SOCIAL SECURITY AND PHYSICAL CAPITAL:

AN INTERPRETATION OF THE EVIDENCE, LESSONS AND OUTLOOK*

by

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1. Introduction

In the last decade, a controversy has arisen concerning the possibility of an aggregate capital shortage and its potential causes and remedies. One possible factor in reducing aggregate saving and the capital stock has been the rapid growth of unfunded social security benefits. Because the social security system is so large, even a small decline in private saving per dollar of future social security benefits could cause a substantial reduction in total private saving. The relationship between social security and savings has been, as a result, the subject of an extensive, and still growing, body of economic research. This literature has been summarized and evaluated in several recent surveys.[1] Rather than simply duplicate those surveys, this paper will attempt to draw some lessons from the literature for empirical policy analysis and to call attention to fruitful avenues of current and future research.

Following the seminal papers of Feldstein [1974] and Barro [1974], two models which have strong implications for the effect of an unfunded social security program on savings -- the life-cycle and the intergenerational hypotheses -- have been the focus of analytical and empirical work on this issue. The following section briefly summarizes the results and methodologies of these studies. The results are generally negative for the extreme versions of both hypotheses. Collectively, the empirical studies demonstrate, both in the breach and in the observance of methodological principles, the value of econometric approaches similar to that recommended by Leamer [1983]. The third section discusses other aspects of the social security system which may affect both the level of saving and the division of that saving between human and physical capital formation. It also mentions empirical work on the motivation for bequests, which is indirecty but significantly relevant for the

question of the effect of social security on the stock of capital.

2. Life-cycle and Intergenerational Hypotheses: Theory and Evidence

The life-cycle model, as developed by Modigliani and others, was applied by Feldstein [1974] to the issue of the effect of an unfunded social security program on the aggregate level of savings. The theory assumes that individuals plan their consumption over their lifetime subject to a lifetime budget constraint based on earnings and other wealth. In the simple version, which assumes perfect capital markets and no desired bequests, a tax-and-transfer program which pays the benefits late in life, but leaves the present value of lifetime wealth unchanged, causes no change in lifetime consumption and hence a dollar-for-dollar reduction in private savings as disposable income is reduced. If the program increases lifetime wealth, the theory predicts consumption will increase throughout the individual's life while saving is reduced.

Bequests could be added to the life-cycle framework without affecting the conclusions significantly so long as they are independent of the utility of the recipient.[2] Barro [1974] pointed out, however, that if donors cared about the welfare of their heirs and if consumption planning had a long enough horizon, then a pay-as-you-go social security system would have no effect on saving since the older generation would increase bequests to compensate the younger generation for their higher taxes.

Various theoretical modifications have been proposed even within the structure of these two models. Kotlikoff [1979] noted that a large capital stock reduction — such as Feldstein suggested occurred after the introduction of social security — would, in a closed economy, lead to a major increase in the rate of return of capital and possibly induce a mitigating response.

International capital flows might also offset a reduction in the domestic
capital stock caused by social security.[3] Borrowing constraints on some
individuals can inhibit the operation of the life-cycle smoothing; the
introduction of an unfunded social security system would have ambiguous
effects for these people.[4] In addition, as Feldstein pointed out in his
original paper, such features of social security as the method of actuarial
adjustment for early retirement and the earnings test may induce workers to
retire sooner than they otherwise would. This last effect could cause social
security to increase savings within the simple life-cycle model.

Robert Eisner [1983] criticizes the predictions of substantial impact of
social security on saving using a simple Keynesian model. During times of
high unemployment, any increase in consumption caused by social security being
unfunded would increase aggregate output and perhaps lead to an increase in
saving. At full employment, the monetary authorities could increase the price
level after the introduction of social security to leave the total level of
real government debt (including social security debt) at the pre-social
security level. This application of the "paradox of thrift" illustrates the
risk of taking income and prices as exogenous in a macro model.

