	21,630
	C. Leimer-Lesnoy algorithm									
(A.8.9)	1. Constant ratio	.674 (12.02)	.167 (3.19)	.220 (2.31)	.017 (2.60)	-.014 (-2.15)	55 (1.15)	.9989	1.56	19,060
(A.8.10)	2. Current ratio	.693 (11.21)	.130 (2.49)	.081 (.94)	.012 (1.84)	-.002 (-.49)	115 (2.05)	.9988	1.45	21,500
(A.8.11)	3. Adaptive expectations, $\delta = .5$	.687 (11.33)	.130 (2.46)	.091 (1.10)	.012 (1.74)	-.001 (-.25)	127 (2.19)	.9987	1.43	21.610
(A.8.12)	4. Perfect foresight	.682 (12.03)	.161 (3.05)	.186 (2.06)	.018 (2.52)	-.012 (-1.88)	46 (.82)	.9989	1.56	19,610
(A.8.13)	5. Actuarial projection	.690 (11.22)	.130 (2.47)	.090 (1.10)	.012 (1.80)	-.001 (-.35)	124 (2.42)	.9987	1.46	21,570

Note: The years 1941-46 are excluded. The Durbin-Watson statistic is adjusted for this gap. Figures in parentheses are t-statistics.

Table A.9 - Consumer Expenditure Function Estimated Using Alternative Gross SSW Variables

1947-1976

Equation	SSW Variable	YD	YD_{-1}	RE	W	SSW	Constant	$\bar{R}^2$	D-W Statistic	SSR
	A. Feldstein revised variable									
(A.9.1)	1. Feldstein Reply	No equation estimated for this period.								
(A.9.2)	2. Estimated with Leimer-Lesnoy New Evidence data	.649 (6.14)	.158 (1.61)	.180 (.93)	.008 (.82)	.009 (.71)	157 (1.73)	.9973	1.27	18,180
(A.9.3)	3. Estimated with revised NIPA data	.658 (6.18)	.165 (1.67)	.223 (1.14)	.007 (.75)	.001 (.11)	140 (1.60)	.9974	1.39	18,090
	B. Feldstein replica algorithm									
(A.9.4)	1. Constant ratio	.789 (8.19)	.216 (2.50)	.191 (1.13)	.022 (2.20)	-.068 (-2.83)	-191 (-1.62)	.9981	1.71	13,570
(A.9.5)	2. Current ratio	.683 (6.92)	.174 (1.81)	.166 (.84)	.010 (.98)	-.006 (-.98)	68 (.95)	.9975	1.50	17,390
(A.9.6)	3. Adaptive expectations, $\delta = .5$	.673 (6.88)	.178 (1.83)	.190 (.98)	.010 (1.00)	-.005 (-.86)	71 (.91)	.9975	1.46	17,550
(A.9.7)	4. Perfect foresight	.764 (7.50)	.215 (2.33)	.177 (.99)	.019 (1.78)	-.042 (-2.14)	-150 (-1.11)	.9978	1.70	15,190
(A.9.8)	5. Actuarial projection	.678 (6.81)	.169 (1.75)	.194 (.99)	.009 (.88)	-.004 (-.74)	92 (1.47)	.9975	1.55	17,690
	C. Leimer-Lesnoy algorithm									
(A.9.9)	1. Constant ratio	.676 (7.89)	.169 (1.99)	.203 (1.20)	.024 (2.30)	-.022 (-2.80)	7 (.13)	.9981	1.68	13,640
(A.9.10)	2. Current ratio	.679 (6.94)	.173 (1.81)	.171 (.87)	.010 (1.01)	-.006 (-1.02)	71 (1.05)	.9975	1.48	17,350
(A.9.11)	3. Adaptive expectations, $\delta = .5$	.668 (6.85)	.176 (1.81)	.195 (1.00)	.010 (.99)	-.005 (-.79)	82 (1.16)	.9975	1.46	17,640
(A.9.12)	4. Perfect foresight	.681 (7.77)	.175 (2.02)	.198 (1.15)	.023 (2.18)	-.019 (-2.57)	-14 (-.22)	.9980	1.68	14,180
(A.9.13)	5. Actuarial projection	.678 (6.87)	.169 (1.76)	.192 (.99)	.009 (.93)	-.004 (-.85)	87 (1.42)	.9975	1.55	17,560

Note: Figures in parentheses are t-statistics.

