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EXAMINING THE EFFECTS OF GUARANTEE FUNDS ON PENSION PLANS

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ABSTRACT

Bankruptcy risk falls to pension plan participants if a plan sponsor fails when a defined benefit (DB) pension plan is underfunded. This article examines the incidence of that risk and how it changes when public policy provides a guarantee fund. Although government-based guarantee funds are in a unique position to provide pension protection, primarily because of the extent to which the risk of sponsor default is systematic in nature, a looming question is the extent to which such guarantees are exposed to moral hazard. The article focuses on that question using data from four Canadian provinces, including one (Ontario) that operates a guarantee fund for pensions. The findings show that plan assets per DB-plan participant increase with the earnings of workers and decrease with higher unemployment, and that level of assets also is moderated by the influence of taxes, with higher plan assets observed when and where tax rates are higher. Plans in Ontario had on average \$20,035 less in asset value per participant, and Ontario plans covered by the guarantee fund had an average of \$16,497 less per participant than other Canadian DB plans not backed by a guarantee fund. A separate model finds the presence of a guarantee fund to be one of a very small number of variables significant in explaining variability in the plans' funded ratios. These empirical results are consistent with the existence of moral hazard.

1. INTRODUCTION

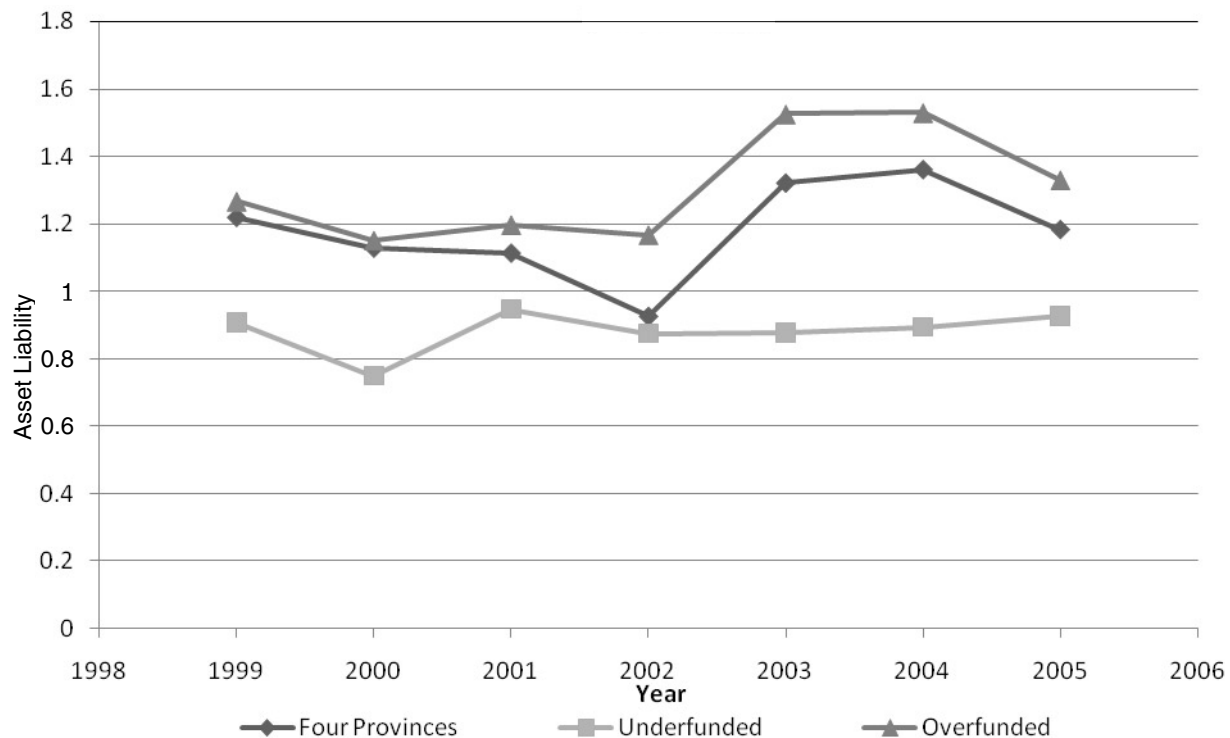
The nature of a pension plan is that a promise is made in one period to provide income in a later period. When pension promises are broken, intense political pressure can arise. The financial consequences are intensified by the fact that affected workers have generally aged past the point at which they can easily work to replace the promised income. Yet Canadian pension plans operate in the environment of a market economy where financial failures of plan sponsors are inevitable. Therefore, the risk that a firm has insufficient capital available to pay pension promises exists

and must be borne by someone. Public policy must allocate that risk among a plan's sponsor, plan participants, and possibly some societal mechanism.

A key reason that pensions involve risk is that the actual cost cannot be known with certainty. Pesando (2000) and others stress that it is impossible to ensure that pension funds are always fully funded; these authors cite examples of sharp deterioration in investment returns, actuarial assumptions proving incorrect, or cases when financial instruments required to fully immunize assets against liabilities are not available. Plan underfunding is the symptom through which the potential for default initially appears. Overall the issue of underfunding in Canadian pension plans is widespread but not universal. In 2005, 43.8% of all defined benefit (DB) plans in Alberta, British Columbia, Ontario, and Saskatchewan were

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Figure 1
Funding Ratio for AB, BC, ON, SK (1999–2005)



underfunded;¹ on average these underfunded plans had assets equal to 84.1% of their liabilities. Figure 1 graphs the level of funding found in these four provinces for the period December 31, 1999, to June 1, 2006.

