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MANAGING PUBLIC INVESTMENT FUNDS: BEST PRACTICES AND NEW CHALLENGES

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ABSTRACT

Publicly-held pools of assets have grown dramatically over the last several years, and they are playing an increasingly prominent role in cross-national investments. This paper examines how to better secure prudent and economically sound public fund management practices, focusing on ways to formulate and build a strong governance structure for managing the assets, how one might protect the assets from political interference, and what sensible investment policy might entail. We compare three distinct forms of public funds, namely foreign exchange reserve funds, sovereign wealth funds, and public pension funds, to highlight similarities and differences between these. We also explore how their management structure relates to governance practices and country-specific characteristics, drawing from the pension and corporate finance literature. Last, we discuss alternative means of managing public reserve funds in aging economies such as Japan, to help meet future social security liabilities in the face of rapid demographic aging.

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Many nations have accumulated large pools of resources held by, and managed in the interest of, the public sector. The media terms these asset pools "future funds," "sovereign wealth funds," and "government investment funds," and they afford their sponsoring nations both opportunities and risks depending on how the national endowments are managed. This paper gathers and analyzes information about key management practices for such publicly-managed investment pools. Our goal is to develop lessons on how these institutions can be strengthened so as to better secure prudent and economically sound fund management practices. We focus on ways to build a stronger governance structure for managing the assets, how one might protect the assets from political interference, and what sensible investment policy might entail. This effort suggests conclusions about which investment strategies and governance structures may be best suited to oversight of these publicly-held wealth funds, and it also allows us to draw some policy inferences regarding governance reform.

Publicly-managed investment funds have many different historical roots, including a purposeful buildup of fiscal surplus against future economic shocks (e.g. Australia, New Zealand); a focused effort to mitigate the effects of demographic disequilibrium on the social security balance (e.g., Japan); or a desire to set aside some portion of revenue associated with the exploitation of natural resources (e.g. Norway). In value terms, the Japanese public pension reserve is among the largest, with some US$912 billion in accumulated funds (Matsui and Suzuki 2007). Other large funds include that of the United Arab Emirates (US$875B), Singapore's GIC fund ($330B), and Norway's Pension Fund (US$300B); see *Economist* (2007).

As these publicly-held wealth funds grow, they are assuming an increasingly prominent role in news-making international investments, including providing support to some of the world's most important – and currently quite fraught – financial institutions (Scheherazade and Blitz 2007). Analysts regularly comment on the size and potential international clout of these financial behemoths (Morgan Stanley 2007), and some of the investment choices made by these funds have prompted policymakers including the governments of France and Germany to worry publicly about the potential economic impact of these funds' global reach (*Economist* 2008). In parallel, international agencies including the OECD and the International Monetary Fund have begun asking questions about what these funds are and how they should be managed.

This paper summarizes prior research on best practice for public wealth funds, and offers some new thoughts on how decision-makers might approach thinking about better practices for managing large assets pools – particularly as many seek new ways to invest these assets more productively. For instance, the Japanese Government Pension Investment Fund, or GPIF, is estimated to hold over US$900 billion dedicated to pay retiree benefits under the national social security scheme. In the past, the fund has been almost entirely invested in Japanese government bonds, but recent reports indicate that finance authorities may begin investing some portion of the nation's reserves as a soon-to-be created sovereign wealth fund (Lewis 2008; Pesek 2008). Accordingly, it is important to explore whether this future shortfall could be significantly reduced through superior investment of these resources which until recently have mainly been invested in government bonds.

In what follows, we take up several questions of key importance to public investment funds. First we ask what is "good management practice," by which we mean the protocols and practices regarding fund *governance*, *accountability*, and *investment policies* (c.f. Musalem and

Palacios 2004). We outline what we mean by each of these below. Second, we ask how good management of public investment funds affects fund performance. In order to do so, it is necessary to evaluate what types of performance metrics exist and whether they might depend on the type of fund. We also review the literature regarding the effect of management practice on performance of public investment funds. Third, we explore whether good management practices for public investment funds for governance, accountability, and investment policies can be shown to depend on key aspects of a nation's economic, political, and social conditions. In particular, we evaluate links between a country's management practices, economic environment, political/legal structure, and practice regarding transparency/reporting/accountability. We also evaluate whether the future call on resources, measured by the aged dependency ratio, influences management practices. In a final section, we outline what remains to be learned about how to manage public investment funds.

This research should be of interest to readers concerned with topics in public and social security finance. There are useful lessons from prior studies on corporate governance and pension fund management provides useful insights into how good *governance*, *accountability*, and *investment policies* influence economically interesting outcomes. As nations grow increasingly aware of obligations in the form of promises to their aging societies, this also prompts the need for more sophistication with regard to trading off equity premium on global scale versus the shortfall risk of a system running out of money. It is hoped that publicly-managed fund fiduciaries will become increasingly aware of the rationales for better investment performance, the value of international diversification, and the opportunity costs of more aggressive investments as the publicly-managed funds balloon in size. As financial market

upheaval is offering these public investment pools new opportunities and challenges, it is essential to provide more sophisticated management.

The Nature and Variety of Public Investment Pools

Public investment funds refer to assets under the control of the public sector. In practice, these take three main forms: *foreign exchange reserve funds* held for stabilization purposes; *sovereign wealth funds* accumulated from taxes levied on natural resources such as petroleum; and *public pension funds* built up either through an explicit funded arrangement or the result of an excess of contributions over benefits during a demographic transition. From the perspective of investment discretion, we place currency stabilization funds at one end of the spectrum. These assets must be liquid and are usually held in the form of short term paper or commodities. Moving along the spectrum, sovereign wealth funds (SWFs) are government investment vehicles that manage their assets separately from official foreign exchange reserves. As a rule, their assets have been invested in international holdings, though sometimes they have been used for domestic investments (e.g. infrastructure). Some analysts are quite specific in what they refer to as SWfs: for example, Jen (2007a) requires five ingredients, namely the pool must be managed by a government (sovereign entity); it must have high foreign currency exposure; it must have no explicit liabilities; it must have high risk tolerance; and it must have a long investment horizon.

Yet further along the spectrum are public pension reserves. These are typically less constrained by the need for immediate liquidity, but because of their liability profile, their asset allocations have traditionally been weighted toward domestic currency assets (as this is the currency of the pension liabilities). In addition, public pension funds are often concentrated in government bonds, as a result of explicit policy or due to institutional tradition. For instance the

US Social Security Trust Fund of almost US$2 trillion is held entirely in special-issue nonnegotiable US government bonds.

Of the three types of public investment funds, sovereign wealth funds seem to be growing most rapidly and have been permitted the greatest investment flexibility. Some SWFs were established to manage the intertemporal allocation of resources generated by the discovery and exploitation of a non-renewable natural resource, while others were set up to absorb government fiscal surpluses expected to be spent in the future. One way or another, both pension funds and SWFs have an inter-temporal or even intergenerational dimension in their objectives. We explore the form and function of each, in what follows.

Stabilization Funds

Though currency stabilization funds are not the central focus of the present paper, it is worth noting that they are the largest of the three categories of public investment funds. Available estimates place the total at around US$4.5 trillion (see Table 1). These have been rationalized by perhaps the oldest and most conventional explanation for government-held funds, namely the central monetary authority's desire to smooth currency fluctuations. In practice, it is often stated that three months' of reserves is a prudent cushion for exchange rate shocks (Rietveld and Pringle 2007).

Table 1 here

In point of fact, many countries have held far more than this minimum level of assets required to manage currency stabilization, which in some cases has then given rise to more aggressive investments via sovereign wealth funds. For example, in China, Russia, and Singapore, SWFs are responsible for both foreign exchange reserves and fiscal surpluses. An important stimulus behind the recent growth in SWFs has been the rising central bank reserves in

rapidly growing countries such as South Korea and Taiwan. Official reserves in such funds have expanded at US$600 billion per year over the past half-decade (Patelis 2007), and reserves held for currency stabilization are expected to rise in the future. Nevertheless, as our present concern is with asset pools held for the long run, we do not further consider stabilization pools below.

Sovereign Wealth Funds

Despite substantial media and policymaker interest in SWFs of late, their precise magnitude is unknown for reasons to be discussed below. One estimate suggests they hold between US$1.5-$3.1 trillion (Kern 2007; Patelis 2007). Truman (2007a,b) identifies around 20 SWFs which he contends control around US$2 trillion in assets; he also separately lists foreign exchange reserves held by governments totalling about US$4 trillion and he includes Japan's approximately US$800 billion pension fund. Conservative estimates from Watson Wyatt (2006, 2007) suggest that SWFs and public pensions together hold about US$4 trillion. Figure 1 provides a comparison of assets held by both public and private funds, and it indicates that currency stabilization and pension funds are far larger than SWFs, while SWFs in turn are larger than hedge funds in the global capital market.

Figure 1 here

Many of the early SWFs were set up in countries holding natural resources such as petroleum which were exposed to unpredictable revenues due to the volatility of oil prices. As an example, if a country's oil revenue represented 20 percent of its gross domestic product, then a one standard deviation shock to oil prices would create a revenue decrease equivalent to six percent of GDP (Hausmann and Rigobon, cited in Devlin and Titman 2004). Chile's Economic and Social Stabilization Fund and the Venezuela Macroeconomic Stabilization Fund are examples of stabilization funds designed to offset commodity price fluctuations. One way to

handle commodity price risk might be to self-insure or transfer risk to international capital markets to smooth economic performance over the relatively short term (Arrau and Claessens 1992). But the thinness of international insurance markets and apparent borrowing constraints are believed to make self-insurance a more natural choice for oil-producers to protect themselves against such price volatility. Indeed, self-insurance is recommended by Shabsigh and Ilahi (2007) who contend that the benefits from public expenditures on lumpy investments when oil prices are high exceed the costs of shutting them down when oil prices are low. Commodity-exporting countries may self-insure against volatile commodity prices either by diversifying their export structure or accumulating financial assets. Since diversifying export structure requires long-term structural reform and may reduce comparative advantage, financial asset accumulation can be a better choice given available alternatives.[1]

There is some controversy about the economics of such stabilization funds. For instance Davis *et al.* (2001) indicate that fiscal stabilization funds may be less efficient than sound fiscal policy in protecting against commodity price volatility. On the other hand, Shabsigh and Ilahi (2007) analyze the effects of stabilization funds not only in terms of fiscal stability but also in terms of macroeconomic stability. The latter study concluded that inflation and price volatility prove to be lower when countries keep stabilization funds, and it weakly supported the proposition that commodity funds can be useful macroeconomic stabilizers. On the whole, the economics literature suggests that commodity funds will be small when they are motivated by commodity price fluctuations, since larger funds distort the domestic economy and can trigger suspicions about the fund's activities in international financial markets (Devlin and Titman 2004).

[1] See Arrau and Claessens (1992), Shabsigh and Ilahi (2007), and Fasono (2000) for a more detailed discussion on the necessity of fiscal stabilization funds.