Appendix B

Consumer Expenditure Function: Analysis of Feldstein's Revised Results

Table	Period
B.1	1930-71
B.2	1931-71
B.3	1947-71
B.4	1930-74
B.5	1931-74
B.6	1947-74
B.7	1930-76
B.8	1931-76
B.9	1947-76

Table B.1 - Consumer Expenditure Function: Analysis of Feldstein's Revised Results

1930-1971

Equation	Description of SSW Variable	YD	YD_{-1}	RE	W	SSW	Constant	$\bar{R}^2$	D-W Statistic	SSR
(B.1.1)	Revised Feldstein	.651 (11.31)	.109 (2.42)	.112 (1.25)	.010 (1.78)	.013 (1.35)	229 (4.26)	.9987	1.15	13,690
(B.1.2)	Revised Feldstein, gradual adjustment	.651 (11.31)	.109 (2.42)	.112 (1.25)	.010 (1.78)	.013 (1.35)	229 (4.26)	.9987	1.15	13,690
(B.1.3)	"Revised" Feldstein replica	.655 (11.34)	.106 (2.29)	.115 (1.28)	.010 (1.79)	.013 (1.22)	228 (3.97)	.9987	1.16	13,850
(B.1.4)	"Revised, price-indexed" Feldstein replica	.655 (11.48)	.106 (2.29)	.115 (1.28)	.010 (1.79)	.013 (1.22)	228 (3.97)	.9987	1.16	13,850
(B.1.5)	"Revised" Leimer-Lesnoy constant ratio	.694 (13.06)	.120 (2.58)	.150 (1.63)	.010 (1.65)	-.002 (-.25)	156 (3.25)	.9986	1.16	14,500
(B.1.6)	Modification of revised Feldstein	.679 (11.35)	.117 (2.55)	.141 (1.57)	.009 (1.62)	.003 (.37)	185 (3.23)	.9986	1.13	14,460
(B.1.7)	"Mixed" perception	.676 (11.69)	.115 (2.49)	.141 (1.58)	.009 (1.62)	.005 (.55)	193 (3.40)	.9986	1.13	14,390

Note: The years 1941-46 are excluded. The Durbin-Watson statistic is adjusted for this gap. Figures in parentheses are t-statistics.

Table B.2 - Consumer Expenditure Function: Analysis of Feldstein's Revised Results

1931-1971

Equation	Description of SSW Variable	YD	YD_{-1}	RE	W	SSW	Constant	$\bar{R}^2$	D-W Statistic	SSR
(B.2.1)	Revised Feldstein	.632 (11.39)	.159 (3.23)	.182 (1.98)	.013 (2.38)	.0001 (.01)	162 (2.67)	.9988	1.27	11,960
(B.2.2)	Revised Feldstein, gradual adjustment	.632 (11.39)	.159 (3.23)	.182 (1.98)	.013 (2.38)	.0001 (.01)	162 (2.67)	.9988	1.27	11,960
(B.2.3)	"Revised" Feldstein replica	.637 (11.54)	.166 (3.21)	.194 (2.09)	.013 (2.41)	-.003 (-.28)	145 (2.19)	.9988	1.28	11,930
(B.2.4)	"Revised, price-indexed" Feldstein replica	.637 (11.55)	.166 (3.21)	.194 (2.09)	.013 (2.41)	-.003 (-.28)	145 (2.19)	.9988	1.28	11,930
(B.2.5)	"Revised" Leimer-Lesnoy constant ratio	.637 (12.58)	.181 (3.96)	.231 (2.69)	.016 (2.88)	-.009 (-1.59)	99 (2.13)	.9989	1.40	11,000
(B.2.6)	Modification of revised Feldstein	.650 (11.67)	.169 (3.66)	.199 (2.35)	.014 (2.54)	-.007 (-.88)	115 (1.97)	.9988	1.38	11,640
(B.2.7)	"Mixed" perception	.644 (11.80)	.170 (3.57)	.194 (2.29)	.014 (2.51)	-.006 (-.72)	123 (2.09)	.9988	1.33	11,750

Note: The years 1941-46 are excluded. The Durbin-Watson statistic is adjusted for this gap. Figures in parentheses are t-statistics.