An institutional constraint which affects the conclusions of the
intergenerational model is the inability to leave negative bequests.
Feldstein [1978] notes that in a growing economy the desire to leave negative
bequests might be common even among the altruistic donors considered by
Barro. An unfunded social security system would allow the older generation to
leave negative bequests in the form of increased taxes and, therefore, some of
the elderly might not offset it by making bequests. As Barro states, however,
the intergenerational hypothesis might be operating through inter vivos gifts
or aid from children to retired parents.

Since, as the preceding discussion should make clear, a wide range of response of private saving to the unfunded social security system would be consistent with the theoretical models, much attention has been devoted to obtaining empirical estimates. Various studies have used aggregate U.S. time series, cross-sectional, or cross-national data sets to approach this problem. These shall be briefly reviewed, with an effort made to find lessons for future empirical research on policy questions. Some efforts to test directly some predictions of the life-cycle and intergenerational models shall be mentioned.

The aggregate time series estimates for the effect of social security on savings have generated the most controversy by far. Feldstein in his 1974 paper took the Ando-Modigliani [1963] consumption function and included an estimate of social security wealth. This estimate was supposed to represent the actuarial value of perceived future benefits expected by individuals. Two of the critical assumptions used to derive it were that individuals expected the ratio of benefits to per-capital income to be constant and equal to the historical average and that real nominal income grew 2% faster than the real interest rates. The estimated coefficient on social security wealth suggested a cumulative reduction of 38% of the private capital stock was attributable to social security.

The early critiques of Feldstein's econometric estimates focused on three basic issues: (1) Whether social security wealth should be gross or net of future payroll taxes (and how social security wealth should be specified in the first place); (2) how the consumer expenditure equation should be specified; and (3) whether it was legitimate to use the entire sample period from 1929 (but excluding the war years), since the Depression includes many years before social security was introduced, and hence when social security

wealth was zero. Thus, Barro [1978] included a measure of the government surplus and the stock of consumer durables as explanatory variables, while Darby [1978] considers a quite different specification of the equation, including, for example, real money balances. Boskin and Robinson [1980] use real consumption (including service flows of durables but excluding durable purchases) rather than current consumption expenditure as a dependent variable, try improved measures of income and wealth, and, in some estimates, consider demographic and intrest rate explanatory variables. All three studies consider variations in the measure of social security but pay particular attention to the measure suggested by Feldstein. All three, as well as newer estimates by Feldstein [1978], at least for the full sample period, arrive at point estimates suggesting that social security reduced saving, though not always with statistical significance.

Most of these results became obsolete following the discovery by Leimer and Lesnoy of a programming error in Feldstein's algorithm for calculating social security wealth and their demonstration that correction reduced the coefficient in Feldstein's equation to insignificance. More importantly, they showed that reasonable specifications for individual perceptions of future social security benefits could lead to remarkably different profiles of social security wealth, that none of the alternatives lead to signficiant positive (suggesting social security reduced saving) coefficients on social security wealth in the basic Feldstein specification, and that the sign of the coefficient was sensitive to small changes in the period of estimation. The rejoinder by Feldstein [1982] showed that by increasing the measure of social security wealth by 20% in 1972 to take changes in the law into account, a significant positive coefficient on social security could be salvaged. However, as pointed out by Leimer and Lesnoy [1982], this requires different

treatment of the 1972 amendments than earlier ones, is an inaccurate characterization of the 1972 amendments, and is sensitive to the sample period.

The heat generated by the controversy has had some salutary effects. It lent sufficient importance to the issue for researchers to consider it worthwhile to carefully replicate the results and test their sensitivity to specification of an important variable. This effort led to the discovery of the programming error and to the consensus rejection of time series estimates as a source of evidence on the effect of social security on saving.[5] The importance of replication was thereby emphasized. The lesson that the aggregate time series data are insufficiently rich and aggregate consumption models insufficiently specified to permit reliable inferences to be made regarding savings behavior was somewhat painfully learned.