2. BANKRUPTCY RISK AND PENSIONS: THE THEORY

A review of theory provides a good beginning point for development of sound policy for the risk associated with the possible bankruptcy of pension plan sponsors. In this article the terms *bankrupt* and *bankruptcy* are used in an economic sense, that is, to mean firms with no remaining capital; when *bankruptcy* is intended in the legal

sense, an explicit term such as *bankruptcy proceedings* or *CCAA* are used.

A discussion about how to manage the bankruptcy risk involves two distinct branches of the theoretical literature:

- Understanding the risk profile, that is, understanding why underfunding occurs and who bears the risk associated with that underfunding and
- Understanding the strengths and weaknesses of private market mechanisms and government-based actions most commonly used to modify that risk profile.

This section is organized accordingly.

2.1 Theoretical Reasons for Underfunding

Two branches of literature examine different explanations used by economic theory for predicting the underfunding of pension plans. These two branches are broadly classed as incentive based and capital based.

¹ Data were provided at the plan level from these four provinces and represent 70.96% of pension plan membership in Canada in 2006. The author is grateful to the Financial Services Commission of Ontario and Departments of Finance of Alberta, British Columbia, and Saskatchewan for their cooperation and effort in supplying these data. Readers should note that three of these provinces provided data in a "blind" format that did not identify the plan or its sponsor by name.

2.1.1 Incentive-Based Explanations

The *incentive-based* research arises chiefly from the field of labor economics, with early work by Lazear (1981) modeling pensions as a way to elicit worker effort. Ippolito (1985) went further and incorporated the tax benefits available to pension funding. His model, developed to explain why pension funds generally are underfunded despite tax incentives, has workers “depositing” with the firm the amount of wage reduction willingly incurred in exchange for pension promises. In this way workers become debt holders of the firm and, to the extent the pension plan is underfunded, bear the risk of losing some or all of their promised benefits if the firm loses viability. His theoretical model, developed in an environment that does not regulate funding, explicitly examines the relationship between a firm and its (organized) workers. A firm facing financial difficulties also faces a situation where its ability to bargain with its workers changes. Specifically the two parties refrain from cooperating—even though economically that would be the most efficient thing for them to do—because cooperation could give the other party increased bargaining power. Organization theorists use the term *holding up* to describe this circumstance; in lay terms it might be called a stalemate.

Albeit under a set of somewhat restrictive assumptions, Ippolito (1985) further demonstrated that funding ratios for plans covering unionized participants would be systematically lower than their counterparts in nonunionized firms. He proves that, at least when assuming a zero discount rate, the additional risks assumed through a pension arrangement are distributed in approximately the same fashion across workers as would be the higher wages one could expect to be negotiated with a firm that presents a higher risk of failure:

An underfunded pension can be naturally designed in a way to offset the gains in a proportional sense across worker cohorts; it even assesses the appropriate penalty on workers who are already retired at the point of firm failure but who nevertheless participated in the holdup. (Ippolito 1985, pp. 622–23)

2.1.2 Capital-Based Explanations

Another set of academic research outlines *capital-based* reasons for pension underfunding that arise from the field of finance. This stream of work focuses on optimizing behavior in an environment where positive interest rates are offered. D’Arcy, Dulebohn, and Oh (1999) examine the special case of public pensions, notably examining organizations that do not themselves benefit (although their employees do) from the tax-favored status of pension contributions. They conclude that a modest degree of underfunding is optimal under specific conditions, such as where pension costs are expected to grow at a slower rate than the tax base. The logical corollary for private pensions, although undocumented in the literature, would be that a modest degree of underfunding is optimal where pension costs are expected to grow at a slower rate than the productivity of the firm’s workers. In both instances the proportion of income being diverted to cover pension costs remains smaller—and less onerous—because it will require the sacrifice of a smaller share of income in the future than would be required to fully fund the pension at the present time.

More recently Cooper and Ross (2003) developed a theory that ties the existence of underfunding in DB plans to undercapitalized firms. Their work shows that undercapitalized firms prefer DB plans precisely because they permit underfunding. However, a paradox emerges. When a benefit system requires funding to be higher in the future, the level of future earnings required for the firm to show a profit also increases. Therefore, underfunding in the present can distort future decisions by that firm to remain in business. Furthermore, by influencing funding levels and costs, both funding standards and the premiums charged by guarantee funds can indirectly affect the probability of a firm’s decision to exit the marketplace.

2.2 Guarantee Mechanisms

This section examines two alternative sources available to reduce the amount of participant risk associated with the bankruptcy of pension sponsors: private market mechanisms and government-based guarantees. Although this dichotomy is used here to organize information, it

is entirely feasible that a practical solution could be devised using a combination of the two endpoints.

2.2.1 Private Market Mechanisms

Numerous economic arguments suggest that, as a general principle, private markets should be allowed to operate where they can be expected to function. These mechanisms could include solutions broadly classed as (1) securitization and (2) private insurance. Securitization of other credit risks certainly has advanced over the past decades, but the recent dramatic losses in mortgage-backed securities has unquestionably set back any evolution that might be possible in the development of securities that bundle unsecured credit risks.

As for the private insurance market, such a mechanism provides incentives for efficient investment in risk mitigation, careful claims adjustment, and the development of capacity sufficient to satisfy demand. The foundations of insurance recognize, however, that some risks cannot be handled easily and well in the private marketplace. In the broadest theoretical terms, an ideal insurable risk:

- Has a large number of exposure units
- Stems from losses that are accidental and unintentional
- Results in a loss that is both determinable and measurable
- Is not catastrophic in nature
- Has a calculable chance of loss and
- Carries a premium that is economically feasible.