A different justification for SWFs is that they permit nations to set aside money derived from exploiting exhaustible resources today, for future generations. For instance, the first commodity SWF was the oil fund established by the Kuwait Government in 1953; shortly thereafter the nation of Kiribati established a commodity fund in 1956 in order to manage revenues from phosphate deposits (Petelis 2007; Truman 2007b). More recent examples include the state of Alaska which has put 2.5 percent of its oil royalties into its Alaska Fund. This practice is thought to improve intergenerational equity, smoothing the time path of revenues generated by nonrenewable resources (Olters 2007).

A theoretical rationale for this conclusion is developed by Gerlagh and Keyzer (2001) in a model which examines a government-run “trust fund" that pays future generations claims for revenues generated by the natural resource. They construct a simple pure exchange overlapping generations (OLG) setup with an exhaustible resource. Exhaustibility is the irreversible degeneration of the resource, while the resource’s “amenity value” refers to the services provided by exploiting it. Inasmuch as natural resource extraction today reduces the resource’s amenity value tomorrow, a regulatory mechanism is required to promote intergenerational equity. Agents maximize lifetime utility by selecting consumption levels of private and public goods, and aggregate welfare is the summation of individual lifetime utilities. The model considers three alternative regulatory scenarios. In a first, there is zero extraction preventing the use of natural resources for all generations, akin to keeping an oil field idle. The second scenario, termed ‘grandfathering,’ leaves the ownership of the natural resource to the first generation, while future generations pay to mitigate pollution. This is equivalent to the distribution of all oil or mineral revenues to the first generation. The third scenario introduces a trust fund which entitles all generations to an equal claim over the natural resource. The authors consider the trust fund as an

independent institution that can ensure future generations receive their claims; it is like a saving fund to keep some of the revenues generated by an exhaustible resource for future generations. A comparison of the three scenarios in terms of social welfare indicates that grandfathering improves efficiency compared to the zero extraction policy, but it favors the first generation over others. By comparison, establishing the trust fund improves welfare for subsequent generations.

An alternative, though related, model of a SWF fund has been termed a *financing fund*, built up when a government has a budget surplus that it wishes to dedicate to investment instead of current spending. Some argue that this sort of investment pool is more likely to constitute true "saving," as compared to a stabilization fund, because the latter tends to be paid for via borrowing (often implicitly; c.f. Fasono 2000). Of course, financing funds can also promote intergenerational equity and fiscal stability; examples often given include the Norway Government Pension Fund-Global (GPFG), the Kuwait General Reserve Fund, and the Timor-Leste Petroleum Fund. Table 2 provides a listing of the major SWFs and their asset holdings, as well as their stated objectives and sources assembled from a variety of recent sources.

Table 2 here

Of particular interest in recent years is the question of what SWFs actually invest in. This became particularly topical when key global financial institutions received massive transfers from important Asian funds including the Singaporean Government Investment Corporation and the Chinese government investment fund's infusions into Morgan Stanley and the Blackstone group. One reason these transactions have warranted so much public comment is that public investment pools have traditionally not revealed much about their holdings or governance structure. This nontransparency has been justified on grounds that it preserves investment flexibility and protects business opportunities.

As a consequence, it is generally impossible to obtain precise information regarding SWF asset allocation patterns. Some scattered data are available for four funds that do report their holdings; see Table 3. Thus Norway's SWF has a 100 percent global portfolio with a roughly 40-60 split between equities and bonds. New Zealand's fund holds about half its assets in international equities; it also holds no foreign bonds but has nearly a quarter of its portfolio in "other investments" which may include domestic real estate. Ireland's SWF holds nearly 90% of its assets in international securities, mostly equities. Australia's very new public investment pool is unique in holding mainly domestic securities, but this appears to temporary since procedures have not yet been established for global investment. Most SWFs lack stated or specified liability profiles. As a consequence, they are usually not required to finance any specific time path of benefits or cashflows denominated in domestic currency. As a consequence, it is often suggested that these pools can invest heavily in relatively illiquid but high expected return assets and diversify their portfolios globally.

Table 3 here

Sovereign Pension Funds

The third category of government-controlled asset pools we scrutinize here is the reserves held by government run pension funds. These may be generated either through an intentionally funded pension system, or by reserves generated by population aging where contributions from a large cohort of workers result in a temporary flow of funds in excess of current benefits payouts. What characterizes these pools is that the contributions and payouts are linked through some implicit or explicit contractual arrangement.[2]

[2] A further distinction in these funds relates to the form of payout. Defined benefit (DB) plans promise a payout defined in terms of salary achieved; defined contribution (DC) arrangements rely on investment performance of accumulated contributions. See United Nations (2007).

Intergenerational equity considerations make a pension fund an attractive policy device for many governments, since such a fund provides an opportunity to build up assets to cover future pension liabilities without changing the tax and benefit structure of a pay-as-you-go (PAYG) system. Conventionally, such PAYG systems are considered by economists to be welfare-reducing, as they tend to decrease an economy's capital stock by taxing the young generation with a high propensity to save, to pay pensions of the older population which has a high propensity to consume (Kumru and Thanopoulos 2007). By contrast, a funded pension can invest excess contributions for future generations, which can be very useful in times of population aging (Abel 2001). It must be acknowledged, of course, that while a future fund can reduce negative welfare effects of a pure PAYG system, it can also increase intergenerational inequality in a closed economy by benefiting one cohort over another (Oshio 2004). In other words, saving excess contributions by means of a future fund could still be inferior to letting the younger generation pay lower payroll taxes.

Recognizing that public pension funds do exist in many nations, it is of interest to examine how such funds invest their assets. Some research has deployed actuarial or asset liability management (ALM) perspectives to link fund assets and liabilities, while others employ a general equilibrium framework to consider the effects of an investment change on the whole economy. For instance, MaCurdy and Shoven (2001) adopt an actuarial framework to explore the possible consequences of an asset reallocation in the U.S. Social Security Trust Fund. In particular, they examine whether selling government bonds and buying corporate stocks would improve the finances of the old-age system. Based on historical return data, they conclude that such reallocation would carry a significant risk for Americans; that is, the relocation might bring a lower return than expected. Using a general equilibrium framework, Abel (2001) analyzes the

effects of asset reallocation on the equilibrium equity premium and the equilibrium growth rate of the capital stock. He concludes that when a national pension fund moves into equities, the expected income of the trust fund increases but the welfare consequences will depend on the benefit structure of the social security system.[3] Similarly, Bohn (1999; 2002) shows that the welfare effects of the asset reallocation depend largely on the specific pattern of macroeconomic shocks, the risk characteristics of equities, and individual preferences. In general it is no guaranteed that intergenerational equity is inevitably enhanced by moving to a funded pension.

A number of countries have well-funded national pension schemes, and several of them have accumulated substantial assets associated in their future fund accounts. According to Watson Wyatt (2007), public pension funds are 1.7 times as large as the total estimated size of SWFs around the world. Iglesias and Palacios (2000) document most of the publicly-mandated pension funds and the amount of assets held by these funds as a percentage of GDP. Table 4 lists the major sovereign pension funds and their asset holdings.

Table 4 here

In many developed nations, these pension reserves have risen over time, as Baby Boomer Social Security contributions have exceeded payouts to the more thinly-populated retiree cohorts. This process has permitted a gradual accumulation of assets held in the public sector and invested against the time that the demographic transition occurs. After a peak accrual period, the growth of these public asset pools would then be assumed to reverse and eventually the pools are slated to become exhausted. Such is the case of Japan, which has experienced positive net cashflows in the past that have built up reserves available for investment. The returns on these

[3] In a defined-contribution system, the gains from increased pension fund earnings are distributed to retirees. Hence, young individuals start to save less since they expect higher pension benefits in the future. This, in turn, reduces the current capital stock and social welfare. In a defined-benefit system, increased pension fund earnings reduce payroll taxes. In response to increased current income, young individuals increase their savings, and hence, the current capital stock increases (Abel 2001).

funds provide the potential to significantly alleviate asset liability imbalances as the population ages. Some researchers (Barro 1979) view such a "demographic dividend" as the natural result of optimal tax smoothing. Yet the timing is critical: because social security taxes are tied to benefits payable far into the future, these tax collections generate large current financial reserves in the control of the public sector making them potentially at risk for spending on other purposes.

The relationship between publicly managed pension fund performance and governance structures has been relatively well-documented (Iglesias and Palacios 2000; Carmichael and Palacios 2003; Mitchell and Useem 2000). There are also several empirical studies analyzing the investment performance of public pension funds (Mitchell and Hsin 1997; Mitchell and Hustead 2000; Mitchell and Smith 1994; Useem and Mitchell 2000). Yet to date relatively little has been written on how one might link public sector pension investments to the specific structure of pension obligations that the funds face.

Table 5 provides a comparison of the asset allocations of four publicly-held pension funds that report their data in a public manner. The first two of these, the Canadian and Swedish plans, are essentially funded add-ons to national social security programs; this drives their relatively heavy portfolio concentration in foreign equities. The Korean and Japanese funds, by contrast, represent a demographically-driven temporary accumulation of contributions held mainly in domestic securities. This latter pattern is consistent with the fact that these funds' liabilities are also denominated in domestic currencies though it is unclear whether a formal portfolio optimization reflecting this aspect of the liability profile has been undertaken.

Table 5 here

In the case of Japan, publicly-held pension resources amount to about 30% of GDP, a substantial amount responsive to the rapid aging of the Japanese population. Yet the fund falls

far short of what is needed to pay future liabilities: Employees' Pension (KNH) system liabilities of 550 trillion yen are several times larger than the government's old-age system reserve fund of around 179 trillion yen (Takayama 2006). Yet estimates suggest that the future shortfall might be substantially reduced through superior investment of these resources. One recent analysis by Lu *et al*. (2007) suggested that a 1 percentage point increase in returns, from 3% to 4%, could in certain circumstances bolster by 11 times the system's reserves in the year 2100.

Public Pension Fund Asset/Liabitility Considerations

In order to properly link a public pension fund's investment strategies with its benefit promises, an asset-liability management approach is needed. It is striking, however, that most past discussions of both SWFs and publicly-managed pensions have been silent about the need to link portfolio management goals to any particular obligations. A recent study by Maurer *et al.* (2008) begins to meet this need by investigating how a tax-sponsored public pension fund could best invest pension contributions to relieve government budgets. The study uses as illustration a group of German civil servants, but the more general contribution of the work is that it explicitly models the decisionmaker's appetite for risk and reward. One outcome of the study is that it provides recommendations for portfolio investments which control the expected economic costs of providing the promised pensions, while at the same time controlling investment risk. Both the expectation and the Conditional Value-at-Risk of economic pension costs are simulated using a stochastic simulation process for pension plan assets, allowing the authors to simultaneously set both the optimal contribution rate and the optimal capital market allocation. Of key importance is the fact that the plan sponsor may occasionally be forced to make supplementary contributions, which, as in the real world, brings with it a penalty. Conversely, the authors also prohibit the public pension from being used as a hedge fund, so excess assets are withdrawn according to a

pre-set rule. Using parameters specific to the German case, the authors demonstrate that the optimal pension fund investment strategy given a 20 percent of salary contribution rate requires investing the public fund 30 percent equities and 70 percent in bonds.[4]

While the specific results must vary with country parameters, the general approach is useful as it requires public pension plan managers to make explicit their objectives when developing investment policies. More generally, pension and saving funds need to focus on the consequences for intergenerational equity when they make their portfolio allocation decisions (Weinberger and Golub 2007). This will require dynamic multi-period simulation models which take into account both the risks and returns associated with risky investment, including Value-at -Risk models increasingly used by private sector pension funds.[5]

In this section we have provided an overview of the main types of public investment funds along with an outline of their key characteristics. Focusing on funds with a long-term objective, we suggest that pension fund and SWF reserves share many commonalities with regard to their objectives and rationales. Yet in practice they have been structured differently in terms of their explicit liability commitments which influence their investment decisionmaking structure. In particular, publicly-managed pension funds tend to place a higher weighting on assets denominated in domestic currency and may choose assets which provide immunization against liability risks in other ways. By contrast, the SWFs have been more heavily invested in global assets and their managers have not been required to make explicit their liability streams nor their risk budgets. Nevertheless, even in the case of the SWFs, it must be recognized that the

[4] Current taxpayers only have to pay regular contributions of 15 percent but the portfolio is invested 43 percent in equities. In this way future generations may benefit from contribution holidays and withdrawals, while providing an acceptable level of risk of supplementary contributions resulting from under-funding. For a related model see Haberman *et al.* (2000)

[5] In an interesting extension, Gray (2007) proposes that governments should move to using value at risk for all macroeconomic risks, by building a comprehensive national balance sheet and simulating national assets, liabilities, and contingent claims.

liabilities are there, if only implicitly so. More transparency about expectations is likely to be demanded in the future.