The last point is related to the issues raised by Leamer [1983]. He asks that two words — whimsy and fragility — be used by econometricians. The first captures the idea that many judgments and assumptions must be made in any empirical study. In this example they range from the choice of the dependent variable and error distribution to the specification of the formation of expectations of future benefits. Some choices may seem to outside observers to be more whimsical than others (such as the modified social security wealth variable in Feldstein [1982]), but in any case the judgment of another intelligent observer might differ from that of the researcher. "The profession consequently and properly withholds belief until an inference is shown to be adequately insensitive to the choice of assumptions."[6] That is, the confidence inspired by an estimate which is fragile to modifications of controversial assumptions is small. More extensive sensitivity analyses, particularly in those assumptions regarding

specification and parameter values where the priors are not strongly maintained, would help achieve consensus, if that is possible, or at least isolate the areas of disagreement. Leimer and Lesnoy [1982] show the value of such sensitivity analyses, even though their attention is restricted to the measurement of social security wealth and the period of estimation.

The cross-section evidence is also mixed, though much less controversial. Feldstein and Pellechio [1979], using asset data for a sample of employed men 55-64, find that each dollar of social security wealth substitutes for a dollar of private wealth. Kotlikoff [1979] and Diamond and Hausman [1980] use the National Longitudinal Survey of men 45-59 and estimate that social security substitutes for other assets, but much less than dollar-for-dollar. Kotlikoff also presents a direct test of the life-cycle model which shall be discussed a little later.

David and Menchik [1980] construct a data set that includes state income tax records, lifetime contributions to socil security, and probate record for a smaple of Wisconsin males born betwen 1890 and 1900, a significant number of whom never because eligible for social security. They reject the intergenerational hypothesis since bequests do not vary with social security wealth and reject the life-cycle hypothesis because the age wealth profile is not affected by social security. Blinder, Gordon and Wise [1981], using the Retirement History Survey to obtain careful wealth measures, arrive at a point estimate for the effect of social security on other assets which suggests a partial offset, but which cannot be statistically distinguished from either full or no offset.

As has been emphasized by Barro [1978], Auerbach and Kotlikoff [1981], and Kurz [1983], cross-section studies have significant metholodogical defects. Missing data is a serious problem, especialy in the most important

variables: assets and social security wealth. Socil security is treated as exogenous and fully expected; especially in the years of the cross-section data bases, a large component of social security wealth may have been unexpected. Barro argues that cross-sectional evidence that social security wealth was associated with lower savings may not refute the intergenerational hypothesis since it may reflect individual windfalls rather than higher taxes on the individual's heirs.

The need for sensitivity analyses arises in cross-section work just as in time series. For some reason, such analyses are less common in cross-section estimations, perhaps due to the difficulty outside researchers have in duplicating work. One of the advantages of cross-sectional data is the variety of sources for different efforts. Biases in one data set may not be present in the same way in another, so the overall error, as discussed in Leamer, may be reduced.

The international cross-section data can be summarized quickly. Omitted variables and problems of data definitions are likely to be particularly severe. Feldstein, in two studies [1977] and [1980], finds that social security significantly reduces private saving. However, for reasons given by Danziger, Haveman, and Plotnik [1981] and by Aaron [1982], the results do not seem to pass the fragility test. Barro and McDonald [1979] find no significant relationship.

A number of direct tests of the intergenerational and life-cycle hypotheses have been made. The results have been disturbing for advocates of both models. One simple test of the life-cycle model is whether people dissave during retirement. A large number of studies (see Kurz [1983] for list) have found that wealth continues to increase with age, though Kearl and Pope [1983] working with historical data find a peak in the age-wealth profile

and other evidence consistent with the life-cycle hypothesis, while King and Dicks-Mireaux [1982] and Shorrocks [1975] find a peak after correction for differential mortality and pension wealth. Additional evidence against the life-cycle hypothesis are the estimates by Darby [1978] and Kotlikoff and Summers [1980] that life-cycle consumption smoothing accounts for less than 20% of the total capital stock. Kotlikoff [1979] separates social security into a lifetime wealth increment and an annuity and finds the coefficient on the annuity too low, while the lifetime wealth increment is estimated to increase assets in contradiction to the life-cycle model.