Pension default risk falls short of meeting these criteria for insurability. Genuine concerns arise about whether failure of a sponsoring firm is “accidental” and whether the losses across firms are likely to be sufficiently correlated as to pose a potentially catastrophic exposure. Pesando (1996) argues that the correlated (systematic) risk makes it unlikely—or even impossible—for private markets to provide plan termination insurance. More recently, however, Ippolito (2004) raised the possibility that developments in the sophistication of credit risk modeling and risk-hedging products may have reduced those concerns to the point of irrelevance. Recent events

in the marketplace suggest that, while techniques for the management of credit risk may have improved, they remain inadequate.

Still, questions relating to private pension insurance remain unaddressed by rigorous research. Based on the results of an inquiry by a major reinsurer that found no instance of private pension guarantee insurance having been issued anywhere in the world, the questions also remain unaddressed in the marketplace. Furthermore, the federal solvency regulator in Canada (OSFI) has indicated that it might not permit such products to be issued. In summary, while private market solutions hold some theoretical potential to pool or otherwise manage the risk associated with sponsor bankruptcy risks, they do not at present offer a readily available solution.

2.2.2 Government-Based Guarantee Funds

Several branches of the literature examine the reasons various jurisdictions have become involved in reducing the risk of underfunding to pension participants. One theory that supports the development of systems to bolster the pension market deals with *fragile markets*. That theory supports the establishment of guarantee funds across sectors, for example, deposit insurance in banking, to provide general support for trade by increasing confidence in the financial system. Similarly, pension guarantees provide confidence to workers whose concerns about the long-term viability of their pension sponsor may otherwise induce them to leave the firm or demand higher wages.

Governmental policies to modify or manage pension underfunding risk have been manifested primarily as pension regulation and the offering of pension guarantees. This article explicitly considers the latter. In some of the earliest extant work, Langetieg, Findlay, and daMotta (1982) modeled pension guarantees using contingent claims techniques. Later research eased some of the more restrictive assumptions found in the earliest analyses, such as requiring knowledge about the term to maturity of the guarantees. When Ippolito (1985) introduces inflation into the theoretical model, a large divergence appears in bankruptcy between the legal liabilities of a pension plan and the economic value of pension

promises made.² In such an economic market, workers face real losses even from plans that are fully funded on a nominal basis. He presented the first theoretical framework under which a government-based program of pension insurance emerged.

Once research moved past theory and into an examination of practical models for guarantee funds, theory began to illuminate the advantages and disadvantages of such a program. The key argument in favor of government involvement in a pension guarantee scheme is the greater ability of a societal body to address problems associated with systematic risk. A governmental entity may be the only type that can handle tremendous swings in losses across both economic booms and recessions. For this reason, however, any guarantee fund that is established should be accompanied by an expectation that those swings will occur.

Another advantage of a government-based guarantee fund is its ability to manage expectations in advance of a default event. The formality of such a fund, to the extent it caps the amount of benefits guaranteed, offers a credible way to place limits on the extent to which government will help address a specific type of problem. The structure of a formal pension guarantee fund also provides a known limit on the extent to which others will be expected to assist. Specifically in the case of DB pensions, it limits the extent to which sponsors of other DB plans will be asked to contribute.

Furthermore, knowing the limits of the costs of a shock to government and to others a priori effectively reduces the likely spillover effects to other firm(s) in a way that ad hoc responses cannot. Such contagion effects have been studied most extensively in the context of bank runs. There the phenomenon of concern is that one financial failure can spawn anxiety that other institutions also are about to fail. In the case of insurance or pensions, however, the effect is less obvious. Such long-term financial protection arrangements are structured in a way that makes it

far more difficult to get money out. They also make it somewhat more difficult to grasp the concept of contagion. A simple erosion of confidence likely is not sufficient to trigger additional failures in an environment characterized by formal requirements for capital/funding. However, the system of guarantees itself can be a source of contagion. With each default other firms in the guarantee fund begin to anticipate ex post assessments. Should that assessment be anticipated to be especially large, whether because of a single large failure or a series of smaller ones, it can cause liquidity problems for other plans and for the sponsors of those other plans. Those added costs remove assets from all other plans in the guarantee fund, thereby reducing the funded ratio of each and every plan. Of course, the added costs could cause other plans to terminate, and the spiral may continue.

Such contagion effects are generally viewed to include two important components: a change in the valuation of other firms based on new information and an effect that appears to be spread randomly across unrelated firms and is unsupported by market data. Brewer and Jackson (2002) provide the first modern contagion study that attempts to measure the relative importance of informational content versus pure contagion. They conclude that, although informational content is more important than pure contagion, the pure contagion effect does exist. Furthermore, it exists to a greater extent within an industry than across industries. In the pension environment this means we should expect that terminations can and will occur because of fear of additional terminations. A government-based guarantee fund for pensions is a viable tool to assist in management of the uncertainty around the potential assessments and, therefore, management of the contagion risk.

The main theoretical argument against a pension guarantee fund is moral hazard: a situation whereby the existence of insurance actually increases the losses against which the insurance protects. Government-based insurance increases concern that pension sponsors will not have appropriate incentives to engage in risk mitigation. This form of moral hazard is the crux of the so-called Samaritan's Dilemma (Buchanan 1975). In the United Kingdom's development of its pension insurance scheme in 2004, for example, Young

² This finding is an important one for Canadian public policy because the difference under most Canadian pension laws between the going concern liability of a plan and its wind-up liability is increasingly recognized, if not as a source of problems, at least as a source of confusion.