Good Management Practice in Public Investment Funds

The literature on what constitutes good management in public investment funds has focused mainly on public *pensions*, rather than public fund management more generally. The main reason is that, until fairly recently, publicly-managed pensions represented the main source of publicly-managed funds. Palacios (2002) estimated that, world-wide, such reserves amount to around one-quarter of world GDP, held mainly in the US. Whether a government-run fund constitutes public pension reserves or other holdings, however, many of the same governance principles apply (Impavido 2005).

Public Pension Management Principles

Management in this context is generally measured using three sets of standards: *Governance, Accountability, and Investment* practices, which below we refer to as the *GAI* elements. Of these three, *governance* is perhaps the most difficult to quantify in a consistent manner. Carmichael and Palacios (2003:7) discuss it as "the systems and processes by which [an entity] manages its affairs with the objective of maximizing the welfare of and resolving the conflicts of interest among its stakeholders." *Accountability* refers to the process by which governance outcomes and decisions are reported and disclosed to stakeholders. Accordingly, the public would be granted access to information about funding shortfalls, audits should be publicly available, and delegations as well as consultancies must be disclosed. *Investment practices* refer to the process of developing an appropriate investment profile which balances risk and return, taking into account liabilities where these are relevant. In the case of pension reserves, there is

often some information about the liability profile, so this constitutes an important difference between public reserve funds and sovereign wealth funds, as noted above.

In developing a framework for thinking about public fund management more broadly, the broad literature on corporate governance serves as a point of departure, beginning with Jensen and Meckling (1976) and comprehensively surveyed by Shleifer and Vishny (1997). Generally speaking, the problem is cast in a principal-agent framework, where stakeholders must be protected against possible strategic actions by managers who may act in their own best interest unless they are constrained. Empirical evidence has demonstrated the key role of good management practices in firm performance. For example, Gompers *et al*. (2003), using a US database of some 1500 firms through the 1990s, shows that firms with stronger shareholder rights have higher firm value, higher profits, and higher sales growth, as well as lower capital expenditure and fewer corporate acquisitions. In the emerging market context, Klapper and Love (2004) analyze firm level data across 14 emerging markets and find that better corporate governance is associated with better operating performance and market valuation. Importantly in the present context, they also find that governance provisions matter more in countries having weak legal environments.

In the corporate sector, the controls needed to handle the principal-agent conflict revolve around clarity of objective, appropriate rules about conflict of interest, clear incentives/accountability for each player, and disclosure of decisions and performance. In the case of the public sector, the challenge is that there is frequently no agreed-on metric by which agents (taxpayers, public sector employees) can readily measure the long-term performance of the principals acting on their behalf (policymakers).

This may be less of a problem in the case of public investment funds, provided that fund objectives are clear. Then, corporate-type governance, accounting, and investment principles can be applied and will go a long way to providing adequate information about performance. Nevertheless, government involvement in the financial sector is also susceptible to conflicts of interest and therefore, from a governance perspective, in need of special attention. These conflicts arise from the extensive participation of government in financial systems through their role as regulator and owner of financial institutions; as a (non-atomistic) market participant and fiduciary agent; and through direct interventions in the operations of the market. Good management practices are therefore especially relevant for publicly-managed funds.

To illustrate how these can apply for the publicly-managed asset pools, Table 6 reports a checklist for GAI criteria to be applied for public pensions devised by Carmichael and Palacios (2003). The *governance* questions are designed to avoid undisclosed conflicts of interest, ensure autonomy from political intervention, secure staff competence, and in general make the criteria comparable with private sector rules. The *accountability* scoresheet focuses on information communication, information credibility, and process transparency. And the *investment* criteria focus on potential conflict of interest issues, along with the dilemmas created by market dominance in particular sectors, or overall in a country.

Table 6 here

Despite the fact that the GAI checklist was developed specifically for public pension funds, it is striking that the investment checklist takes no explicit account of the fund's liability profile.[6] Indeed, most analysts who have provided criteria to evaluate public fund management devote no attention to the pattern of future liabilities, which is striking given the burgeoning academic literature on public pension liabilities. In general, there is little recognition of the

[6] Liabilities are mentioned in the Accountability checklist, in terms of open reporting.

importance of the structure or timing of fund liabilities in policy or practice for fund mangers, though the corporate pension literature shows that fund performance could be considerably improved were liability profile to be explicitly recognized in investment choices (*c.f.* Blake 2006).

The OECD (2005, 2006, 2007) also offers guidelines for pension managers summarized in Panel B of Table 6. We have re-classified those points under our three headings to emphasize the degree of common ground. Clearly-defined responsibilities for various members of management, suitability of personnel, and control over conflict of interest, appear on both lists. Yet some key points raised in the OECD discussion do not appear in the World Bank guidelines. A first relates to redress, or what happens when promises made are not kept. Secondly, the OECD guidelines explicitly raise the question of "self-investment," which is seen as running counter to sensible diversification of investment risk. In the public pension context, "self investment" could be interpreted as purchase of own domestic government bonds. Whereas many countries do require their public pension reserves to be heavily invested in this asset class, it must be questioned when, for instance, Japan's GPIF recently suffered when the investment quality of national government bonds was downgraded. Third, the OECD explicitly recognizes the importance of a fund's liability profile in developing investment strategies and fund objectives, and in this sense it brings together the purpose and conduct of the fund. We have argued above that this makes sense in the context of public pension funds.

Sovereign Wealth Fund Management Principles

The need for strong public sector governance arises from the same kinds of issues that spur the call for strong corporate governance (Carmichael 2002). Some recent research by the Peterson Institute (PI) on public fund management has developed a "scoreboard" for comparing

management practices of Sovereign Wealth Funds (Truman 2007a). That taxonomy identifies four categories of management practice: (1) structure, (2) governance, (3) transparency/accountability, and (4) behavior. The structure and transparency/accountability categories are further divided into subcategories, such that in total, there is a total of 25 yes/no questions where either a 1 or a 0 if the answer is an unequivocal yes or no. Ambiguity is reflected in fractional scores (0.25, 0.50, or 0.75). This approach offers a useful way to systematize thinking about this relatively new corpus of public sector activity.

Under ***structure***, the PI rubric identifies a SWF's clarity of objective, source of funding, and investment strategy. Topics addressed cover communication of the fund's objective, the specification of both sources and uses of funds, whether there is frequent intervention in source and use (presumably an indicator of multiple or expedient objectives in fund use), and the fund's relationship with the broader government budget. Clarity of investment strategy and separation from international reserves are also considered. From these elements, the picture that emerges has a "good" SWF being the public investment fund that has long term objectives other than strictly currency stabilization, explicitly or implicitly linked to some intertemporal allocation and/or distributional objective. Relating this to the elements of good management we have already identified, structure in the PI terminology encompasses some elements of governance along with investment strategy. The question of the fund's objective, and its scoring, is subject to caveat. This is because most funds examined in the PI study scored positively on this, but there was no attempt to link the stated objective with any other practice. Therefore the tally gives credit to a fund that explicitly lists its objectives, but it does not then additionally credit funds where other aspects of management practice support the stated objective, nor does it penalize funds where they do not.

In the PI formulation, SWF ***governance*** focuses on the independence of the fund's investment strategy and the independence of the role of manager in executing investment strategy. Also under this rubric are included indicators for the existence of corporate responsibility and ethical guidelines, as well as indicators of whether the policies are publicly announced and followed. The notion of governance falls somewhat short of what might be expected given the corporate governance literature. For instance, there is no inquiry about the role of the governing board, or about the incentives available to operational roles in the organization.

The third major category proposed in the PI index pertains to how the SWF behaves in terms of ***transparency/accountability***. Matters considered include reporting on activities and performance, public disclosure of investment portfolios, geographic location of direct investments, specific investments, currency of investments, and the identity of investment agents. The category also includes information about audits, regularity, public availability, and independence. The final PI category, ***behavior***, asks about the nature and speed of adjustment of the SWF portfolio, and this is the least clearly explained. It should be noted that of the 25 PI questions, 12 fall under the *transparency* heading, and several of the questions listed under the *structure* heading could also plausibly be placed there as well. While this is an important component of overall fund management, the fact that only four items are analyzed under the *governance* heading is rather arbitrary and probably incomplete.

In sum, the PI scoreboard is a useful start in terms of formalizing standards for good management practice for SWFs, yet more attention to public fund governance and to fund objectives would be useful to add. A further problem common to many SWFs is that to the extent that they do purpose to adhere to particular management guidelines, they tend to be silent on the

links between management of assets and liabilities. This may be deleterious to fund performance inasmuch as investment policy is generally believed to depend on the objectives of the funds. The reality today is that for most SWFs, fund objectives are often not carefully identified. By contrast, at least in principle, for public pensions, the benefit streams that consist of the funds' liabilities can be measured and stated. (Even then, however, pension system liabilities may not be well-integrated into investment policy.)

Do Public Management Practices Affect Performance?

Next we turn to a review of available studies seeking to link public management practices to public enterprises performance. There has been substantial research over the last decade on how management practices influence private or *corporate* performance, relatively little analysis of public sector entities has been undertaken. For this reason, the present section first offers a brief overview of how corporate management practices have been linked to corporate performance, and then we turn to a discussion of what is known about management of public sector funds.