The evidence against the simple intregenerational model is strong, as well. As Kurz states, "the most important case against the intergenerational hypothesis is the ample evidence that social security has had a profound influence on the relationship between young and old in our society, on the sense of self esteem of the elderly, on the retirement age, on the mobility of the aged and on such diverse phenomena like the consumption patern, nutrition, health care and social interaction among the elderly."[7] More direct evidence is provided by the David and Menchik [1980] study mentioned above and by Kurz [1982], who uses a data set developed for the Commission on Pension Policy to estimate functions on the giving and receipt of gifts and finds the two are not connected in a way implied by the intergenerational hypothesis.

3. Other Research

Until recently, most of the research on the interaction between physical capital formation and the social security system has considered only one aspect of the system: that it pays unfunded benefits with a particular expected present value to retirees. This approach ignores many of the special features of social security as an asset: it is an annuity, it is involuntary,

it is indexed, it redistributes income across classes and between families with different demographic characteristics, it is illiquid, by law, in ways that are more extreme than the illiquidity asociated with human capital, and it is financed by a payroll tax, which, if it is borne by labor, is a tax on the return of human capital. Each of these features might be expected to have some implication for physical capital accumulation.

An early exception to the general neglect of the effect of social security on the distribution of wealth between physical and human capital is the paper by Drazen [1978]. Starting with the intergenerational model, he shows that the existence of positive bequests in the absence of social security is not sufficient for there to be no effect of social security when one cannot borrow against human capital. The desired level of bequests may still leave the child's human capital as a better investment for the parent's retirement than physical capital. The problem is that negative bequests cannot be made, so there is no way to force the child to pay for the parent's retirement in return for the additional human capital investment. Social security allows the possibility of such negative bequests, and so leads to an increase in human capital bequests and an increase in social welfare, though less physical capital is created.

Bernheim and Robinson [1983] look at other special features of social security and human capital which have significant theoretical implications for savings. Human capital, it is argued, is closer to being an indexed asset than is physical capital. In the absence of social security, retired people have no available indexed asset since their own human capital provides no returns while they cannot invest in anyone else's. A voluntary indexed social security system increases welfare. The government can afford to offer an indexed asset since it can invest in other people human capital by taxing

their wages. A second justification for a payroll tax arises if the government makes participation mandatory, since inflation risk aversion might be expected to be correlated with human capital as a fraction of total wealth. Human capital might provide a better base for varying indexed social security benefits than total income. They also show that illiquidity of social security increases the fraction of wealth held as physical capital as opposed to illiquid human capital and suggest why illiquidity might provide another reason for basing benefits on labor earnings.

Other aspects are also being examined. Hubbard [1983] examines the impact of uncertain lifetimes on savings, when private annuities cannot be provided. Kotlikoff and Spivak [1981] show that even small families can provide substantial protection against living too long, when formal annuities do not exist.

Empirical work is needed on the effect of social security on the composition of wealth, taking into account some of the simultaneity issues raied by Bernheim and Robinson. Further theoretical work should explore the interactions among the various features of the social security with the goal of determining the mechanisms by which social security affects saving.

We need to know more bout the motivations for material bequests and their distribution across the population. The question has been addressed repeatedly both in theoretical models (Becker [1981], Blinder [1973], Ishikawa [1975], and Tomes [1981]) and in empirical work (e.g., Menchik [1980] and Smith [1980]). The data sets used by Kurz [1982] and by Kearl and Pope [1983] seem likely to provide additional insights, the latter from a historical view. Tying this literature to that on the effect of social security on saving would seem fruitful. David and Menchik's data set, combining social security earnings records with probate data, is well suited for this task, but

additional sources need to be developed.

In summary, the interaction between the social security system and the stock of capital should continue to be an area for fruitful research. Past research has shed additional light on the motivations for savings, and seems likely to force some modification of the life-cycle hypothesis as well as the simple version of the intergenerational hypothesis outlined by Barro [1974]. Promising areas for future research include those taking into account the complexity of social security and the complexity of motivations and methods for transferring wealth across generations.

Footnotes

[1]Boskin and Robinson [1980], Danziger, Haveman, and Plotnick [1981], Aaron [1982], and Kurz [1983]. I have benefitted from these summaries in preparing this paper.

[2]See, for example, Stokey [1979].

[3]See Aaron [1982], p. 27 for a brief footnote on the evidence on international capital flows.

