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Investment Risk, Bankruptcy Risk, and Pension Reform in Canada

JAMES E. PESANDO *

ABSTRACT

The wealth redistributive effects of retroactive termination insurance together with the difficulty of determining insurance premiums suggest that an alternative response, such as improved disclosure of worker benefits in the event of plan wind-up, may be preferred if the government remains concerned about the security of benefits in underfunded plans. Members of money purchase plans may well be less subject to investment risk than members of defined benefit plans, contrary to the claim of many. In Canada, defined benefit plans appear to have been transformed into defined benefit/money purchase hybrids, and this has several important implications.

IN DECEMBER OF 1980, the Province of Ontario introduced plan termination insurance in order to guarantee benefits in underfunded pension plans. The legislation, which was a response to actual or threatened plant shutdowns, makes the insurance retroactive and establishes premiums solely on the basis of each plan's unfunded liabilities.¹ In early 1981, the Royal Commission on the Status of Pensions in Ontario [10] recommended that the Province adopt a universal money purchase pension plan. Each employer and employee would make fixed contributions to a fund, to be managed by the employee, and the accumulated proceeds of the fund would be used to purchase a pension for the employee upon his retirement. The Royal Commission did not, however, address the fact that plan members bear all of the investment risk in money purchase plans, and many critics summarily dismissed the Commission's main recommendation on this ground.

The premise of this paper is that the analysis of competitive labor markets provides important—and probably neglected—insights into these two policy initiatives. Since plan termination insurance is under active consideration by other governments, and since the question of whether or not to encourage money

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¹ Bill 214, passed in December 1980, imposes a liability on the firm in the event of plan wind-up equal to unfunded, vested benefits. Bill 214 also establishes a government Guarantee Fund, which will make payments if necessary to ensure that plan members receive the full value of their statutorily-vested benefits. The Guarantee Fund has a lien on employer assets to the extent that the Fund is required to make payments to plan members. The legal status of this lien is not yet clear. The Fund will set insurance premiums, to be related in an as yet unspecified way to the firm's unfunded liabilities. Bill 214 *retroactively* guarantees all benefits granted or negotiated since Ontario's Pensions Benefits Act was introduced on 1 January 1965.

purchase in lieu of defined benefit plans² is very topical (President's Commission [9]), both issues merit increased attention.

The first part of the paper analyzes the case for plan termination insurance. The second part examines the distribution of inflation risk—which is virtually synonymous with investment risk for fixed-income portfolios—in defined benefit as distinct from money purchase plans. Both sections focus attention on the implications of competitive labor market behavior. A summary section completes the paper.

I. Plan Termination Insurance

Because money purchase plans are fully funded by definition, the issue of plan termination insurance is relevant only for defined benefit plans. Most defined benefit plans contain explicit provisions which permit the sponsoring firm to terminate the plan with the employer's obligation equal to the lesser of vested³ benefits or the assets in the plan. Most observers, however, view an ongoing firm as having an implicit liability to honor all vested pension benefits (Treynor [14]). This is the assumption adopted in the analysis below.⁴

Assume that economic agents are rational and have access to the same capital market, that the relevant option contracts are available in the capital market (or would be so if agents desired), and that there are no taxes. The firm promises at the beginning of each period to pay its employees a pension benefit L_1 , known at present with certainty, at the end of the period. The firm establishes a pension fund (A_0) to help meet this obligation, which will have a (presently uncertain) value $\tilde{A}_1 = (1 + \tilde{r})A_0$ where $\tilde{r}$ is the (uncertain) return on the plan's assets. The firm's equity at the beginning of the period is E_0 , which will have a (presently uncertain) value $\tilde{E}_1$ at the end of the period. If the implicit obligation of an ongoing firm is to honor all vested pension benefits, then the contractual benefit will be discharged in full if $\tilde{E}_1 + \tilde{A}_1 \geq L_1$. If $\tilde{E}_1 + \tilde{A}_1 < L_1$, then the worker receives only this amount.⁵ In effect, the worker holds a contract to receive the certain pension benefit L_1 and has sold a put option on the sum of the equity in the firm and the assets in the pension plan with a striking price equal to L_1 . Let w_t denote the current wage paid in period t and let VMP_t denote the value of the worker's marginal product. Let $\tilde{e}$ denote the return on the firm's assets *inclusive* of the funds in the pension plan and let $\sigma(\tilde{e})$ denote the measure of risk relevant to option pricing. The worker's compensation is:

$$w_t + PV_t(L_1) - PV_t(PUT(A_0 + E_0, L_1, \sigma(\tilde{e}))) = VMP_t \quad (1)$$

² Defined benefit plans are plans in which the member's pension benefit is determined by a formula, typically involving his years of service times either a fixed dollar amount (flat benefit plans) or an earnings-related base (career average or final earnings plans).