Prior Studies on Corporate Outcomes

A substantial body of empirical research has linked corporate management practices to many firm-level outcomes. Much of the research through the mid-1990's has been carefully reviewed by Schleifer and Vishny (1997); since then, additional studies have emerged in response to the 2002 Sarbanes-Oxley Act (SOX) requiring US public companies to institute a range of procedural and structural reforms intended to enhance stakeholder confidence in the post-Enron era. The range of outcomes addressed in this literature is vast, including the corporation's return on assets, market valuation, stock returns, success at making acquisitions,

and Tobin's Q (or the firm's market value of assets as a proportion of the replacement value of its assets), among others.[7]

There is also a wide selection of measures of 'good managerial practice' used by empirical analysts. In practice, most analysts of corporate performance tend to focus on metrics of *corporate governance.* This, per Schliefer and Vishny (1997: 737), refers to the "ways in which suppliers of finance to corporations assure themselves of getting a return." In particular, the literature emphasizes how investors may gain power through legal protection (e.g. via protection of minority rights and limits on managerial self-dealing), and also via large investor blocks which control managerial behavior directly. Accordingly, the empirical literature has found important empirical relationships between countries' *legal efficacy* scores, which indicate whether the structure is founded on common or civil law, and variables indicative of *shareholder control rights*. Many studies also examine policies regarding *transparency* and *accountability*, on the argument that rules enhancing financial reporting are likely to result in better protection for the investor.

Prior Studies on Public Fund Outcomes

The literature on public enterprise management has built on its private sector counterpart, seeking to craft indicators of good-quality management and relate them to successful public firm outcomes. But public entities often do not conform to private-sector accounting and reporting standards, and output measures useful in the private sector frequently have no counterpart in the public sector. In addition, SOX does not apply to public entities, so much less has been learned to date (at least in the US context) about how management practices relate to public enterprise

[7] For a recent review of the empirical governance literature see Michaud and Magaram (2006); among the most cited studies are Gompers *et al.* (2003) and Schliefer and Vishny (1997). There are also numerous examinations of the links between good management practices and executive compensation which are beyond the scope of the present study; a recent review includes Gerakos (2007).

outcomes. Nevertheless there are some similarities, and economists find it natural to use for public sector entities the same principal-agent framework mentioned above and popularized in the corporate world. In this context, the taxpayer and other members of the public represent the principals, while the agents are the government managers guiding the public enterprise (c.f. Ambachtsheer 2007b; Coronado *et al.* 2003). So in theory it would be feasible to evaluate whether particular management practices can shape outcomes of public sector enterprises, though with some adaptations depending on the type of public firm in question.

In the specific case of public entities of key interest here - namely public pension plans and sovereign wealth funds - the conventional measures of corporate outcomes such as shareholder wealth, firm profitability, and market share do not readily apply. For this reason, analysts have turned to other metrics to determine whether public sector enterprise performance is enhanced as a result of particular management practices. For instance one outcome of interest might be investment-related. In the simplest case, for instance, public pension funds which hold some assets can report their *target* annual return (e.g. 3.2% in the case of the Japanese GPIF). More elaborately perhaps, some public plan managers may indicate their risk-adjusted returns *vis a vis* some benchmark. Relatively few focus on the dynamic path of liabilities as well as assets, about which we say more below.

The few existing studies linking public pension plan investment strategies and investment returns tend to show that these are often influenced by governance factors such as board composition (Mitchell and Hsin 1997). For instance, having more retirees tends to lower performance due to greater weighting toward a fixed income portfolio. Again in public pensions, Useem and Mitchell (2000) show that governance variables account for over 20 percent of the cross-pension plan variation in investment strategies, which in turn are positively associated with

subsequent investment return performance on the pension fund assets. Yang and Mitchell (forthcoming) examine how pension plans' funded status (or the ratio of plan assets to liabilities) as well as investment returns respond to measures of pension board composition, management practice, reporting practice, and investment practice. They show that many pension boards have political appointees as well as active and/or retired workers on the roster, both of which can be problematic when these board members may not be particular financially expert.

Another issue is that sometimes public entity trustees have used fund assets to further their own (or their party's) political/social objectives. Hsin and Mitchell (1997) find that several pension management factors are statistically significant and economically important. For instance, *ceteris paribus,* having more plan participants on the pension board, whether retired or active, reduces plan funding levels and the point estimates imply that adding an additional active member reduced stock funding by 0.7 percentage points, while adding one more retired member decreases funding by 1.7 percentage points. Further, investment yields on the public pension plan assets appear significantly lower when retiree representation increases, perhaps due to lack of investment expertise. Enhanced pension reporting, including making annual reports on financial, actuarial, statistical, and investment information to stakeholders, can enhance returns by 2.1 percentage points annually. Research on public pensions and mutual funds by Ambachtsheer (2007a, b) uses as the dependent variable "net value added" or the fund's gross investment return minus its benchmark return and the fund's total expenses. This outcome proves statistically related to a lengthy list of 45 measures of governance quality obtained by interviewing public fund CEOs (see Ambachtsheer *et al.* 2006). Ambachtsheer (2005:196-7) reports that of the entire lengthy list of indicators, six governance-related and five management-related measures in his CEO survey are significant. In that author's words, "statistically

significant governance statements (are)…related mainly to effective fiduciary behavior and selection processes, clarity in delegation of authority, and a high level of trust between the governing and managing fiduciaries. The statistically significant management statements (are) related mainly to clear strategic positioning and to the effective development and execution of the fund's strategic plan."

Insofar as we are aware, there are very few studies that report investment performance for the SWFs that are not pension related, much less risk adjusted or benchmark-linked returns. One of the view reporting public pension returns by country and time period is that of Carmichael and Palacios (2002).

How Can Fund Objectives Be Incorporated?

The studies of public funds mentioned above focus primarily on asset-related outcomes such as returns and funding patterns. Yet there is another very critical set of issues that arises when it comes to public fund management, namely how one might want to integrate the asset/investment management effort with the evolution of plan liabilities. For instance, in the case of a public pension system, the goal is generally agreed to ensure that retiree benefits can be paid without large and unexpected increases in the cost of maintaining the solvency of the system. Nevertheless, as Ambachtsheer (2005:198) emphasizes, "fund managers of late have made no measurable effort to take into account the financial characteristics of their liabilities when structuring their fund policy portfolios." Indeed, a reason that managers may have found it difficult to do so is that it may be troublesome to convert the broad objective of "paying pension benefits" into specific fund management rules and performance criteria. Sometimes the liability path will be difficult to model and simulate. Or public pension plan investment policy may be set independently of liability paths on purpose; for instance this is the case for the US Social

Security Trust Fund which is permitted to hold only special issue government bonds.[8] Still an additional reason that asset-liability management is not undertaken in a concerted, coherent form may be because policymakers may not wish to make explicit what their risk appetite is in terms of shortfalls and surpluses.

Nevertheless, in the last several decades, great strides have been made in analysts' ability to model and solve for ways to implement asset-liability models, and this could be even more useful in the future. Of course, to select an appropriate investment strategy in the face of these stochastic liability patterns, policymakers must make explicit their risk budgets, or how they balance the unavoidable and dynamic tensions between investment returns, benefit payments, and contribution requirements. Such risk budgets must take into account both the uncertainty of system revenues, including investment returns earned on pension fund assets, and stochastic pension liabilities as discussed above.

Much recent discussion including Moore (2007) touches on these points. Boender *et al.* (2001) implement this approach for Dutch pension funds, while Maurer *et al.* (2007) examine public sector employee pensions in Germany. In general these evaluations must specify how plan outlays will depend on projections of earnings, patterns of labor market attachment, retirement trends, longevity forecasts, and many other factors.[9] In turn, investment portfolios can be optimized to take liability variations into the decision of how to structure the asset mix given capital market trends. Other examples of asset-liability management in the public pension fund arena include the work of Bogentoft *et al.* (2001) and several of the excellent papers in Ziemba and Mulvey (2001).

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[8] For a discussion of investment practices of 15 other publicly-managed pension fund systems see UN (2007).
[9] Other examples of this in the US include efforts by the US Congressional Budget Office (CBO 2004) to build a stochastic model to evaluate the impacts of possible changes in the national old-age benefits program. The US Social Security Administration has also developed a stochastic model used to project probability distributions for future outcomes of the system's financial status; see for instance http://www.ssa.gov/OACT/stochastic/.

One of the most clearly exposited papers in this vein is by Merton (2001), who implements this approach in the case of a university endowment fund. His model is relevant to the present research as it recognizes that such entities draw not only on their endowment pools but may also count on other cash flows including contributions from donors, tuition and other business income, and grants. He makes the crucial point that these revenue flows are also volatile and so should be modeled as part of the plan's resources. This approach has a logical parallel in the case of public pension funds and SWFs which may receive contributions from a variety of sources, while they can also draw down their investment pools to meet specific obligations. Insofar as some of the contribution sources have the same risk characteristics as equities, for instance, the entity may decide to invest less in stock. In its simplest form, the Board's preference structure for the university is taken to be a lifetime utility function of the form:

$$MaxE_0\left[\int_0^{\infty}(Q_1,...Q_m,t)dt\right] \qquad (1)$$

where $Q_j(t)$ is the quantity of the preferred activity j (e.g. education, research, etc) in which the firm engages at time t, and the utility function is well behaved. The entity is assumed to be indefinitely lived, making the upper limit on the integral infinity. (Other more complex formulations can be permitted). The remainder of the model specifies cost functions for producing the firm's outputs, and dynamics for cash flows for contributions and investment earnings. Over time the university selects a vector of activities Q, and a portfolio allocation in its endowment fund, to achieve maximum utility (1). Similarly, a pension fund can also be modeled as seeking to pay benefits, subject to constraints over revenue, investment patterns, and perhaps some risk aversion regarding extreme cash shortfalls that would otherwise require massive transfusions of new cash. To the extent that a university (in Merton's case) or a pension fund (in

our case) faces different risk profiles for its revenue streams and different cost profiles, this will produce different optimal investment strategies for the endowment pools.

The important lesson that emerges from these analyses is that investment policies for publicly-managed pools that fail to take into account the payout paths can be misleading and potentially quite suboptimal. Therefore the lesson is that, in addition to paying attention to the efficient risk-return wealth frontier, fund managers should also take into account the ability of the fund to meet other objectives (e.g. not raising taxes too sharply on any given generation in the event of a revenue shortfall). To date, it would appear that relatively few public pension entities have successfully carried out this process. The topic appears not to have come up yet at all for Sovereign Wealth Funds.

In sum, good management practice does appear to have a material and positive impact on corporate performance. Whether this is true for public pension fund outcomes is less clear given the dearth of high quality data.[10] Yet most studies of public fund management emphasize only financial or actuarial outcomes such as net returns, funding, or investment expenses. Very few appear to have constructed clearly formulated models linking fund contributions and investments to measures of anticipated benefits that these funds are responsible for paying out over the next several decades. But ignoring the liability side of the public pension funds' balance sheet implies that the performance measures thus generated will offer only partial, and perhaps misleading, evidence on how well a publicly invested fund may be doing. Indeed the challenge is to "determine a jointly optimal dynamic strategy for the asset and liability instruments which balances the interests and requirements of all agents involved" (Boender et al. 2001:564). And to date we have found no suggestion of empirical analyses of the determinants of performance in

[10] In Ambachtsheer's (2005) words, the research is suggestive of "a noteworthy convergence between what are deemed to be generally good governance and management practices in the for-profit and not-for-profit sectors as a whole and what we now find is important in the governance and management of pension funds."

sovereign wealth funds, much less an explicit effort to formally model their liabilities and future revenue streams. This is a major gap and should be rectified in future studies of SWFs. Nor has there been an empirical examination of what factors might explain how SWFs management structures might be structured and what influences their formulation in the first place. To this we turn next.