(2006) identified three separate types of moral hazard that were considered:

- The number of claims facing the guarantee fund will increase if employers dump plan liabilities.
- Pension plan benefits may be manipulated before entry into the guarantee fund to maximize the level of compensation payable to some or all participants.
- The cost of claims by employers may increase if firms can legally reduce the claim held by the guarantee fund on the employer in the event of insolvency. An example would be the shifting of sponsor assets to another jurisdiction, thereby putting those assets beyond the reach of the guarantee fund.

The first of these is an issue of the frequency of claims; the second is an issue of claim severity; the third could manifest itself either through claim frequency or claim severity.

Another argument against a pension guarantee fund is that it may reduce the efficiency of the economy. By definition efficiency is enhanced by a guarantee fund when the benefit produced to those made better off exceeds the cost to those made worse off. Plan members are better off if they bear less risk. However, that improves efficiency only if, for example, those workers are proportionately more productive or agree to a lower wage. Empirical evidence on this question is limited. Ippolito (1985) observes that, for some ranges of fundedness, a government pension guarantee increases the power of unions to extract additional resources for its members by recognizing that some amounts still will be received even if a firm fails. He finds for the period 1978–83 that unionized plans are twice as likely to be the recipient of a transfer from the governmental guarantee.³ Similarly, failing firms and workers associated with poorly funded pension plans may find it mutually beneficial to collude to terminate the plan in order to obtain the transfer amount from the government pension insurance.

Using the theory of optimal contracts, Cooper and Ross (2003) demonstrate theoretically that participation in a guarantee fund—public or pri-

vate—can make some firms worse off by forcing strong firms to subsidize weak ones. Other research indicates that governmental guarantees tend to increase equity values and subsidize wages at firms in financial distress. In the extreme cases, it keeps some otherwise insolvent companies afloat. It is a source of genuine concern that steep increases in the premium charged for a guarantee system could accelerate the move away from the provision of pensions in general and away from DB plans in particular.

3. A CLOSER LOOK AT CANADA

In 1980 the Pension Benefits Act established the Pension Benefits Guarantee Fund (PBGF) and made Ontario the only Canadian province to provide a government-based system of protection for the pension promises of private employers. Pesando (1982), in addition to being one of the first scholarly works to focus on Ontario in examining the economic impact of a guarantee fund, also provides important historical context. From the outset the PBGF guaranteed benefits retroactive to passage of the Pension Benefits Act in 1965. It was compulsory and was designed to be self-financing, that is, to meet its obligations solely through an annual premium based on the number of employees in DB plans. The PBGF benefit formula has not changed since its inception in 1980; premium rates were last revised in 1992.

3.1 Details of the Guarantee Fund

The PBGF premium structure begins at \$1.00 per member for a plan that is fully funded. If underfunded, risk-based premiums are assessed on the basis of unfunded, vested wind-up benefits. The premiums total \$20 to \$25 million annually. Premiums for most plans are capped at \$4 million per year with the annual cap increased to \$5 million for *qualifying plans*. The qualifying plan provision,⁴ adopted during the major recession of the early 1990s, allowed an employer to elect not to fund the solvency deficiency in its plans.⁵ At the time this provision was created, the threshold of

³ The overall probability of receiving a transfer in Ippolito's sample is 4.5%; unionized plans have a probability of 9.1%.

⁴ Pension Benefits Act, R.R.O. 1990, Regulation 909, §5.1.

⁵ Plan sponsors making the *qualifying plan* election were required to file actuarial valuations more frequently (annually) and to pay higher PBGF premiums.

\$500 million in assets limited the scope of the qualifying plan rules to the very largest pension plans. However, continuing benefit accruals and inflation combined to expand its availability to at least 27 plans by 2002.⁶ Effective June 28, 2002, the Pension Benefits Act was amended to remove the *qualifying plans* option. The few plans that actually had made the election before its removal were grandfathered under the reform legislation.

The PBGF guarantees specified benefits, up to \$1,000 per month per member,⁷ in respect of service in Ontario.⁸ For participants to receive PBGF benefits, a pension plan must be registered under the Ontario legislation or a designated province, wound up in whole or in part, and receive a determination from the Financial Services Commission of Ontario (FSCO) that it is not able to satisfy the funding requirements of the legislation. Several exclusions, some intended to reduce moral hazard, in the legislation limit the circumstances in which the PBGF guarantee applies. Those exclusions include the following:

- A plan that has been established for less than three years
- Increases in benefits within the preceding three years
- Multiemployer plans
- Benefits under a DB plan in which the employer's contributions are set by collective agreement or

⁶ Author tabulation of the FSCO data for 2002. This count reflects the number of separate plans that reached the \$500 million threshold. The number would increase slightly because the qualifying plan election also was available to some plan sponsors who reached the threshold by aggregating multiple plans sponsored.

⁷ The Arthurs recommendation is for a more sophisticated approach to premium setting for the PBGF as well as an increase in the maximum benefit amount to \$2,500 per month to reflect the effect of inflation on the original benefit maximum (Ontario Expert Commission on Pensions 2008).

⁸ For purposes of the Pension Benefits Act, a worker is deemed to be employed in the province in which the establishment of his or her employment is located and to which the person is required to report for work. Employees who are not required to report to a specific location for work are considered to be employed in the province from which they are paid. That the PBGF coverage can apply to participants in plans not registered in Ontario was clearly articulated in a May 22, 2002, letter that the Pension Plans Branch of the Financial Service Commission of Ontario sent as part of a program initiated to systematically recover PBGF assessments from all plans with members who are eligible for coverage.

- Other pension plans excluded in the regulations.