³ When an employee's benefits vest in a defined benefit plan, he becomes legally entitled to a pension defined under the terms of the plan. In Ontario, an employee's benefits must vest if he has attained age 45 and completed 10 years of service.

⁴ See Sharpe [11] for a parallel analysis of the case in which the liability of the firm is the lesser of vested or funded benefits.

⁵ This requires that if $\tilde{E}_1 + \tilde{A}_1 < L_1$ and $\tilde{E}_1 > 0$, the firm transfers all of its equity to its pensioners. Obviously, this is just a simplifying assumption.

The compensation package consists of three components: (1) the current wage; (2) the present value, calculated at the risk-free rate of interest (r_f), of the contractual benefit L_1 ; and (3) the value of the “pension put”, which recognizes that the pension benefit actually paid may fall short of its contractual value. The value of the put option will be zero—and hence L_1 will be fully secure—in two cases. The first occurs if the plan’s funds are invested solely in the risk-free asset *and* the plan is fully funded when valued at the risk-free rate (i.e. $A_0(1 + r_f) = L_1$). The second occurs if the probability of bankruptcy is zero. In general, the benefit L_1 will be risky.

Suppose now the benefit L_1 is fully insured, either by a private insurance company or through public termination insurance. Then (1) reduces to:

$$w'_t + PV_t(L_1) = VMP_t \quad (1a)$$

Clearly, $w_t > w'_t$ unless the value of the put option in (1) is zero,

The simple model sketched above provides three important insights.

First, under the assumption (to be discussed later) that the analysis can proceed as if the relevant options could be bought or sold in the capital market, the concern with the security of benefits in underfunded plans is misplaced. Compensating wage differentials will ensure that workers receive the equivalent of risk-free pension benefits.

Second, the market determined insurance premium to be charged under the termination insurance scheme is $w_t - w'_t = PV_t(PUT(A_0 + E_0, L_1, \sigma(\tilde{\epsilon})))$. There are significant measurement *and* monitoring costs of establishing and maintaining the competitive insurance premium. The insurer must continuously monitor not only A_0 and E_0 , but also their (jointly) uncertain return as embodied in $\sigma(\tilde{\epsilon})$.⁶ The Province of Ontario’s apparent intention to establish premiums solely on the basis of some measure of unfunded liabilities is clearly inadequate. Note, in particular, that linking the insurance premium solely to the unfunded liability presumes that an increase in pension plan contributions reduces the value of the put option in (1). Yet if additional contributions are debt financed, the probability of firm bankruptcy increases. Even if (and contrary to fact) the firm retained complete access to pension plan funds, debt-financed contributions to the plan would leave the value of the put option unchanged only if the additional funds in the pension plan were used to purchase bonds. If these additional funds were used to purchase (risky) common stocks, the value of the put option would increase. In general, and contrary to the presumption in Ontario’s draft legislation, additional plan contributions which reduce the size of the unfunded liability need not reduce the value of the put option and thus need not provide the basis for the reduction in the insurance premium.

⁶ To use the Black-Scholes [2] model of option pricing, the risk free rate of interest and the time to expiration of the option must be known as well.

Note again the requirement that all of the equity in the firm will be applied, if necessary, to discharge pension benefits in the event of plan wind-up. As noted in footnote one, this is an implication of Ontario’s proposed scheme. In the United States, by contrast, the Pension Benefit Guarantee Corporation (PBGC) has a claim in the event of plan wind-up equal to only 30 percent of shareholder’s equity. See, for example, Sharpe [11] and Bulow [4] for a more complete discussion of the role of the PBGC.

