# SOVEREIGN WEALTH FUND PORTFOLIOS

**Alexander Dyck,**
University of Toronto, Rotman School of Management

**Adair Morse**[*]**,**
University of Chicago, Booth School of Business
February, 2011

ABSTRACT

Using a novel, hand-collected dataset of Sovereign Wealth Fund (SWF) investments in public equities, private equities and real estate, we establish what SWF portfolios look like. SWF risky portfolio allocations include significant investments in private equity and real estate, are very home-region biased, and are very biased toward certain industries, in particular, toward finance (owning 4.8% of world equity) and transportation, energy and telecommunication. SWFs invest actively (with control rights) in both public and private equities, but mainly in these industries in their home regions. We use these allocations to understand better the objectives that drive SWF investment decisions. We find evidence for financial portfolio investor benchmarking and for hedging of income covariance risk. We introduce and test an industrial planning hypothesis as an alternative political objective and find this also has considerable power to explain portfolio choices and for the choice of ownership concentration. Including measures for both financial and industrial planning objectives more than doubles explanatory power, allowing us to explain 14.4% of SWF portfolio variation. There is significant variation in the power of industrial planning objectives across SWFs revealing important heterogeneity in this investor class.

[*] We thank John Cochrane, Magnus Dahlquist, Paola Sapienza, and seminar participants at London Business School, Imperial College London, CEPR/Gerzensee summer institute, and University of Chicago for helpful comments. Dyck thanks INSEAD for hosting him as a visiting scholar while part of this research was completed. Morse thanks the James S. Kemper Family Foundation, CRSP, the Initiative on Global Markets and the Polsky Center for Entrepreneurship for financial support.

Sovereign Wealth Funds (SWFs) constitute an important new institutional investor class. They have existed as investors for many decades but in recent years less than two dozen funds have grown to control significant assets that by 2007 reached $2.7 to $3.2 trillion with projections suggesting continued growth in size and relative importance (GAO 2008). Their size, combined with the fact that they are sovereign entities, owned and controlled by political actors, raises questions about how their presence will impact global capital allocation. Are they best thought of as a larger version of typical institutional investors? Or are they something quite distinct, with resource allocations being driven by political objectives producing radically different allocations across industries and geographies, and different approaches to ownership and control?

A first objective in this paper is to assemble as complete a picture as possible of SWF portfolios. Existing research, discussed at greater length below, has tended to focus on SWF international holdings of publicly traded companies and on the more transparent funds. This study in addition includes SWF holdings of private companies, their domestic public and private holdings, including holdings of the less transparent Middle Eastern and Asian funds. These SWF portfolios, with a few exceptions, are not in the public domain, but we have found that individual holdings and transactions can be uncovered with sufficient manual labor. The more comprehensive holdings already paint a new picture of SWFs – with extensive non-public holdings, and active positions in certain industries in which they hold a large fraction of world capitalization.

A second objective is to use these allocations to understand better the objectives that drive SWF investment decisions. These objectives influence future allocations, and provide insight as to how SWFs will manage these investments and the likely responses to economic shocks. We introduce empirical measures that capture the different possible objectives and see what power they have to explain variation in SWF portfolios both across our sample of SWFs and over time.

Theory, SWF statements and their similarity to other institutional investors suggest an important objective will be maximization of risk-adjusted returns which puts a premium on diversification with

limited ownership concentration. To capture financial portfolio investor objectives we include as explanatory variables both world market capitalization across public and private markets, and the actual portfolios of an international sample of large pension plans that meet our selection criteria for SWFs, with the exception being that as pension plans they have clearer beneficiaries and consequently a more obvious requirement to achieve financial returns. We also quantify important sources of background risk coming from other wealth sources in the economy (e.g. energy), that may generate a demand to hedge that risk through financial portfolios.

The fact that SWFs are state-owned and controlled, have large and continuous flows of new funds, and only long-horizon expected obligations, raises the possibility that the SWFs could use their portfolios to achieve political in addition to financial objectives, with much less emphasis on diversification. In this paper we consider the importance of industrial planning objectives - using the allocation of the investment portfolio to achieve a different domestic industrial allocation. The resource wealth that supports inflows to the SWF in many countries also produces a highly focused industrial mix. Another way to manage risk is to use their current financial portfolios to attempt to influence longer-term industrial mix. Acquiring significant stakes in firms in desired industries, if managed well, could directly boost the development of domestic industries or indirectly boost development by improving information that could feed back to domestic production. Industrial planning objectives predict a direction in their portfolio allocation, although of course this could in addition just be a convenient mask for investment motivated by more mundane personal political objectives, and this could be done poorly or inefficiently.