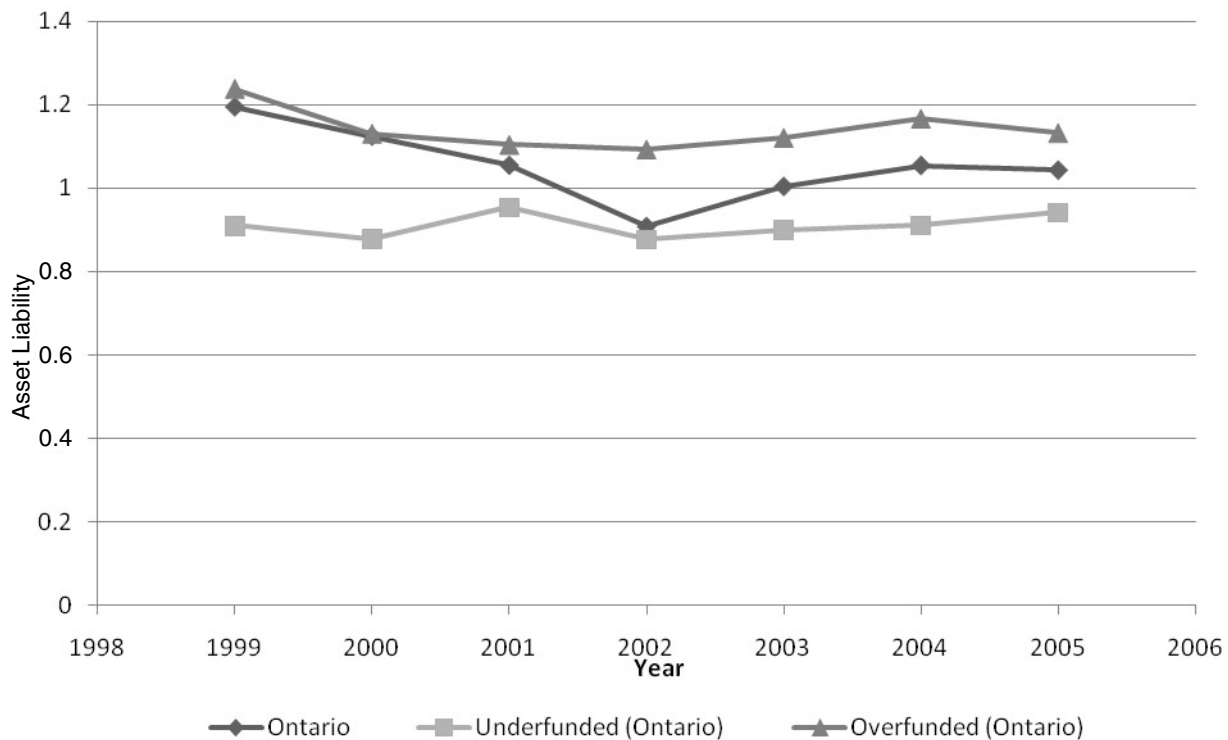
In principle, therefore, a retiree will receive total payments equal to 100% of the benefits guaranteed by the PBGF plus a proportion of other benefits included in calculating the wind-up liability under the Ontario rules. In practice, determination of these benefits is plan specific and can be complex. An example is provided here, based on a member who has a pension entitlement under the plan of \$1,500 per month in a plan that has an average amount of underfunding (see Fig. 1), that is, that holds about 75% of the funds needed to meet its liabilities. The first step is to determine how much of the \$1,500 benefit may be excluded under the PBGF rules, for example, the benefits added over the last three years. To continue the example, assume that the amount remaining after the required reductions is \$1,200 per month. The plan's assets are used to pay 75% of the \$1,200, and the PBGF ensures that the benefit reaches \$1,000 (i.e., \$900 from the plan and \$100 from the PBGF). Beyond that the plan will pay 75% of the difference between \$1,000 and the full benefit. So in the end, the member gets \$1,150 per month: \$1,050 from the plan and \$100 from the PBGF. Administratively funds are transferred from the PBGF to the plan once the application for PBGF support is approved. Members receive one check.

A review of some key financial outcomes in Ontario during the 27 years since it introduced the PBGF is provided in this section as background. Figure 2 illustrates the same trends in fundedness for Ontario plans (only) as was presented in Figure 1 for four provinces. In Ontario 48.2% of all DB plans were underfunded in 2005; on average these underfunded plans had assets equal to 88.1% of their liabilities.

The PBGF's annual reports provide information about claims payable with respect to already terminated pension plans. In the annual report for March 31, 2005, the amount of outstanding claims was \$204,624,000; by March 31, 2006, that figure had dropped to \$104,064,000.⁹ Based

⁹ The steep decline was caused by higher interest rates, which in turn caused the present value of liabilities to decline. Simply stated, this effect recognizes that more of the funds needed to pay promised benefits can be expected to arise from investment earnings.

Figure 2
Funding Ratio: Ontario Plans Only



on valuation reports filed between July 1, 2003, and June 30, 2006, the FSCO DB funding report of March 2007 estimated there were approximately 1,300 underfunded plans in Ontario with an aggregate wind-up deficit approaching \$29.5 billion. The number of underfunded plans and deficit amount would likely be larger today, as a result of the tumultuous investment markets in late 2008 and continuing into 2009.