Third, if plan termination insurance were introduced with respect to *future* service only (and if the appropriate premiums were charged), there would be no wealth redistributive effects. Employees, via wage reductions equal to $w_t - w'_t$, would pay the insurance premiums as the market-determined price for the increased security of their accruing pension benefits. If termination insurance were made *retroactive* to include past service credits, as in Ontario's scheme, there would be a windfall gain to workers at the expense of firms. This result occurs on the presumption that the legislation would require that past service credits be insured for terminating as well as for still active workers. If the insurance scheme were extended to past service credits, then the required premiums would be higher than if the scheme applied only to future service. If the firm tried to extract a correspondingly higher wage concession from its workers, the effort would fail. Each worker, recognizing that his accrued benefits are now fully insured regardless of whether he remains with the firm, would leave if the sum of his current wage plus the accruing value of his fully secure pension benefit in Equation (1a) were less than the value of his marginal product. As a result, the incidence of the insurance premiums—to the extent that they reflect past service credits—must be borne by firms. In a competitive labor market, the retroactive improvement through government legislation in the security of previously acquired pension benefits necessarily entails an arbitrary redistribution of wealth from firms to workers with past service credits.

The two key assumptions in the preceding analysis are that (a) workers are rational and (b) the analysis can proceed as if the requisite options could be bought or sold in the capital market. If the government's primary concern is that workers misperceive the security of their contractual benefits, then the preferred policy response would be to require the disclosure of relevant information. Firms could be required, for example, to report to each worker the value of his accrued benefit in the event of plan termination, with the presumption that this information would be used in formal or informal bargaining.⁷ The assumption that the analysis can proceed as if the requisite options were available is not so strong as it may at first appear.⁸ If workers are rational, compensating wage differentials will exist. If workers are sufficiently risk averse that they do not want to assume the risks associated with unfunded pension promises, they can presumably avoid them. Workers, for example, could demand that a larger fraction of their compensation be paid in the form of current wages and then use the additional wages to establish their own money purchase plans (Registered Retirement Savings Plans in Canada and (now) Individual Retirement Accounts in the United States). Two observations are particularly relevant. First, small firms—where the probability of bankruptcy is relatively high—invariably offer (fully funded) money purchase plans. Although this fact is sometimes attributed to the lower administrative costs of such plans, it may well reflect the unwillingness of workers to assume the risks associated with unfunded pension benefits when the probability

⁷ In effect, the Royal Commission [10] recommends this alternative to plan termination insurance, which thus places it at odds with Ontario's recently enacted legislation.

⁸ If workers cannot shed the risks associated with unfunded pension benefits, then the firm's deliberate decision to underfund the plan may serve an alternative purpose, as discussed by Arnott and Gersovitz [1].

of plan wind-up is perceived to be very high. Secondly, even if workers had discounted *ex ante* the probability of plan termination in their wage bargaining, it would be surprising if they did not clamor for public assistance if *ex post* their pension plan terminated and they received less than the full value of their contractual benefits. The true equity issue, again, focuses on the role of compensating wage differentials. Although formal evidence on the extent to which workers in Canada discount risky pension promises is not available, Inman [7] provides evidence that at least some public sector employees in the United States—whose benefits are not insured by the PBGC (footnote 6)—discount the value of contractual benefits in poorly funded plans by granting smaller wage concessions than would otherwise be the case.

To sum up, the introduction of a termination scheme which (1) charged the appropriate insurance premiums and (2) applied only to future service would simply involve workers' paying a higher price—in terms of their current wage concessions—to compensate for the enhanced security of their pension benefits. If (1) were not satisfied, subsidies would inevitably exist and firms would have an incentive to game against the insurance authority (Sharpe [11], Bulow [4]). If (2) were not satisfied, wealth would be arbitrarily redistributed from firms (shareholders) to workers with past service credits. Since neither (1) nor (2) is likely to be met, the argument for using an alternative policy response would appear to be strong. Either improved disclosure, or improved disclosure in conjunction with tighter funding requirements, would appear to be preferable to the introduction of public termination insurance. If termination insurance were mandated, it would appear preferable to require that it be purchased from private insurers. This would ensure (at least) that the insurance premiums would be market rates, although the previously acknowledged costs of establishing and monitoring these premiums would remain.