Table B.3 - Consumer Expenditure Function: Analysis of Feldstein's Revised Results

1947-1971

Equation	Description of SSW Variable	YD	YD_{-1}	RE	W	SSW	Constant	$\bar{R}^2$	D-W Statistic	SSR
(B.3.1)	Revised Feldstein	.687 (8.99)	.256 (3.49)	.129 (1.04)	.029 (3.72)	-.057 (-3.55)	-144 (-1.66)	.9982	1.93	5,291
(B.3.2)	Revised Feldstein, gradual adjustment	.687 (8.99)	.256 (3.49)	.130 (1.04)	.029 (3.72)	-.057 (-3.55)	-144 (-1.66)	.9982	1.93	5,291
(B.3.3)	"Revised" Feldstein replica	.697 (8.93)	.257 (3.48)	.106 (.84)	.028 (3.63)	-.062 (-3.50)	-151 (-1.68)	.9982	1.92	5,350
(B.3.4)	"Revised, price-indexed" Feldstein replica	.697 (8.93)	.257 (3.48)	.106 (.84)	.028 (3.63)	-.062 (-3.50)	-151 (-1.68)	.9982	1.92	5,350
(B.3.5)	"Revised" Leimer-Lesnoy constant ratio	.611 (8.42)	.202 (2.77)	.098 (.77)	.030 (3.68)	-.020 (-3.37)	21 (.46)	.9981	1.71	5,508
(B.3.6)	Modification of revised Feldstein	.712 (9.35)	.178 (2.55)	.047 (.38)	.028 (3.77)	-.035 (-3.83)	-69 (-1.11)	.9983	2.06	4,961
(B.3.7)	"Mixed" perception	.649 (8.07)	.220 (2.81)	.062 (.45)	.025 (3.09)	-.029 (-2.77)	-30 (-.42)	.9979	1.81	6,269

Note: Figures in parentheses are t-statistics.

Table B.4 - Consumer Expenditure Function: Analysis of Feldstein's Revised Results

1930-1974

Equation	Description of SSW Variable	YD	YD_{-1}	RE	W	SSW	Constant	$\bar{R}^2$	D-W Statistic	SSR
(B.4.1)	Revised Feldstein (1981 NIPA data)	.653 (10.92)	.100 (2.24)	.144 (1.85)	.010 (1.74)	.013 (1.69)	238 (4.49)	.9988	1.27	17,150
(B.4.2)	Revised Feldstein, gradual adjustment	.692 (11.42)	.102 (2.17)	.123 (1.54)	.009 (1.50)	.005 (.51)	186 (3.24)	.9987	1.38	18,490
(B.4.3)	"Revised" Feldstein replica	.656 (10.96)	.097 (2.13)	.145 (1.86)	.011 (1.76)	.014 (1.59)	237 (4.29)	.9988	1.29	17,300
(B.4.4)	"Revised, price-indexed" Feldstein replica	.683 (11.51)	.096 (2.01)	.099 (1.17)	.009 (1.54)	.010 (.86)	206 (3.43)	.9988	1.38	18,220
(B.4.5)	"Revised" Leimer-Lesnoy constant ratio	.704 (12.81)	.104 (2.23)	.122 (1.51)	.009 (1.38)	.002 (.26)	171 (3.33)	.9987	1.35	18,600
(B.4.6)	Modification of revised Feldstein	.679 (10.81)	.105 (2.28)	.136 (1.70)	.009 (1.49)	.006 (.82)	204 (3.40)	.9988	1.29	18,260
(B.4.7)	"Mixed" perception	.680 (11.24)	.102 (2.21)	.143 (1.76)	.009 (1.50)	.007 (.89)	206 (3.51)	.9988	1.31	18,200

Note: The years 1941-46 are excluded. The Durbin-Watson statistic is adjusted for this gap. Figures in parentheses are t-statistics.

Table B.5 - Consumer Expenditure Function: Analysis of Feldstein's Revised Results