The fund has not determined, and has stated they do not have the technical capacity to determine, the potential PBGF exposures in a manner that reflects any nonzero insolvency probability of the sponsor employers. Assuming that no terminations will occur in the future, and that the cost of future terminations is zero, is unrealistic in a market economy. It seems particularly unwise in the current economic crisis. In order to provide at least some sense of how losses recorded to date compare with potential losses, two special tabulations were done: one on a measure aimed at assessing the sensitivity of costs to changes in the *frequency* of future losses, and the other aimed at assessing sensitivity to changes in the *severity* of future losses:

- *Frequency.* The 1% of plans in Ontario with the lowest ratio of assets to liabilities was examined. The low funding ratio found in these plans is one indicator that these plans may expose the PBGF to additional claims. For those seven plans, the gap between assets and liabilities was \$20.9 million. The single plan with the lowest funded ratio (46%) represents a potential liability of \$238,100; the next plan in that sequence has a funded ratio of 52% and represents a potential liability of \$7.8 million. Other plans that appear in this 99th percentile grouping have funding ratios that range from 56% to 68%.
- *Severity.* The 1% of plans in Ontario with the highest dollar value difference between their PBGF liabilities minus assets also was examined. These plans represent the extent to which the PBGF may find itself exposed due to a small number of claims of catastrophic proportions. These six plans, dominated by the steel and auto industries, represent a potential aggregate deficit of \$5.95 billion.

All of the plans that appeared in these special tabulations supplied their valuations in 2005. Estimating the present value of additional future PBGF claims with any greater accuracy would require assessing the creditworthiness of each plan sponsor individually, a difficult technical exercise for the PBGF itself, which has access to all plan data.¹⁰ For external researchers it is simply not possible when privacy concerns remove details of a plan's identity.

4. EMPIRICAL RESULTS

To examine questions surrounding pension funding and its relationship to the availability of a guarantee fund, plan-level data were requested from four provincial supervisory authorities. In all, data were received from four provinces representing 70.96% of pension plan membership in Canada in 2006. In all, data were included on a total of 6,288 plan-years covering the period December 31, 1999, to June 1, 2006. Table 1 provides additional details on the breakdown of the dataset that was studied.

As shown in Table 1, 4,543 plan-years were for plans registered in Ontario (72%), and 1,745 plan-years were for plans registered outside Ontario (28%). Among the Ontario plans, 3,212 of

the plan-years are believed to have been required to participate in the PBGF.¹¹ Overall, the available dataset included 3,212 plan-years (51%) with PBGF coverage and 3,076 (49%) without PBGF coverage. Data from all years were combined to develop the pooled ordinary least squares (OLS) regression models for which results are reported in the following sections.

Pension benefits, by definition, promise to provide cash. Cash benefits can best be secured by funding. Therefore, by extension, the funds available to a pension plan are one measure of the security of a pension's benefits. The two principal types of measures used in pension research are nominal and relative. Nominal measures look at plan assets only. For example, the *qualifying plan* rule described earlier used a nominal measure—the absolute number of dollars in a pension plan—as its threshold. Relative measures, such as the commonly used *funded ratio*, compare the dollar values to something else, often the plan's liabilities.

4.1 Nominal Value Measure

This section reports an examination of one nominal measure: plan assets per participant in DB plans across four provinces for which plan-level information was presented earlier. Here “funds available to a pension plan” are used to mean (1) sponsor and member contributions plus (2) earnings on those contributions minus (3) benefit payments by the plan.¹²

The model presented in this section incorporates provincial data for all variables except investment returns, for which 90-day Treasury-bill rates and rate of return on the Toronto Stock Exchange (TSX) were used.¹³ The resulting model, presented in Table 2, is a pooled OLS re-

Table 1
Plans Reporting by Province and Year

Year	Province				Total
	AB	BC	ON ^a	SK	
1999	22	152	706	50	930
2000	28	88	464	90	670
2001	70	76	550	51	747
2002	41	115	893	79	1,128
2003	64	72	477	86	699
2004	67	102	554	89	812
2005	74	80	755	61	970
2006 (partial)	104	47	144	37	332
Total	470	732	4,543	543	6,288

^aOntario requires an Annual Information Summary be provided, while most other provinces require the reporting of summary information from the triennial actuarial valuation. As a result the number of plan-years in this study is greater proportionally for Ontario, which would be the absolute number of plans registered in that province.

¹⁰ For additional detail on such methodologies, see Hirtle and Estrella (1990) or Lewis and Cooperstein (1993). For an example of what such an estimation process might entail in practice, see the U.K. Failure Score from Dun and Bradstreet.

¹¹ Not all Ontario plans participate in the PBGF. For example, a “multi-employer pension plan established pursuant to a collective bargaining agreement” is exempt from PBGF coverage as is a plan established within the last three years. Also, 12 public plans are specifically exempt by Ontario law from paying the PBGF assessment.

¹² Theoretically “funds available to a pension plan” could be interpreted to include contingent amounts available from a guarantee fund. However, such an interpretation would lead to endogeneity concerns and would limit the usefulness of the discussion that follows for the purpose of devising public policy as regards such a fund.

¹³ This model updates and extends the results published in Nielson and Chan (2004).

Table 2
Plan Asset Value per DB Participant^a

Income per worker	1.2487** (2.46)
Unemployment	-15,077.5*** (-7.74)
Tax rate	3,709.47*** (3.97)
Interest rate	-4,338.52** (-2.36)
Annual return on TSX	22,138.93** (2.39)
PBO design (compared to ABO) ^b	58,437.06*** (-17.27)
ABO/PBO uncertain (compared with ABO)	70,958.11*** (13.53)
Ontario	-20,034.57*** (-3.40)
PBGF	-16,496.73*** (-3.65)
R ²	0.3344
F	346.87***

^aPooled OLS model using provincial data (Alberta, British Columbia, Ontario, Saskatchewan), 1999–2006.