We find that the SWF portfolios are best explained by considering *both* financial portfolio investor objectives and industrial planner objectives. In our empirical examination of portfolios we disentangle the relative importance of financial portfolio objectives and industrial policy objectives for SWFs as a class of institutional investors, and for specific SWFs revealing important hetereogeneity in this investor class. This focus on industrial planning objectives does not eliminate the possibility that SWFs could be using their financial portfolios to achieve other more troubling political goals. But in

quantifying the importance of what might be termed developmental objectives, we provide a different interpretation of deviations from financial objectives than offered by many in the media that voice concerns over unspecified political economic objectives.

More specifically, we assemble time series holdings for all of the important sovereign wealth funds from 1999-2008, including the less transparent Middle Eastern and Asian funds. We include funds with more than $10 billion in assets as of 2007, which results in 20 funds averaging $116 billion per fund with $2.03 trillion in assets under management and $1.43 trillion in risky assets under management. Our data go beyond holdings of international publicly traded firms to include firm or property-level data for public and privately held assets, complete with a time-series calculation of value.

Our main findings are the following. First, relative to either capitalization benchmarks or home-biased pension plans, there is a significant tilt towards private equities, toward domestic investments, and towards specific industries. The twenty SWFs own 2% of the global public equities, but this represents on average only half of their portfolio mix (by allocation percent). SWFs risky portfolio mix is, on average, 52% public equities, 29% private equities, and 19% real estate. The home bias leads to SWFs owning 6.4% and 4.3% of the public equity capitalizations in the Middle East and Asia respectively. The most important of fact in this first finding is probably the industry tilt. SWFs allocate 21% of the portfolios (in both private and public equity) to the finance industry; they own nearly 5% of the public equity capitalization in finance. Other than finance, the list of the industries favored by SWFs is the opposite of a tilt implied by hedging income risk. They allocate 15% to energy, 9% to transportation, and 7% to telecommunications.

Second, we find a surprising level of active ownership. SWFs invest actively (with control rights) in both public and private sectors but primarily in their home regions and in finance, transportation and telecommunications. Eighty percent of investment value in Asia and the Middle East is invested actively, where we use stakes over five percent to signify active investments. Worldwide, SWFs invest

actively in finance (70% of the value), transportation (66% of the value) and telecommunications (45% of the value).

These two findings from portfolio statistics provide a preliminary indication why it may be important to consider factors beyond risk-adjusted financial returns to explain SWF portfolios. To analyze the hypothesized tensions between financial portfolio investing versus state planning in the portfolio decisions, and to speak to how well the combination of these hypotheses do in explaining the cross-sectional variation in allocations, we estimate a portfolio choice model, following most closely Massa and Siminov (2006). The dependent variable is the SWF (risky) portfolio weight in an asset class-industry-geography (thirteen industries crossed with seven world regions and three asset classes).[1] We address within-SWF serial correlation by clustering at the SWF level and, sequentially, by using a GLS-AR1 model. We first focus on SWFs as financial portfolio investors by testing the explanatory power of two benchmarks and three hedging variables. We find that a capitalization-based benchmark does well in explaining allocations across asset classes, but a home-biased pension fund benchmark, from an international sample of 90 large pension plans, has much more power in explaining geography-industry portfolio weights in the panel. (We home bias the pension fund as if were located in the SWF country for each observation each SWF based on the amount of home bias the pension fund exhibits.)

Third, we find evidence of the importance of background risks for portfolio choice. SWFs tilt toward more risky portfolios when they have proportionally more country fixed income and a lower standard deviation of country returns to income generating assets (measured as fiscal revenues over GDP). We find no direct wealth affect tilting SWF portfolios toward risk. We also explore whether SWFs tilt their financial portfolios to reduce covariance of SWF returns with important domestic drivers of wealth. Specifically, as our covariance hedging variable we use the covariance of the industry-geography bin of equities with fiscal revenues of the country, which theoretically should be negative. We do not find

[1] We do not incorporate fixed income holdings of SWFs into our analysis, as choices on the level and type of fixed income instruments are much more likely to depend heavily on other fixed income holdings on the government balance sheet outside our analysis (e.g. central bank).

this effect when considering financial portfolio objectives alone, but we do find negative hedging when we simultaneously allows for an impact of industrial planning variables. We are among the first portfolio choice papers to identify such hedging.