Factors Shaping Public Investment Fund Management Structures: Empirical Analysis

The long-term investment horizons and reliance on low amounts of leverage inherent in SWFs make for a stabilizing long-term influence on global liquidity (Citigroup 2007). But in recent years, SWFs have displayed an increasing risk appetite, very imperfect transparency, and little clarity of objectives. As a result, their growth has prompted debate in both recipient countries and among financial market intermediaries.

Accordingly, there have been increased calls for regulatory reform in the international sphere, and for financial protectionism or the explicit prohibition of investments by SWFs. For instance, the European Commission is drafting a plan to prohibit non-European Union members from investing in the European energy business. German Chancellor Angela Merkel has mentioned designing a system similar to that implemented in the US where a governmental Committee on Foreign Investment must review and approve foreign-based investments that might be deemed a threat to national security (EurActive.com 2007).

It is often suggested that, to reduce the risk of financial protectionism, SWFs should be more transparent, clearer in their objectives, and more independent. For instance, as noted above, a set of ‘best practices’ for international investments by SWFs has been devised with a “scoreboard” consisting of four performance categories: structure, governance, transparency and

accountability, and behavior. In this formulation, the higher a SWF scores, the more positive an example it represents; the possible maximum score is 25 (Truman, 2007b). The analysis has evaluated 32 SWFs in 28 countries and reports that New Zealand's Superannuation Fund is at the top of the list in terms of quality. Norway's Government Pension Fund-Global is the second on the list, while Abu Dhabi Investment Authority and Corporation of U.A.E. is at the bottom.

It is interesting to observe that SWFs scored higher by this scoreboard are also those nations listed as most competitive in the global competitiveness index of the World Economic Forum. In other words, there may be an association between SWF performance and factors indicative of human and business capital. For instance, human capital could be proxied by levels of education and levels of democratic representation (e.g. have a parliamentary democracy and free elections). We also hypothesize that SWF performance may be associated with having a good national business environment.

To explore how attributes particular to the national economy might be associated with the management characteristics of a SWF in that country, we next turn to an examination of the empirical relationship between the SWF's management score and country-specific characteristics. We bring the PI scores for SWFs described above into line with our own classification of good management practice developed pursuant to the public fund management literature. This is accomplished by translating the key PI elements into our three preferred headings of *governance, accountability* and *investment.*[11] It is again worth noting that the PI scores lack any link between objective and conduct – that is, there is no mention of future fund requirements or liabilities included in the list of questions around investment. [12] Missing from the

[11] Appendix I reports how we allocated the PI questions into our GAI categories. Accountability is quantitatively the most important of the three components, comprising 15 of the 24 questions we included from the PI list. We have omitted the question of how a SWF might be integrated within the overall government budget.
[12] In Appendix II we list the county funds ranked according to their GAI scores.

SWF analysis thus far has been any common guidelines for management objectives and performance measurement outcomes. This is in sharp contrast to the widespread agreement regarding management of publicly-run pension funds, where the OECD has produced detailed guidelines, and where other organizations such as the World Bank have been active in developing guides and policy parameters (Carmichael and Palacios 2003).[13]

Our empirical analysis employs the GAI scores for each subcategory, as well as the aggregate of those scores. Specifically, we explore a multivariate specification using regression analysis of the following sort:

> GAI score = f (Vector of national governance and political participation indicators, indicators of human capital and business environment, demographic control).

As control variables we include a measure of national governance from the World Bank Governance Indicators (WBGI; see Kauffman *et al*. 2007). This WBGI Index has six subcomponents relating to different aspects of governance, namely Voice and Accountability; Political Stability; Government Effectiveness; Regulatory Quality; Rule of Law, and Control of Corruption. To control on country-specific measures of the quality of human capital and the efficacy of the business environment, we draw on the World Economic Forum indices of global competitiveness (GCI; see Sala-i-Martin *et al*. 2007). This GCI index focuses more heavily on economic performance: stability in the macro-economy and in key markets, and education and business sophistication. Further, since SWFs typically have some inter-temporal redistribution or reallocation objective, even if implied rather than objective, we include a measure of the old-age dependency ratio as an indicator of the relative weight of demographic transition. The age

[13] Outcomes for SWFs might be developed using OECD pension fund guidelines or proposed voluntary guidelines for private equity firms recently drawn up by The Walker Group (Walker 2007). In the case of the latter study, its main thrust is to emphasize communication of decisions and outcomes rather than to implement decision-making structures or measure suitability of investment outcomes.

dependency ratios are taken from United Nations estimates (UN Population Division 2008).[14] In some alternative models we also substitute the projected old-age dependency ratio, instead. Variable definitions and descriptive statistics on our empirical variables are reported in Table 7.

Table 7 here

Next we investigate how our GAI metrics of interest relate to the key measures of national governance and global competitiveness. In preparing these data for statistical analysis, the first issue relates to matching the data sets across countries. In some cases a country may have multiple wealth funds with differing GAI scores. To handle this, we compute an asset-weighted average of the GAI scores to come up with a single combined fund metric for that country. Secondly, a number of countries for which GAI and World Bank data are available lack GCI scores so we omit these from our analysis.[15] Thirdly, an over view of the data reveals that a few countries with exceptionally high GAI scores for their SWFs also have very low GCI and Governance scores.[16] These developing and emerging market countries' funds are might be influenced by international organizations such as IMF and World Bank; to control on such institutional input, we use the log of the SWF assets as a control variable in our analysis.

To render the World Bank and GCI indices more tractable, we combine each of these data sets into a single index using principal component analysis (PCA).[17] Principal components combine many highly correlated variables into a smaller number of underlying dimensions. In

[14] For more information see http://esa.un.org/unpp/index.asp?panel=2.
[15] The list includes Brunei, Iran, Kiribati, Sao Tome and Principe, and Sudan.
[16] This list includes Azerbaijan, Botswana, Timor Leste and Trinidad and Tobago.
[17] We call them Modified World Bank Governance Index (MWBGI) and Modified Global Competitive Index (MGCI) during our analysis.

other words, PCA describes a series of uncorrelated linear combination of variables that contain most of the variance (Hamilton 2006; StataCorp 2007).[18]

Our multivariate analysis regresses the overall GAI aggregate on key governance indexes and results appear in Panel A of Table 8. As can be seen in Column A, the World Bank governance index is significant and positive, while the GCI index is statistically significant at the 10% level and negative. The current old-age dependency ratio is positive and significant, suggesting that when more elderly have larger economic claims, the result is better SWF management. The log of assets is negative and significant at the 10% level, indicating larger funds are less well managed.

Table 8 here

The other three columns in the top panel of Table 8 break down some specific sub-component variables to further explore the relationship between relevant national characteristics and the GAI scores. The idea that the quality of national institutions is associated with economic performance is not new. Analogously, strong public investment fund protocols and management structures may be hypothesised to be associated with strong national institutions. To explore this relationship more specifically, we develop models to test the power of specific institutional variables in explaining the perceived quality of public investment fund management, while taking into account the small sample size (N=23) which precludes including a large number of controls. We therefore use a series of variables reflecting these factors to account for measured managerial quality, following our three-way breakdown of Governance, Accountability and Investment using the following model:

[18] Correlations between all the variables used in our analysis are reported in Appendix III where we show that the governance, accountability, and investment measures of governance success are, not surprisingly, positively correlated with each other. Overall, we observe that the larger the size of the SWF, the lower the GAI score.

GAI measure= f (market efficiency, legal env., political env., demographic factors).

The GAI variables are those explained above. Market efficiency is proxied by a business sophistication metric, on the basis that this would be positively associated with public investment fund accountability. Legal environment can be represented by regulatory quality (by which we mean policies that enhance private sector performance) or rule of law (by which we mean a strong judicial system). This is in line with work by Klapper and Love (2004) and Shleifer and Vishny (1997) who show that better legal systems help protect shareholder rights.

We use two alternative proxies to represent political environment. The first, "Voice and Accountability" mainly measures participation in government and freedom of expression and the second, "Government Effectiveness" is a measure of civil service quality. The rationale is that freedom of expression should enhance all dimensions of our GAI score, because of the greater risk of public exposure for incompetence or fraud. Similarly, high quality public service should be able to deliver better quality management of a public institution. Finally, we include the old-age dependency ratio to evaluate whether an underlying objective of public investment funds, namely future beneficiaries, may be driving intertemporal investment and governance decisions. An older economy will face mounting pressure on public budgets from pension and health care obligations. We proxy this phenomenon by the current aged dependency ratio (but in one case, column D, we instead include the future dependency ratios as an alternative model).

Column B of Table 8 offers a more streamlined model which replaces the aggregate variables MWBGI and MGCI with indicators of Business Sophistication, Regulatory Quality, and Voice/Accountability. While business sophistication and regulatory quality are not statistically significant, we find that Voice/Accountability is a strong and positively significant factor driving the GAI outcomes. Omitting the Regulatory quality variable (column C) changes

results little if at all.[19] Panel II of Table 8 offers alternative variations on Model A in Panel I; the first column is replicated for ease of comparison. Interestingly, different factors are associated with each of the three GAI outcomes. Specifically, governance appears significantly worse for larger funds, while size is not significant for accountability or investment. The current old-age dependency ratio is strongly positively associated with accountability, while shareholder voice is positively associated with investment. The entire set of controls explains about one-third of the Governance and Investment outcomes, but closer to two-thirds of variation is explained for the Accountability index.

Overall, our results lend some support to the claim that key SWF characteristics are associated with interesting country-specific features. In particular, the *Voice and Accountability* factor seems to be the most important institutional explanatory variable. In terms of demographics, the 2005 aged dependency ratio is also important, but not the future projected ratios. National characteristics that matter revolve around political mores (Voice) and business sophistication, but not variables such as regulatory impact or rule of law. The analogy with private funds can also be argued by reference to other evidence. In a recent study, Servaes and Khorana (2007) find a relationship between fees collected by mutual funds and some national characteristics. In particular, those authors state that mutual funds which collect lower fees are more likely be found in the countries that have better judicial systems and more educated populations. It is interesting to see that similar national characteristics also affect governance, accountability, and investment structure of sovereign wealth funds.

[19] Column D substitutes Rule of Law for Regulatory quality, and Government Effectiveness in place of Voice and Accountability; we also include the future dependency ratio (in 2040) as an alternative measure of future-orientation of the SWF. The results indicate that none of the main explanatory variables is significant at the 5% level and the R^2 falls to 0.40; future dependency ratios are also unsuccessful.

Conclusions

This paper has examined management practices for publicly-managed asset pools to draw lessons about how these institutions might better manage their funds prudently and economically soundly. In the process, we have asked how to formulate and build a strong governance structure for managing the assets, how to protect the assets from political interference, and what sensible investment policy might entail. Our research suggests several conclusions about which investment strategies and governance structures may be best suited to oversight of these publicly-held wealth funds, and it also permits us to draw some policy inferences regarding governance reform. Most importantly, we argue that it is essential to take proper account of the origins of and motivations for the existence of the funds or reserves. Improved understanding of what might constitute best practice for the management of such reserves has the potential to inform policy formulation on governance and investment guidelines, and management practice.