^bABO = accumulated benefit obligation; PBO = projected benefit obligation.

***Significant at 1%, **significant at 5%, *significant at 10%.

gression that is highly significant (as indicated by the high *F*-statistic). One place to begin interpreting the results is to view a basic amount of pension funding as that based on the state of the economy. The coefficients indicate that plan assets increase with earnings of workers and decrease with higher unemployment.¹⁴ The signs on these coefficients are consistent with the economic intuition that would suggest a more important role for pensions for workers who can demand higher wages, including, for example, markets in which there are fewer workers available. The level of accumulated assets supported by these underlying economic conditions is then moderated by the influence of tax incentives, with plan assets increasing when and where higher tax rates are observed.

From this starting point, the model reveals several other factors that partially explain the up or

down movement of the asset level across plans and across time. These variables reflect differences in investment markets, plan design, and regulatory factors. Movements of returns in the investment market—both interest rates and stock market returns—produce coefficients that are significant. Each one-percentage-point increase in interest rates corresponded to an aggregate decrease on average of an additional \$4,339 of funding per DB plan participant. For example, an interest rate movement from 5% to 6% would be associated with a decrease in pension assets of \$4,339. The annual rate of return (including dividends) on the TSX produced results in the opposite direction: an increase in the returns on stocks results in greater levels of funding. The negative coefficient on the interest rate variable suggests that funding tends to be reduced when markets expect higher rates in the future, but that actual returns in the market (TSX) increase pension assets by amounts that were not fully anticipated in the funding formula. In other words, the former is largely anticipated whereas the latter is not.¹⁵

Full details of plan design would have been ideal control variables in any model of plan funding as richer plans would be expected to produce higher benefits. Similarly useful control variables would have been the average age of participants or the proportion of participants receiving payouts. However, the blind nature of the data provided for this study precludes the incorporation of that information. The analysis was able to incorporate a pair of variables designed to distinguish among the basic types of actuarial cost methods. The key difference recognized is that certain plan designs (notably final average plans) automatically incorporate actuarial assumptions regarding future wage growth—for example, use projected benefit obligation (PBO) methods—

¹⁴ Income per worker is an important element of any component of compensation, but it also can be expected to be correlated with the average age of participants. Also, because it is an input variable in many DB plan formulas, it is expected to be positively correlated with the generosity of the benefit formula. Although age and formula details would be interesting variables to study separately, the effect that might remain after controlling for income cannot be determined.

¹⁵ Another variable omitted from the analysis is financial strength of the sponsor. While this may be an important factor in explaining decisions to fund or not fund to specific levels, it also could be a strong contributing factor to moral hazard. Including it as an independent variable would only serve to split the statistical results between cause and effect, essentially reducing the accuracy of any evidence that may be available about the existence of and/or extent of moral hazard. Controlling for financial strength would result in a measure of moral hazard only for firms that are in a strong financial position. This could actually be a far less useful result for many purposes, including public policy.

when estimating liability and determining contributions. Plan designs that use accrued benefit obligation (ABO) methods, such as flat benefit and career average plans, ignore future growth in wages until such time as plan changes become explicit. The ABO/PBO information was incorporated in the model to separate that source of variability from other influences on the nominal level of plan funding. As anticipated, the PBO-based plan designs, which by their very nature produce higher liability estimates and contributions, resulted in higher asset values per participant. In the current regression, the funding is estimated to be \$58,437 higher per participant for PBO plans than for ABO plans.¹⁶

Finally, the model assessed the importance of jurisdictional differences in explaining differences in the level of plan assets. One dummy variable reflects the simple fact of the plan being registered in Ontario. This captures the effects that result from Ontario law being different from other provinces, for example, the “grow-in” provision¹⁷ that guarantees early retirement benefits to members of DB plans in Ontario whose age plus years of plan membership as of the date of the wind-up equals 55 (also known as the “rule of 55”). Another difference between Ontario and other provinces is the availability during a portion of the period studied of the qualifying plan election in Ontario that allowed some plans to legitimately slow down their funding in a way that other plans could not.

In addition to the variable for plans registered in Ontario, a separate variable was created to identify plans covered and not covered by the PBGF. Ontario’s Actuarial Information Summary contains data for PBGF assets and liabilities. Any

plan that had a nonzero value for one of those was coded as being covered by the PBGF. Any that reported zero values for both PBGF assets and liabilities was assessed individually to determine if it appeared to qualify for a specific exemption. The use of two separate variables is especially important considering that the literature suggests reasons to expect a priori that the effect on plan assets may operate in opposite directions: for example, the PBGF may provide an incentive to plan sponsors to fund at a lower level while the “grow-in” provision operates to increase liability and, in turn, require higher contribution levels.

After correcting statistically for all the variables described above, Ontario pension plans exhibited a distinct and statistically differentiable level of assets per participant with each participant in an Ontario-registered plan having on average \$20,035 less in asset value. Beyond that, a dummy variable for PBGF coverage also was statistically significant at the 1% level. Plans insured by the PBGF have an average of \$16,497 less per participant than other Canadian DB plans that are not backed by a guarantee fund. The model explains approximately one-third of the variability in nominal pension funding across plans with an explanatory power (R^2) of 33%, which is considered extremely good for a model of this type.

With one exception, there is no reason to believe that DB plans where offered are more or less generous in other provinces than in Ontario. The exception is the fact that all public employee pension plans are included in the non-PBGF plans and evidence. Evidence comparing private and public sector benefits is extremely scarce in Canada, although there is some limited evidence that benefits (e.g., pensions) are more generous in the public sector.