II. Investment Risks in Money Purchase Plans

In a money purchase plan, the plan member bears all of the investment risk. There thus exists uncertainty regarding the income replacement rate (i.e. the ratio of pension to preretirement earnings) in a money purchase plan with a fixed contribution rate. To some, this uncertainty implies that money purchase plans should not be encouraged as an act of public policy. They argue that defined benefit plans, particularly final earnings plans with postretirement indexing, should be encouraged instead. They argue further that, since the vast majority of plan members are in defined benefit plans⁹, these plans represent the market's preferred solution to the provision of retirement incomes. The purpose of this section of the paper is twofold. The first is to place the income uncertainty in money purchase plans in perspective by drawing attention to the fact that a member of a final earnings plan which provides a fully indexed benefit at retirement is nonetheless exposed to great inflation risk throughout his active work years. The second is to note the apparent transformation of many defined

⁹ In Canada, almost 95 percent of members of occupational pension plans are in defined benefit plans.

benefit plans in Canada into defined benefit/money purchase hybrids. This transformation provides an important perspective on the argument that defined benefit plans represent the market solution.

Consider first a career average plan (i.e. a plan in which the member earns each year a pension benefit equal to a designated fraction of that year's income) which has no postretirement indexing. Accrued benefits are thus purely nominal and have the investment characteristics of a long-term bond. If an unanticipated, transitory increase in the rate of inflation takes place, there is a once only decline in the real value of the accrued benefit. If an unanticipated, permanent increase in the rate of inflation takes place, there is a continuing decline in the real value of the accrued benefit. The present value of this decline is equal to the change in the market price of a long-term bond in response to an unanticipated, permanent change in the rate of inflation.¹⁰ Since inflation and investment risk are (virtually) synonymous for fixed-income securities, the substantial investment risk borne by the member of this career average plan is readily apparent. If a member of a money purchase plan were to invest (say) in Treasury Bills (Bodie [3]), he clearly would be exposed to less inflation/investment risk.

What is perhaps not so apparent, however, is that a similar result obtains if the plan member is in a final earnings plan (i.e. a plan in which the benefit is based on years of service and earnings during the final years of employment) with full postretirement indexing. There are two key points. First, *until* the plan member reaches retirement age, his accrued benefits are purely nominal as in the case above. Secondly, in the final earnings plan, an increase in the current wage raises the value of all previously accrued pension benefits. This does not occur in the career average plan. Indeed, this feature is cited by most commentators as evidence that the member of a final earnings plan has pension benefits which are effectively indexed during the preretirement period. The observation, based on the tendency for wages *in the aggregate* to rise in tandem with inflation, is potentially quite misleading.

The obvious point is that an increase in the nominal wage rate in the current period will raise the value of accrued benefits in a final earnings plan and thus serve—at least in part—to restore any decline in their real value that occurred as a result of inflation in the previous period. The perhaps less obvious point is that the worker must “pay” for this restoration by accepting a lower increase in his current wage than would be the case in the career average plan (Bulow [5]). This result occurs as the enrichment of past service credits which accompanies the wage increase is factored into the competitive wage settlement. If inflation were unanticipated, its impact on the real value of accrued benefits would mirror its impact on the real value of a long-term bond, as previously discussed in the context of the career average plan.¹¹

Although there is debate among economists about the extent to which the existence of implicit contracts between workers and firms might qualify the above

¹⁰ This is based on the assumption that a one percentage point change in the steady state rate of inflation will cause an equivalent change in the nominal interest rate.

¹¹ If inflation were anticipated, its eroding impact on the real value of accrued benefits would have already been discounted in prior wage settlements. The result again parallels the result for a long-term bond which is priced to compensate the holder for the eroding impact on its fixed income payments of anticipated inflation.

analysis (Bulow [4], Pesando [8]), there is at least one fact that offers considerable support for its basic insight. That is the “paradox” that firms in the private sector are willing to provide final earnings plans, which “index” benefits during the preretirement period, yet are unwilling to index benefits in the postretirement period. This paradox is easily resolved in the context of the preceding analysis when it is recognized that the firm can only extract current wage concessions in the preretirement period for enrichments to the value of previously accrued benefits.