Focusing on the indicators of "good management practice" in the arena of public investment funds, we argue that often these notions have not been well formulated in prior studies. For our purposes, we develop three criteria regarding fund *governance*, *accountability*, and *investment* policies - similar, though not identical to, criteria proposed by the OECD and the World Bank. It is interesting that these criteria all ignore or downplay the structure of liabilities that is implicitly or explicitly associated with these funds, in other words overlooking the intertemporal dimensions of the funds even when the rationale for these funds is to enhance welfare for future generations. We have also related variables indicative of the GAI outcomes to examine sovereign wealth fund management practices. Here we find that some key public fund characteristics are associated with interesting country-specific features. In particular, *Voice and Accountability*, encompassing participation in government processes and freedom of expression,

is the strongest institutional explanatory variable. The current *aged dependency ratio* is also important, but not the future ratios. National characteristics that matter revolve around political mores (voice) and business sophistication, but not variables such as regulatory impact or rule of law. Our multivariate analysis is in line with those of corporate and pension finance literature regarding the effects of country-specific characters on private and pension funds' governance and performance.

More research is surely needed on the question of what constitutes good public investment pool management, and what performance indicators should be developed to link measurable outcomes to the fund's objective. In the case of public pensions, intertemporal and intergenerational objectives, along with the profile of old-age liabilities, should be a key driver of investment policy. Presumably this would also be the case for SWFs that are not simply reserve stabilization funds. Nonetheless, existing checklists and scoreboards have overlooked this aspect completely. And without performance objectives in the case of publicly managed funds, performance metrics are difficult to articulate and measure.

Implications for an Aging World

Policymakers charged with managing public investment pools are receiving increasing global scrutiny, and in years to come they will surely be further reviewed and analyzed in terms of whether they are achieving their objectives. This would be consistent with the global trend among nations with large foreign exchange reserves to create sovereign wealth funds to facilitate higher return through asset diversification and a long term investment horizon. To illustrate the issues, we turn to the case of Japan with one of the largest publicly invested asset pools in the world, and the most rapidly aging population. Japan's stabilization or foreign reserve fund is

currently valued at over USD1 trillion, or more than 20% of Japanese GDP; this is enormous compared to other large economies which tend to hold only 1% of GDP in currency reserves. Accordingly, a move towards diversification has some appeal, especially in the face of the recent history of exchange rate risk.

An alternative possibility for Japan might be to make use of an already-established fund management vehicle, namely the Government Pension Investment Fund. Given population aging and a profile of unfunded social security liabilities driven by past promises, transferring assets from the currency stabilization fund into the GPIF could be more beneficial than establishing a entirely new SWF. There are at least three reasons why. First, the GPIF has an explicit profile of future liabilities, which may well impose greater discipline on fund managers than might be true with a sovereign wealth fund not linked to explicit liabilities. Second, the GPIF is already in existence, so start-up costs would not need to be re-incurred. Third, estimated retirement system liabilities exceed the reserve fund by a least three times, so additional funding would make sense.[20]

Since the GPIF is so seriously underfunded, it is natural to ask what would happen if the current Japanese currency stabilization fund were to be transferred to the national retirement system. Our simulations follow those of the Actuarial Affairs Division (2005), and they assume that JPY 90 trillion is potentially available to be transferred to the National Pension (KN) and Employees' Pension (KNH) systems.[21] We then compare four scenarios including a no-transfer option, a lump-sum transfer option, and the gradual transfer of funds over 5 and 10 year periods, respectively. As per government projections, we assume that the GPIF annual investment return

[20] This refers to the Employees' Pension (KNH) system liabilities; underfunding is far greater if the Basic Pension (KN) imbalances were to be taken into account (Takayama 2006).
[21] The simulation exercise assumes that JPY 80 trillion will be transferred to the KNH and 10 trillion JPY to KN, which is proportionate to the Actuarial Affairs Division (2005)'s projections of assets projected by each fund in 2008.

is 3.2% and evaluate the different scenarios according to the reserve ratio, which is the ratio of the value of assets at the end of any given year to the value of payout at the same year.[22] Table 9 shows that in the no-transfer case, reserve ratios plummet due to the rapidly aging population which in turn hampers the retirement system's ability to meet future obligations. Transferring the funds gradually mitigates decreases in reserve ratios and enhances the funds' long-term stability. Not surprisingly, a lump-sum transfer approach delivers the highest reserve ratio due to effects of compound interest.[23]

Table 9 here

It might be anticipated that this confluence of factors would suggest a clear benefit from careful identification of best practice regarding policies and structures most suited to ensure that fund investment policies are in line with liability streams generated by the national pension system. Such a strategy could be appealing in Japan and sister nations if ways can be found to extract greater investment performance from publicly-run asset pools. Asset diversification in publicly-managed asset pools cannot cure the fundamental fact that these pension funds will eventually be drawn down and exhausted, and we acknowledge that investing in higher expected-return assets can also lead to losses. But the funds that already exist can arguably be better managed with an explicit risk budget that can guide managers to select investment policies which better meet public financing objectives.

[22] Details appear in Appendix IV.

[23] This simple model does not consider general equilibrium effects of transferring such a large amount of assets from one fund to another, and we assume that the pension systems can earn slightly higher returns (1% pa) on the assets. While higher returns will bring with them additional risk, this approach warrants further research since the status quo approach will guarantee fund exhaustion.

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Table 1. List of Currency Stabilization Funds by Nationality and Size

Country	Assets (2007) US$M	Size as % of GDP
Algeria	83,000	72.3
Australia	67,166	8.7
Brazil	155,617	14.6
China	1,334,590	50.0
Hong Kong	136,267	71.8
India	220,223	24.3
Indonesia	49,406	13.6
Japan	907,346	20.9
Korea	250,667	28.2
Libya	64,000	127.2
Malaysia	91,240	61.3
Mexico	78,172	9.3
Norway	56,658	18.2
Poland	52,286	15.4
Russia	407,495	41.3
Singapore	144,056	109.0
Taiwan	266,287	73.1
Thailand	69,000	33.5
Turkey	67,000	16.6
UK	42,000	1.8
US	55,086	0.4

Sources: Merrill Lynch (2007), Truman (2007a), and World Bank (2008).

Table 2. Sovereign Wealth Funds by Name, Year of Inception, Source, Stated Objective, and Size

Country	Fund Name	Year of Inception	Sources	Objectives	Assets (US$M)	Assets (% of GDP)
UAE	Abu Dhabi Investment Authority and Abu Dhabi Investment Council	1976 and 2006	Oil revenues	Savings	875,000	674.6
Norway	Government Pension Fund - Global	1990	Oil revenues	Savings & stabilization	322,000	103.6
Singapore	Government of Singapore Investment Corporation	1981	Trade surpluses	Savings	330,000	249.7
Singapore	Temasek Holding	1974	Fiscal surpluses	Savings	100,000	75.7
Kuwait	General Reserve Fund and Future Generations Fund	1953 and 1976	Oil revenues	Savings & stabilization	250,000	309.5
China	State Foreign Exchange Investment Corporation	2007	Trade surpluses	Savings	200,000	7.5
China	Central Hujin Investment Corporation	2003	Trade surpluses	Savings	100,000	3.7
Russia	Stabilization Fund of the Russian Federation	2003	Oil revenues	Stabilization	127,000	12.9
Russia	Future Generation Fund of the Russian Federation	2008	Oil revenues	Savings	32,000	3.2
Australia	Future Fund	2004	Fiscal surpluses	Savings	50,000	6.5
U.S.	Alaska Permanent Reserve Fund Co.	1976	Oil revenues	Savings	40,000	0.3
U.S.	New Mexico State Investment Office Trust Funds	1958	Royalties on State lands	Savings	15,000	0.1
U.S.	Permanent Wyoming Mineral Trust Fund	1974	Mineral revenues	Savings	3,200	0.0
Brunei	Brunei Investment Authority General Reserve Fund	1983	Oil revenues	Savings	35,000	546.9
Ireland	National Pension Reserve Fund	2001	Fiscal surpluses	Savings	29,000	13.0
New Zealand	Superannuation Fund	2001	Fiscal surpluses	Savings	10,000	9.6

Sources: Das (2007), Kern (2007), Truman (2007), Watson Wyatt Worldwide (2006; 2007), Ireland National Pension Reserve (2006), and World Bank (2008).

Table 3. Reported Asset Allocation and Return for Four Sovereign Wealth Funds

Fund Name	Country	Reported Asset Allocation (%)					Return (%)
		Domestic Fixed Income	*Domestic Equities*	*Foreign Fixed Income*	*Foreign Equities*	*Other Investments*	
Government Pension Fund - Global (GPF-G)	Norway	0	0	59.4	40.6	0	7.9
New Zealand Superannuation Fund (NZSF)	New Zealand	17.3	7.3	0	52.6	22.8	14.6
National Pension Reserve Fund (NPRF)	Ireland	0	0	12.6	76	11.4	12.4
Future Fund	Australia	74	3.5	0	3.9	18.6	7.39

Sources: Australia Future Fund (2008), Norges Bank Investment Management (2006), New Zealand Superannuation Fund (2008), and Ireland National Pension Reserve Fund Commission (2006).

Notes:

1. In Norway, the GPF-G invests only in global markets. The other wealth fund of the Norwegian government GPF-Norway invests only in local markets. The table reports the nominal return from the whole portfolio in 2006. The portfolio real return (adjusted for inflation) in 2006 was 5.65%. Nominal returns from equities and fixed income instruments in 2006 were 17.04% and 1.93% respectively. The annualized nominal return from the portfolio between 1997 and 2006 was 6.49%. The actual asset allocation refers to the situation at the end of 2006.
2. In New Zealand, the NZSF annual reports do not separately report the portfolio share of domestic and foreign fixed income securities, and hence, the portfolio share of domestic bonds (both in benchmark and actual assert allocation cases) includes the portfolio share of the foreign bonds. The remainder of the NZSF portfolio is held in other asset classes such as local and global property, commodities, and private markets. The table reports the nominal return (adjusted for fees but not for inflation) between June 2006 and June 2007. The annualized nominal return from the whole portfolio was 14.81% between 2003 and 2007. The actual asset allocation refers to end June 2006.
3. In Ireland, the NPRF does not hold Irish government bonds. The portfolio is heavy in alternative asset classes such as property and commodity investments. Foreign bonds consist of only Eurozone bonds and Eurozone equities (including Irish equities); the latter total about 45% of the portfolio. Since Ireland is a member of the European Union, one might consider Eurozone bonds and equities as domestic for Ireland. The table presents the 2006 nominal rate of return; annualized it was 6.5%. The asset allocation refers to end 2006.
4. Australia's Future Fund investment program started in June 2007; the benchmark portfolio has not yet been declared and to date the majority of the portfolio has been kept in cash (the table reports the portfolio share of the cash in the cell of domestic fixed income securities) and Telstra shares (this is an Australian telecommunication company). The portfolio share of Telstra Corporation, which is 18.6%, is not reported in the table. The nominal return from the portfolio from June 2006 to June 2007 is reported in the table. The real return (the nominal return after the price inflation adjustment) is 5.29 in the same period. Actual asset allocation is as of June 2007.