4.2 Relative Value Measure

This section reports the results of the model of a relative measure, that is, the funded ratio for the same set of plan-years that appeared above. The same variables are employed in this model as were presented in Table 2. When compared with that model, the number of variables showing statistical significance in the explanation of plans’ funded ratios is dramatically smaller. This is not surprising because the environmental and economic variables included as control variables often have similar—and likely offsetting—effects

¹⁶ For plan types recorded as hybrid, designated, or other by the respective provincial regulator, neither ABO nor PBO methodology could be inferred. These plans are classed as “ABO/PBO uncertain” in the regression. As designated plans are by definition those that provide high benefits to the highly paid, they are inherently atypical. While such plans exhibit higher funding than ABO plans, little can be inferred from that result. Including the variable is important primarily to provide statistical controls for such atypical plans.

¹⁷ Nova Scotia amended its Pension Benefits Regulations on December 9, 2004, to remove a similar requirement to include “grow-in” benefits within a solvency valuation. In Nova Scotia, “grow-in” provisions continue to apply on full or partial pension plan wind-up; however, their priority on payout would be second to the basic pension that all employees would receive.

Table 3
Plan-Funded Ratios^a

Income per worker	-0.000124 (-1.28)
Unemployment	-0.3258 (-0.87)
Tax rate	0.0553 (0.24)
Interest rate	-0.1245 (-0.70)
Annual rate of return on TSX	-0.000124 (-1.28)
PBO design (compared to ABO) ^b	0.091879* (1.81)
ABO/PBO uncertain (compared with ABO)	0.5263*** (5.87)
Ontario	7.2069 (0.55)
PBGF	-0.1769*** (-3.19)
R ²	0.4923
F	272.97***

^aPooled OLS model using provincial data (Alberta, British Columbia, Ontario, Saskatchewan), 1999–2006.

^bABO = accumulated benefit obligation; PBO = projected benefit obligation.

***Significant at 1%, **significant at 5%, *significant at 10%.

on both the assets and liabilities of pension plans.¹⁸ Certainly this makes intuitive sense for the income levels of workers and investment returns. Only two variables demonstrate significance at the 1% level. The strongest influence is seen by the “ABO/PBO Uncertain” variable, which is included primarily as a control for the influence of *designated plans*, that is, those plans upon which special limitations are imposed to restrict the tax expenditures provided to those at the highest income levels. The *only* other variable significant at the 1% level is the existence of coverage under a public guarantee fund. Overall, the performance of the model is stronger in terms of explanatory power than the earlier model of nominal funding.

5. IMPLICATIONS FOR GUARANTEE FUND POLICY

The base case in the rest of Canada, as well as for amounts above the PBGF limit in Ontario, is that

the allocation of risk associated with sponsor’s insolvency is determined under Canada’s bankruptcy law, the provisions of which recently underwent important changes when, in July 2008, the Wage Earner Protection Program Act and amendments to the Bankruptcy & Insolvency Act took effect. Under this change, priority rights are provided to employees for unpaid pension plan contributions in the event of the bankruptcy of their employer, ranking these claims ahead of secured creditors. The legislative silence with respect to all other unfunded pension liabilities means that plan participants bear the remaining insolvency risk.

For public policy makers, the issue of protecting plan participants from this insolvency risk through some sort of pension guarantee truly is a double-edged sword. The availability of a pension plan that makes deferred funding options available to a firm also makes it possible for an economy with finite capital to create more jobs and promise more pensions. The implicit assumption is that future growth will fund the future promises. Explicitly protecting pension plan participants against the risk of a sponsor’s bankruptcy, such as by offering some sort of guarantee, encourages confidence in the growth of the economy and the firm and makes it easier for firms and workers to reach an agreement. Offering a guarantee fund removes the risk associated with pensions from the firm and its workers and, by definition, transfers that risk to taxpayers. In the case of Ontario the PBGF has become a third party on the list of those available to bear the risk of a sponsor’s insolvency. Like any insurance mechanism, such a program also can reduce that risk by pooling it across different firms, different industries, and across time.

However, the guarantee fund also may increase the total amount of risk faced because of moral hazard. Absent government intervention, there are incentives for plan sponsors and plan participants to monitor, minimize, and manage the risk that must somehow be divided between them. The results presented in this article, while limited by the availability of data for what would unquestionably be useful factors, provides evidence that funding is lower on both a nominal and relative basis when a government-based guarantee fund is present. While not conclusive, these results make

¹⁸ To test the robustness of the model, it was also run with variables for each of the seven calendar years in the study. None of these year variables were themselves significant, and, in that expanded version, the model’s overall explanatory power and the coefficients on all variables that exhibit statistical significance remain identical to at least two significant figures.

it impossible to dismiss the issue of moral hazard arising from Ontario's pension guarantee fund.

6. SUGGESTIONS FOR FURTHER RESEARCH

A natural experiment has been occurring for nearly 30 years in Canada, where roughly half of the country's workers are provided pension guarantees while the other half are not. Although there are differences in the regional economies of this vast country, this opportunity to learn how real employers respond to the differential in public policy regarding pension guarantees is unsurpassed anywhere in the world. Still, this study is limited, primarily by the data available, as to what evidence it can provide on this question. More details of each plan's benefit formula would allow a more detailed set of controls to be built into the analysis. In addition, detailed data regarding the population in a plan matched with characteristics of the plan sponsor(s)—such as size, industry, unionization, and whether publicly traded, to name a few—would aid tremendously in the effort to further expand our understanding. This is but a single example of how limited the data in Canada is in the area of employee benefits and how limited our understanding will remain until research can be extended to include more evidence in this area.

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