In spite of the fact that the pensions provided by most defined benefit plans in the private sector are not indexed, most large employers in Canada have made substantial ad hoc payments to limit the eroding impact of inflation on pensions in pay (Tomenson-Alexander [3]; Financial Executives Institute Canada [6]). Further, evidence suggests that—to a large extent—these adjustments are financed out of investment earnings in excess of the assumed valuation rate (Pesando [8]). This fact suggests that employees have an equity interest in the assets in the pension plan just as they would in the case of a money purchase plan.

For a large firm for which the probability of bankruptcy is negligible, and hence for which the value of the pension put in (1) may be set equal to zero, this result may be formalized as follows. Let L_1 again represent the contractual value (nominal) of the pension benefit. If r_v is the valuation rate, then A_v such that $A_v(1 + r_v) = L_1$ will be the current contribution to the plan. If $\tilde{r}_1 \leq r_v$, then the employee receives the contractual benefit L_1 . If $\tilde{r}_1 > r_v$, then the employee receives the augmented benefit $\tilde{L}_1 = A_v(1 + \tilde{r}_1) > L_1$. Since the contractual benefit is nominal, the risk-free nominal rate r_f is still used to calculate its present value. Thus the employee’s compensation package is:

$$w_t'' + PV_t(L_1) + PV_t(CALL(A_v, A_v(1 + r_v), \sigma(\tilde{r}))) = VMP_t \quad (2)$$

The employee has a call option on the investment earnings in excess of those implied by the valuation rate. If the employee retires at the end of the period, he receives an ad hoc increase in his pension. If he is still an active worker at the end of the period, he receives either an amendment to the benefit formula or an appropriate increase in his next period’s wage.¹²

To the extent that workers have the call option sketched above, their direct exposure to investment risk is apparent. This point has two important implications. First, defined benefit plans have taken on the fundamental characteristic of money purchase plans.¹³ Secondly, the argument that defined benefit plans

¹² Industry analysts argue that sponsors of career average plans typically use plan surpluses (arising from “excess” investment earnings) to facilitate the updating of past service credits. To the extent that sponsors of final earnings plans use “excess” earnings to enrich the benefits of still active workers, the vehicle would be larger increases in current wages—which update the value of all accrued benefits—than would otherwise be the case.

¹³ Tepper [12] analyzes the optimal pension funding and fund allocation decisions in a world with taxes on the assumption that pension liabilities are independent of pension assets. If employees instead of (or in addition to) shareholders have an equity interest in the plan’s assets, this assumption is no longer valid. The question of whether Tepper’s analysis is robust with respect to the relaxation of this assumption is important because the key implications of his analysis—that defined benefit plans should be fully funded and invested only in bonds—do not conform to Canadian nor to U.S. practice.

represent the market solution to private pension arrangements loses much of its force. To the extent that there are legal or institutional impediments (for example, the existence of large unfunded liabilities) to the termination of defined benefit plans and their replacement by money purchase plans, the metamorphosis of defined benefit plans described above may be interpreted as suggesting that money purchase plans may now be the market's preferred solution.

III. Conclusions

The conclusions from the preceding analysis can be summarized succinctly. In view of the likelihood that rational workers discount the riskiness of pension benefits by requiring compensating wage differentials, the need for termination insurance is easily overstated. Those who advocate public termination insurance must address both the difficulty in establishing (and monitoring) appropriate insurance premiums and the windfall redistributive effects that would accompany the retroactive insurance of past service credits. Improved disclosure and (possibly) tighter funding requirements might be a preferred policy response if the security of benefits remains a policy concern. Members of money purchase plans not only bear investment risk, but (presumably) choose the desired degree of investment risk. In defined benefit plans, including final earnings plans in which the benefit is indexed after retirement,¹⁴ accrued benefits are purely nominal and share the substantial inflation/investment risk of long-term bonds. There can be no general presumption that members of money purchase plans are more exposed to inflation/investment risk. Finally, the apparent metamorphosis in Canada of defined benefit plans into defined benefit/money purchase hybrids pre-empts to a large extent the claim that defined benefit plans are the market's preferred solution to private pension arrangements.

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¹⁴ Note, of course, that if the benefit is indexed during retirement (and payable with certainty), it must be valued for compensation purposes at the risk-free real rate of interest. Bodie [3] suggests that this rate may be at most zero in the United States. If the pension fund earns more than this rate because it contains risky assets, the additional returns flow to the shareholders as compensation for assuming this risk.

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