1931-1974

Equation	Description of SSW Variable	YD	YD_{-1}	RE	W	SSW	Constant	$\bar{R}^2$	D-W Statistic	SSR
(B.5.1)	Revised Feldstein	.635 (10.64)	.129 (2.70)	.156 (2.05)	.013 (2.09)	.009 (1.06)	206 (3.68)	.9989	1.35	15,970
(B.5.2)	Revised Feldstein, gradual adjustment	.674 (11.47)	.147 (2.93)	.155 (1.99)	.012 (2.02)	-.005 (-.50)	125 (1.99)	.9988	1.45	16,400
(B.5.3)	"Revised" Feldstein replica	.639 (10.70)	.127 (2.62)	.157 (2.04)	.013 (2.10)	.008 (.93)	202 (3.45)	.9989	1.37	16,090
(B.5.4)	"Revised, price-indexed" Feldstein replica	.670 (11.63)	.150 (2.76)	.169 (1.87)	.013 (2.04)	-.006 (-.42)	125 (1.72)	.9988	1.46	16,440
(B.5.5)	"Revised" Leimer-Lesnoy constant ratio	.668 (12.11)	.146 (2.98)	.160 (2.02)	.013 (2.09)	-.004 (-.56)	127 (2.39)	.9988	1.52	16,370
(B.5.6)	Modification of revised Feldstein	.659 (10.69)	.138 (2.87)	.151 (1.93)	.012 (2.00)	.001 (.13)	160 (2.57)	.9988	1.42	16,520
(B.5.7)	"Mixed" perception	.657 (10.99)	.136 (2.81)	.153 (1.94)	.012 (1.99)	.002 (.21)	165 (2.69)	.9988	1.42	16,510

Note: The years 1941-46 are excluded. The Durbin-Watson statistic is adjusted for this gap. Figures in parentheses are t-statistics.

Table B.6 - Consumer Expenditure Function: Analysis of Feldstein's Revised Results

1947-1974

Equation	Description of SSW Variable	YD	YD_{-1}	RE	W	SSW	Constant	$\bar{R}^2$	D-W Statistic	SSR
(B.6.1)	Revised Feldstein	.645 (6.73)	.167 (1.86)	.225 (1.26)	.010 (.97)	.0003 (.02)	148 (1.88)	.9974	1.41	13,390
(B.6.2)	Revised Feldstein, gradual adjustment	.719 (8.63)	.215 (2.66)	.135 (.84)	.016 (1.81)	-.037 (-2.53)	-67 (-.75)	.9980	1.62	10,380
(B.6.3)	"Revised" Feldstein replica	.643 (6.67)	.167 (1.85)	.226 (1.26)	.010 (.97)	.001 (.08)	152 (1.93)	.9974	1.40	13,390
(B.6.4)	"Revised, price-indexed" Feldstein replica	.762 (8.50)	.211 (2.64)	.188 (1.21)	.021 (2.16)	-.058 (-2.59)	-136 (-1.21)	.9980	1.84	10,260
(B.6.5)	"Revised" Leimer-Lesnoy constant ratio	.666 (7.60)	.171 (1.98)	.198 (1.15)	.014 (1.38)	-.009 (-1.20)	82 (1.31)	.9976	1.67	12,560
(B.6.6)	Modification of revised Feldstein	.692 (7.06)	.165 (1.89)	.180 (1.01)	.011 (1.15)	-.010 (-1.01)	71 (.87)	.9976	1.67	12,790
(B.6.7)	"Mixed" perception	.668 (7.11)	.174 (1.96)	.192 (1.06)	.011 (1.08)	-.007 (-.67)	96 (1.18)	.9975	1.54	13,120

Note: Figures in parentheses are t-statistics.

Table B.7 - Consumer Expenditure Function: Analysis of Feldstein's Revised Results

1930-1976

Equation	Description of SSW Variable	YD	YD_{-1}	RE	W	SSW	Constant	$\bar{R}^2$	D-W Statistic	SSR
(B.7.1)	Revised Feldstein (revised NIPA data)	.666 (10.30)	.093 (1.90)	.097 (1.22)	.010 (1.61)	.014 (1.61)	228 (3.93)	.9988	1.30	21,810
(B.7.2)	Revised Feldstein, gradual adjustment	.694 (10.62)	.091 (1.80)	.078 (.96)	.009 (1.47)	.009 (.88)	194 (3.15)	.9987	1.40	22,920
(B.7.3)	"Revised" Feldstein replica	.653 (10.19)	.087 (1.80)	.115 (1.44)	.011 (1.80)	.018 (1.97)	248 (4.23)	.9988	1.31	21,090
(B.7.4)	"Revised, price-indexed" Feldstein replica	.707 (11.14)	.091 (1.75)	.057 (.64)	.009 (1.38)	.007 (.58)	179 (2.77)	.9987	1.38	23,210
(B.7.5)	"Revised" Leimer-Lesnoy constant ratio	.722 (12.24)	.097 (1.91)	.077 (.92)	.008 (1.30)	.001 (.14)	152 (2.75)	.9987	1.37	23,420
(B.7.6)	Modification of revised Feldstein	.701 (10.38)	.098 (1.94)	.086 (1.05)	.009 (1.36)	.005 (.62)	182 (2.80)	.9987	1.32	23,170
(B.7.7)	"Mixed" perception	.679 (10.43)	.093 (1.87)	.113 (1.34)	.009 (1.49)	.011 (1.29)	218 (3.48)	.9987	1.30	22,370

Note: The years 1941-46 are excluded. The Durbin-Watson statistic is adjusted for this gap. Figures in parentheses are t-statistics.