Table 4. Publicly-Managed Pension Asset Pools by Size

Rank	**Fund Name**	**Country**	**Inception year**	**Total Assets (US$M' 2006)**	**Assets as % of GDP**
1	Social Security Trust Fund	U.S.	1940	2,048,112	15.5
2	Government Pension Investment	Japan	2001	935,569	21.6
3	National Pension Fund	Korea	1988	190,842	21.5
4	GEPF	South Africa	n.d.	177,559	69.6
5	Postal Savings Fund	Taiwan	n.d.	128,194	18.8
6	National Pension Funds (AP1, AP2, AP3, AP4, AP6)	Sweden	2000	117,468	30.5
7	National Social Security Fund and Social Insurance Funds	China	2001/1951	104,350	3.9
8	Canada Pension Plan	Canada	1997	86,392	6.9
9	Employees Provident Fund	Malaysia	1991	82,256	55.2
10	Central Provident Fund	Singapore	1955	70,468	53.3
11	Fondo de Reserva de la Seguridad Social	Spain	1997	44,875	3.7
12	Public Institute/Social Security	Kuwait	1977	40,482	50.1
13	Fond de Reserve des Retraites	France	2000	39,140	1.8
14	Employees Provident Fund	India	1952	31,581	3.5
15	The State Pension Fund	Finland	1990	12,929	6.2
16	Social Security Fund	Thailand	1990	9,074	4.4
17	General Organisation for Social Insurance	Saudi Arabia	1973	8,622	2.8
18	Social Security Financial Stabilization Fund	Portugal	1989	8,330	4.3
19	IMSS Reserve	Mexico	n.d.	7,392	0.9
20	Social Security Corporation	Jordan	1980	6,023	42.5
21	Employees' Old-Age Benefits	Pakistan	1976	1,822	1.4
22	Demographic Reserve Fund	Poland	n.d.	1,760	0.5
23	Social Security Fund	Denmark	1964	659	0.2

Sources: OECD (2007), Canada Pension Plan Board (2008), Watson Wyatt Worldwide (2006), World Bank (2008), India Employees' Provident Fund Organisation (2008), Singapore Central Provident Fund (2008), Malaysia Employees' Provident Fund (2008), and Kuwait International Social Security Review (1998).

Note: n.d. = no date

Table 5. Reported Asset Allocation and Return for Four Publicly-Managed Pension Funds

Fund Name	Country	Asset Allocation in the Actual Portfolio (%)					Return (%)
		Domestic Fixed Income	*Domestic Equities*	*Foreign Fixed Income*	*Foreign Equities*	*Other Investments*	
Canada Pension Plan Investment Board (CPPIB)	Canada	24.6	25.2	0	40	0	12.9
First National Pension Fund (AP1)	Sweden	10.6	13	21	44.4	11	9.8
National Pension Fund (NPF)	Korea	79.3	12.1	7.3	0.4	0.9	5.39
Government Pension Investment Fund (GPIF)	Japan	48.4	26.3	10.4	14.9	0	14.3

Sources: Canada Pension Plan Investment Board (2008); Sweden First AP Fund (2008); Korea National Pension Fund (2008); Japan Government Pension Investment Fund (2008).

Notes:

1. For Canada, the table shows the nominal rate of return at the end of fiscal 2007. The annualized nominal rate of return between 2004 and 2007 was 13.6%. The actual asset allocation refers to the situation in 2007.
2. For Sweden, the table shows nominal returns in 2006. The annualized nominal return between 2001 and 2006 was 5.3%. The actual asset allocation refers to 2006. The asset holdings of the other AP funds (AP2, AP3, and AP4) are pretty much same as those of AP1. Fund AP6 is very small and invests only small and medium Swedish companies; it is excluded from the table.
3. For Korea, the benchmark portfolio was not available; the table shows nominal returns in 2005. The annualized nominal return between 2003 and 2005 was 7.27. The actual asset allocation refers to 2005.
4. For Japan, the table indicates nominal returns in 2005. The annualized nominal return between 2001 and 2005 was 4.1. Actual asset allocation refers to 2007.

Table 6. International Guidelines for Public Pension Fund Management

World Bank Checklist	***OECD Checklist***
GOVERNANCE	**GOVERNANCE**
Are the roles of the respective parties in the public pension scheme clear? Are the terms under which the managing agency and its governing members appointed and terminated well understood? Are there adequate fit and proper person protections to prevent the agency from being deliberately manipulated by the government or the Board of the agency? Is the management agency open and transparent about its governance structures? Is the scheme open to periodic review; do the government and/or the managing agency welcome constructive criticism? How well does the agency's internal and/or external governance systems compare with those imposed by the regulator of private pensions?	Identification of responsibilities; Governing body; Expert advice; Custodian; Suitability; Redress; Self-investment.
ACCOUNTABILITY	**ACCOUNTABILITY**
Does the public have access to adequate information about the governance structures of the public pensions scheme and its managing agency, either through explicit laws, annual reports, publications and/or web sites? Is disclosure of potential conflicts of interest of Board members required and imposed? Is the scheme subject to regular independent audit for both governance and performance? Are the financial performance and financial state of the scheme revealed publicly on a regular basis based on sound accounting standards? Is the scheme's financial performance reported against established benchmarks? Is the government open about its liabilities under the scheme and subject to independent actuarial reviews? Are the incentive structures within the scheme transparent to the public, linked to delegated responsibilities and risk based?	Auditor; Actuary; Accountability; Internal controls; Reporting; Disclosure; Rigorous process for investment; Publicly available investment policy; Identification of investors; Procedures for investment policy review; Transparent and market based valuation and accounting.
INVESTMENT	**INVESTMENT**
Is the investment policy fully documented and publicly available? Is the stated purpose of the scheme to benefit the members of the scheme and, if not, are there potential conflicts between stated objectives? Does the policy permit lending to government and/or members and, if so, are there transparent guidelines identifying the issues involved and governing how such investments will take place? Is the target rate of return based on a long-term funding ratio objective and is it consistent with this objective? Does the investment policy identify how it will deal with actual or potential market dominance? Have all major risks been identified and taken into consideration in forming the investment policy? Has the tolerable level of risk been defined by the Board. Are the processes involved in delegating the implementation of the investment policy to managers clearly defined? Are benchmark criteria for hiring and firing managers clear and the information needed by the Board to act on them available? Are the investment parameters defined in terms of restrictions and prohibitions or in terms of modern portfolio concepts?	Retirement income objective and prudential principles; Prudent person standard; Fiduciary duty; Clear investment objectives (liabilities); Strategic asset allocation; Risk management; Investment options; Portfolio limits; International investment; Regular assessment of limits and controls.
Source: Carmichael and Palacios (2003).	**Source:** OECD (2005).

Table 7. Variable Definitions and Sources for Empirical Analysis of Public Fund Management Practices

Variable	Definition	Mean	Standard Deviation	Data source
Total	Sum of the scores obtained in Governance, Accountability, and Investment subcategories. (Min=0, Max=24)	11.34	6.47	Truman et al. (2007b)
Governance	Measures how well a SWF is governed; represents a reordering of Truman scores. (Min = 0, Max=4).	1.98	1.02	Truman et al. (2007b)
Accountability	Measures degree of accountability; represents a reordering Truman scores.(Min=0 , Max=15).	6.92	4.34	Truman et al. (2007b)
Investment	Measures how well the SWF investment activities are structured; represents a reordering of Truman scores. (Min=0, Max=5).	2.44	1.66	Truman et al. (2007b)
Log Asset	Log of assets held by the sovereign wealth fund.	3.13	1.75	Truman et al. (2007b)
Current old-age dependency ratio	Ratio of population age 65+ to population age 15-64 (in 2005).	10.74	6.22	UN Population Division (2008)
Future old-age dependency ratio in 2040.	Ratio of population age 65+ to population age 15-64 (in 2040).	28.35	13.21	UN Population Division (2008)
Modified World Bank Governance Index (MWBGI)	Measure of good national governance practices built by Kauffman et al. (2007) with indicators including voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, and control of corruption. We use principal components analysis to recreate a data-weighted aggregate score of national governance practices. (Min= -3.55, Max=3.38).	0.00	2.26	Kaufmann et al. (2007) and authors' calculations.
Modified Global Competitiveness Index (MGCI)	Measure of economic competitiveness derived by Martin et al. (2007) who build an index of national competitiveness by summing indicators of measures of the quality of institutions, infrastructure, macroeconomy, higher education/ training, goods market efficiency, financial market sophistication, technological readiness, market size, business sophistication, and innovation. We use principal components analysis to recreate a data-weighted aggregate measure of competitiveness. (Min = -6.19 a, Max=4.59).	0.00	2.95	Sala-i-Martin et al. (2007) & authors' calculations.
Business sophistication	Measure quality of a country's overall business networks and firms' operations and strategies. Higher scores demonstrate more business sophistication.	4.37	0.76	Sala-i-Martin et al. (2007).
Regulatory quality	Measures government's ability to produce and implement policies that benefit the private sector. (Min= -2.5, Max =2.5).	0.43	1.00	Kaufmann et al. (2007)
Voice and accountability	Measures citizenry's participation in selecting a government, freedom of expression, freedom of association, and free media (Min= 2.5, Max= 2.5).	0.03	0.99	Kaufmann et al. (2007).
Rule of law	Measures quality of judicial system. (Min= -2.5, Max=2.5).	0.45	1.11	Kaufmann et al. (2007).
Government effectiveness	Measures quality of public and civil services, independence of public and civil services from political pressures, quality of policy formulation and implementation, and government credibility. (Min= -2.5, Max=2.5).	0.57	1.02	Kaufmann et al. (2007).

Source: Authors' compilations.

Table 8. Empirical Estimates of GAI Models

I: Alternative Formulations for Total GAI Score Models

	(A)		*(B)*		*(C)*		*(D)*	
Log assets	-1.19	*	-0.81		-0.80		-1.72	**
Current old-age dependency ratio	0.70	**	0.46	**	0.46	**		
Future old-age dependency ratio							0.12	
MWBGI	1.81	**						
MGCI	-1.13	*						
Business sophistication			-2.01		-1.92		-3.14	
Regulatory quality			0.18					
Voice and accountability			3.21	**	3.31	**		
Rule of Law							1.91	
Government effectiveness							2.52	
R^2	*0.65*		*0.64*		*0.64*		*0.40*	

II: Breakdowns of GAI Components

	Total		*Governance*		*Accountability*		*Investment*	
Log assets	-0.81		-0.24	*	-0.63		0.06	
Current old-age dependency ratio	0.46	**	0.06		0.37	**	0.03	
Business sophistication	-2.01		-0.01		-1.83		-0.17	
Regulatory quality	0.18		0.27		0.56		-0.64	
Voice and accountability	3.21	**	0.05		1.61		1.55	**
R^2	*0.64*		*0.38*		*0.66*		*0.48*	