[4]For those paying taxes, consumption would be reduced, while for those receiving benefits, it would be increased.

[5]Danziger, Haveman and Plotnick [1981], Aaron [1982] and Kurz [1983] agree on this, for instance.

[6]Leamer [1983], p. 43.

[7]Kurz [1983], p. 6.

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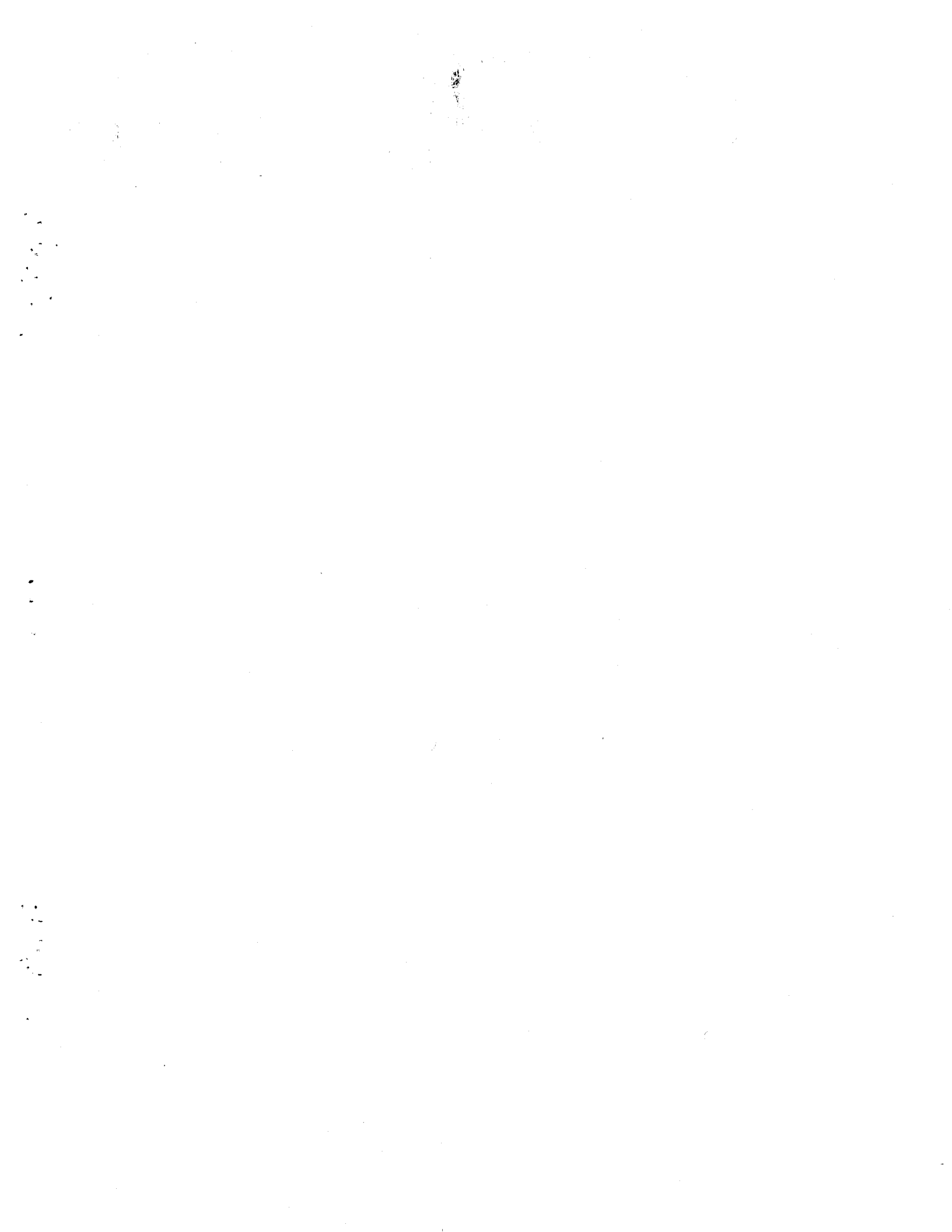
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