Table B.8 - Consumer Expenditure Function: Analysis of Feldstein's Revised Results

1931-1976

Equation	Description of SSW Variable	YD	YD_{-1}	RE	W	SSW	Constant	$\bar{R}^2$	D-W Statistic	SSR
(B.8.1)	Revised Feldstein	.652 (9.98)	.117 (2.22)	.105 (1.32)	.012 (1.85)	.010 (1.09)	200 (3.22)	.9988	1.35	20,920
(B.8.2)	Revised Feldstein, gradual adjustment	.680 (10.45)	.126 (2.26)	.095 (1.17)	.011 (1.77)	.002 (.15)	149 (2.16)	.9987	1.42	21,640
(B.8.3)	"Revised" Feldstein replica	.640 (9.85)	.110 (2.09)	.119 (1.49)	.013 (2.00)	.014 (1.48)	223 (3.55)	.9988	1.34	20,340
(B.8.4)	"Revised, price-indexed" Feldstein replica	.695 (11.15)	.145 (2.41)	.126 (1.30)	.012 (1.83)	-.008 (-.55)	99 (1.24)	.9988	1.44	21,460
(B.8.5)	"Revised" Leimer-Lesnoy constant ratio	.690 (11.47)	.136 (2.51)	.107 (1.29)	.012 (1.86)	-.004 (-.55)	111 (1.89)	.9988	1.48	21,460
(B.8.6)	Modification of revised Feldstein	.683 (10.18)	.128 (2.41)	.096 (1.19)	.011 (1.76)	.0002 (.02)	141 (2.04)	.9987	1.42	21,650
(B.8.7)	"Mixed" perception	.661 (10.06)	.120 (2.26)	.115 (1.38)	.012 (1.79)	.007 (.80)	187 (2.83)	.9988	1.36	21,250

Note: The years 1941-46 are excluded. The Durbin-Watson statistic is adjusted for this gap. Figures in parentheses are t-statistics.

Table B.9 - Consumer Expenditure Function: Analysis of Feldstein's Revised Results

1947-1976

Equation	Description of SSW Variable	YD	YD_{-1}	RE	W	SSW	Constant	$\bar{R}^2$	D-W Statistic	SSR
(B.9.1)	Revised Feldstein	.658 (6.18)	.165 (1.67)	.223 (1.14)	.007 (.75)	.001 (.11)	140 (1.60)	.9974	1.39	18,090
(B.9.2)	Revised Feldstein, gradual adjustment	.705 (6.91)	.197 (2.00)	.181 (.95)	.010 (.98)	-.020 (-1.20)	13 (.13)	.9976	1.42	17,070
(B.9.3)	"Revised" Feldstein replica	.636 (5.99)	.156 (1.59)	.236 (1.22)	.008 (.82)	.008 (.65)	181 (2.13)	.9975	1.33	17,790
(B.9.4)	"Revised, price-indexed" Feldstein replica	.786 (7.73)	.214 (2.39)	.186 (1.06)	.019 (1.90)	-.062 (-2.44)	-170 (-1.33)	.9979	1.71	14,510
(B.9.5)	"Revised" Leimer-Lesnoy constant ratio	.683 (6.96)	.172 (1.80)	.199 (1.04)	.011 (1.10)	-.009 (-1.07)	67 (.96)	.9975	1.57	17,270
(B.9.6)	Modification of revised Feldstein	.714 (6.55)	.163 (1.71)	.172 (.88)	.009 (.94)	-.012 (-1.01)	47 (.52)	.9975	1.60	17,360
(B.9.7)	"Mixed" perception	.664 (6.30)	.166 (1.69)	.219 (1.10)	.007 (.75)	-.0003 (-.02)	129 (1.45)	.9974	1.41	18,090

Note: Figures in parentheses are t-statistics.