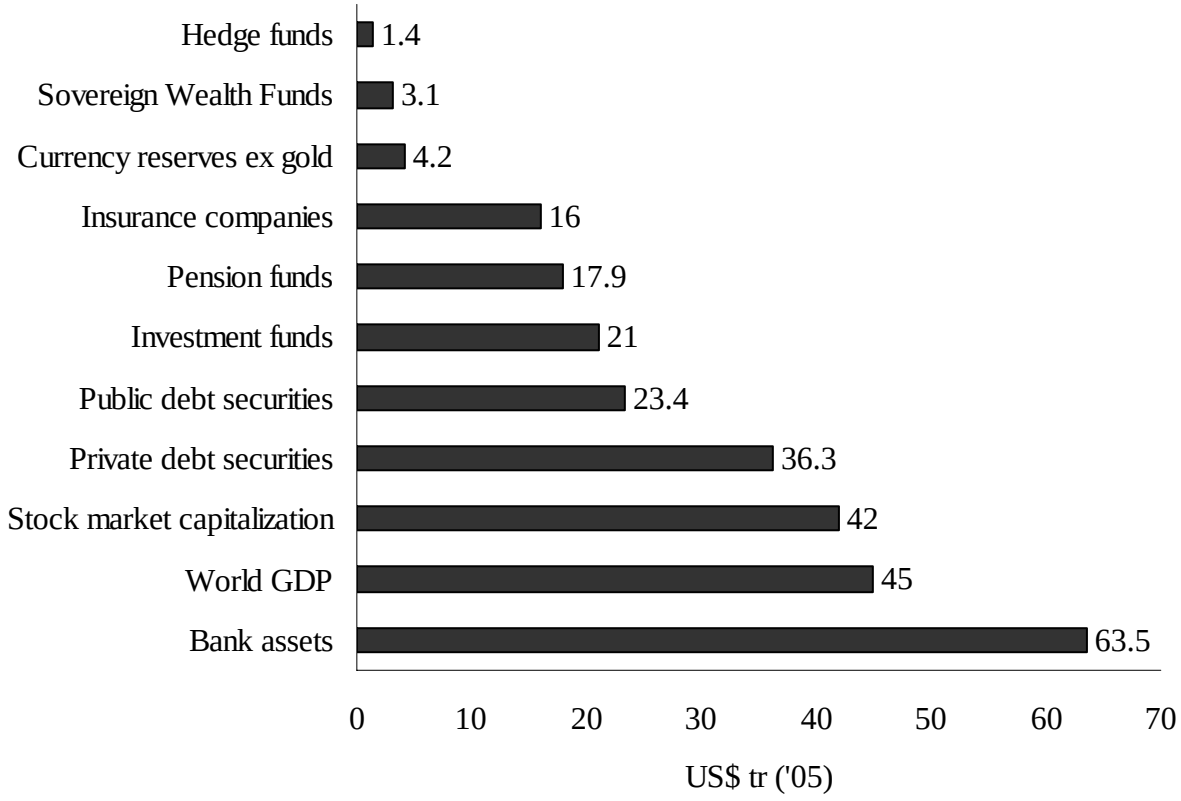
Note: * significant at 10% level; ** significant at 5% level.
Source: Authors' analysis of data described in text.

Table 9. Projections of GPIF (KNH and KN) reserve ratio evolution under alternative stabilization fund scenarios

	Reserve ratio calculation 2008-2100							
	KNH				**KN**			
Year	*No-transfer*	*10-year*	*5-year*	*Lump-sum*	*No-transfer*	*10-year*	*5-year*	*Lump-sum*
2008	4.74	4.98	5.22	7.16	2.10	2.31	2.52	4.19
2025	3.94	5.71	5.83	5.94	2.86	3.09	3.28	4.66
2050	4.37	7.00	7.18	7.33	3.10	3.42	3.67	5.48
2075	2.71	7.25	7.54	7.78	2.08	2.64	3.07	6.06
2100	*0.73*	*8.13*	*8.55*	*8.91*	*0.73*	*1.72*	*2.47*	*7.28*

Source: Authors' calculations based on Actuarial Affairs Division (2005).

Figure 1. Relative Size of Global Asset Pools



Source: Kern (2007)

Appendix I. Criteria for Scoring Sovereign Wealth Fund Management Practices

Governance

Are the guidelines for fiscal treatment generally followed without frequent adjustment? *(Structure)*
Is the SWF separate from the country's international reserves? *(Structure)*
Does the SWF ethical guidelines that it follows? *(Governance)*
Is the audit independent? *(Transparency and Accountability)*

Accountability

Is the SWF's objective clearly communicated? *(Structure)*
Is the source of the SWF's funding clearly specified? *(Structure)*
Is nature of the subsequent use of the principal and earnings in the fund clearly stated? *(Structure)*
Does the SWF have in place and publicly available guidelines for corporate responsibility that it follows? *(Governance)*
Does the SWF provide at least a report on its activities and results? *(Transparency and Accountability)*
Does the SWF provide quarterly report on its activities? *(Transparency and Accountability)*
Do regular reports on the investments by the SWF include the size of the fund? *(Transparency and Accountability)*
Do regular reports on the investments by the SWF include information on the return it earns? *(Transparency and Accountability)*
Do regular reports on the investments by the SWF include information on the types of investments? *(Transparency and Accountability)*
Do regular reports on the investments by the SWF include information on the geographic location of investments? *(Transparency and Accountability)*
Do regular reports on the investments by the SWF include information on the specific investments? *(Transparency and Accountability)*
Do regular reports on the investments by the SWF include information on the currency composition of investments? *(Transparency and Accountability)*
Are the holders of investment mandates identified? *(Transparency and Accountability)*
Is the SWF subjected to a regular audit? *(Transparency and Accountability)*
Is the audit published? *(Transparency and Accountability)*

Investment

Is the overall investment strategy clearly communicated? *(Structure)*
Is the procedure for the changing the structure clear? *(Structure)*
Is the role of the government in the setting the investment strategy of the SWF clearly established? *(Governance)*
Is the role of the manager in executing the investment strategy clearly established? *(Governance)*
Does the SWF indicate the nature and speed of adjustment in its portfolio? *(Behavior)*

Unclassified

Are these elements of fiscal treatment integrated with the budget? *(Structure)*

Notes: Authors' re-interpretation of Truman's (2007b) scores of structure, governance, transparency and accountability, and behavior variables grouped under our headings of governance, accountability, and transparency. The PI scoreboard question is shown in italics.

Appendix II: Governance, Accountability, and Investment (GAI) Scores

Countries	Funds	Governance	Accountability	Investment	Total
New Zealand	Superannuation Fund	4	15	4	23
Norway	Government Pension Fund - Global	3	14	5	22
Timor-Leste	Petroleum Fund	3	13.75	4	20.75
Canada	Alberta Heritage Savings Trust Fund	2.5	12	4	18.5
US	Alaska Permanent Fund	3	10.5	3.5	17
Australia	Future Fund	3	9	4	16
Azerbaijan	State Oil Fund	3	11	2	16
Chile	Economic and Social Stabilization Fund	2	9.5	3.5	15
Kazakhstan	National Oil Fund	2	8.5	3.5	14
Botswana	Pula Fund	1	8.5	4	13.5
Singapore	Temasek Holdings	2	9.5	2	13.5
Trinand &Tobago	Heritage and Stabilization Fund	3	5.75	3	11.75
Sao Tome and Principe	National Oil Account	3	4.25	4	11.25
Kuwait	Kuwait Investment Authority	3	4	4	11
Malaysia	Khazanah Nasional	2	5.5	2	9.5
Russia	Stabilization Fund	1	5.5	2	8.5
Korea	Korea Investment Corporation	1	3	4	8
Kiribati	Revenue Equalization Reserve Fund	0	3.5	3	6.5
Mexico	Oil Income Stabilization Fund	1	4.5	0.5	6
Venezuela	National Development Fund	1.5	4	0.5	6
Iran	Oil Stabilization Fund	1	3.5	1	5.5
Venezuela	Macroeconomic Stabilization fund	1	4	0.5	5.5
China	Central Huijin Investment Company	2	3	0	5
Algeria	Revenue Regulation Fund	1	2.5	1	4.5
Oman	State General Reserve Fund	2	2.5	0	4.5
Sudan	Oil Revenue Stabilization Fund	1	3	0	4
UAE	Istithmar	1	1.75	1	3.75
UAE	Mabadala	1	1	1.5	3.5
Brunei	Brunei Investment Agency	0	2	0.5	2.5
Singapore	Government of Singapore Investment Corporation	0	2.25	0	2.25
Qatar	Qatar Investment Authority	1	1	0	2
UAE	Abu Dhabi Investment Authority and Corporation	0	0	0.5	0.5
Minimum		*0*	*0*	*0*	*0*
Maximum		*4*	*15*	*5*	*24*
Average		*1.72*	*5.87*	*2.14*	*9.73*

Source: Authors' calculations drawing on Truman (2007b).

Appendix III. Correlation Matrix for Empirical Variables

	Total	1	2	3	4	5	6	7	8	9	10	11	12
Governance (1)	0.81	1.00											
Accountability (2)	0.98	0.74	1.00										
Investment (3)	0.85	0.60	0.74	1.00									
Log Asset (4)	-0.29	-0.31	-0.31	-0.12	1.00								
Current old-age dependency ratio (5)	0.63	0.43	0.64	0.51	0.12	1.00							
Future old-age dependency ratio (6)	0.20	0.13	0.19	0.20	0.30	0.69	1.00						
MWBGI (7)	0.39	0.29	0.35	0.41	0.32	0.43	0.47	1.00					
MGCI (8)	0.22	0.18	0.18	0.29	0.47	0.54	0.70	0.83	1.00				
Business sophistication (9)	0.13	0.16	0.07	0.22	0.43	0.42	0.66	0.75	0.96	1.00			
Regulatory quality (10)	0.28	0.30	0.27	0.22	0.28	0.36	0.37	0.92	0.74	0.67	1.00		
Voice and accountability (11)	0.66	0.45	0.62	0.70	-0.05	0.60	0.43	0.80	0.61	0.53	0.64	1.00	
Rule of law (12)	0.33	0.27	0.28	0.39	0.39	0.39	0.49	0.98	0.88	0.81	0.86	0.74	1.00
Government effectiveness (13)	0.39	0.30	0.39	0.32	0.34	0.47	0.45	0.96	0.80	0.70	0.94	0.74	0.92

Source: Authors' calculations.

Appendix IV: Overview of Simulation Analysis for Japanese GPIF Forecasting

This analysis follows the work of Lu *et al*. (2007) in generating projections of future funding ratios for the KNH and KN funds in Japan. The interested reader is referred to that study for additional details.

KNH Simulations:
The Japanese Actuarial Affairs Division (2005) has projected the future values of contributions, subsidies, benefits, contributions to basic pension, and other expenses and documented them for 5-year intervals to 2100. We calculated intermediate values of those variables with spline interpolations. We also take the 2008 year-end balance from the same source. Projections starting from 2008 look at four different scenarios including no transfer, lump-sum transfer, and 5 and 10-year transfers under the assumption that JPY80 trillion will be transferred. The details of the computation are as follows:

- New year-end balance = Year-end balance + transfer amount
- Year-end balance = Outstanding balance in any year + year-end balance in the previous year
- Total revenue = Contributions + subsidies + investment income
- Total expenditure = Benefits + contributions to basic pension (KN) + other expenses
- Outstanding balance= Total revenue - total expenditure
- Investment income = Long-term interest rate x new year-end balance in the previous year

KN Simulations:
The only difference between KNH and KN simulations is the calculation of total expenditures. In the KN simulations, total expenditure is calculated as follows:

- Total expenditure = Benefits + other expenses