Fourth, we find that SWFs are at least partially development or industrial planning funds. Incorporating measures to capture the importance and direction of planning objectives provides significant explanatory power. A completely equal, naïve weighting across all industry-geography bins would lead to 0.529 percent weight in each bin. Our main variable, an indicator for industries highlighted in national (not SWF) strategic plans, is positive and significant in every specification. Inclusion in a strategic plan implies investing 135% more in the domestic industry from the naïve equal weighting. Our other two state planning variables allow us to delve deeper into the motivations of state planning. One possibility is that SWFs act to create industries which are impeded by frictions. We find that SWFs invest more in industries that are ex ante candidates for market failure, as is captured by the extent of regulation and/or reliance on input from regulated industries using OECD data on regulatory impact. Finally, SWFs invest more in industries in which they have perceived skill, defined as the percentage of domestic investments in the industry invested with a controlling stake. A one standard deviation larger regulatory impact is associated with SWFs investing 72 % more in the domestic and 45 % more in the regional industry-asset class bins. Having one standard deviation larger perceived skill associates with 238 % more allocations to that industry in home country than predicted by the naïve equal weight.

Fifth, we find that just considering these two objectives - financial portfolio investment objectives and industrial planning objectives - explains a significant portion of SWF portfolio variation and that ignoring either dramatically reduces explanatory power. Our variables produce an r-squared of 14.4%, and of this explained variation, industrial planning measures accounts for 45%. Equally interesting perhaps is the heterogeneity across funds. We disentangle the explanatory power of financial portfolio and industrial planning variables for each fund and decompose the r-squared based on the objective (discarding the covariance). This decomposition paints an important picture and suggests caution for

some purposes of considering all funds in the SWF class similarly. For some funds (Alaska, GIC Singapore and Norway Global), measures of financial portfolio objectives capture almost all of the explained variance. In contrast, for Singapore Temasek, the Investment Corporation of Dubai, Kuwait and China as well as for most of the smaller SWFs, state planning measures account for over half of the variation.

Sixth, considering the importance of industrial planning objectives helps us to explain the decision to pursue active management and the focus of active ownership positions across industries and geographies. Ownership stakes are higher for SWFs whose portfolio allocations load more heavily on industrial planning variables. We test the hypothesis that when state industrial or developmental planning objectives are important, the goal to extract information, apply skill, and/or expand activity requires more ownership stakes. We regress the average ownership stake in an asset class-industry-region on the fraction of the variation explained by state planning objectives, in a model with industry, geography, and asset class fixed effects. A one standard deviation increase in the fraction of the portfolio choice model explained by industrial planning implies an increase in the ownership stake by approximately 12 %.

In sum, we conclude that you can understand SWFs much better by considering their choices driven both by portfolio investor objectives and by state industrial planning objectives. These results suggest that we think about SWFs and their potential impact differently and that we need to acknowledge and address the significant heterogeneity across funds. The most transparent funds like Norway that pursue relatively pure portfolio investor objectives are simply not representative of the group as a whole.

This paper is complementary to a growing literature on sovereign wealth funds. A number of papers have focused on SWF investments in international public equities (e.g. Bortolotti, Fotak, Megginson and Miracky (2009), Kotter and Lel (2008), Dewenter, Han and Malatesta (2008), and Fernandes (2009)) and have used this data to document industry and geographical focus as well as testing for potential agency costs by correlating proxies for fund governance with short and long window returns around announced SWF investments. Bernstein, Lerner and Schoar (2009) have focused on a set of

private investments by SWF, and have exploited the timing of these investments and their implied returns to test for political, developmental and agency agendas. The main finding is weakness in SWF returns and a negative correlation between fund governance and returns, concluding that the evidence is least consistent with a developmental objective. Our paper differs from these in using a larger set of investments (simultaneously consider international and domestic traded equities, private equities, investments in private equity and real estate), in exploring tilts in these broader portfolios, as well as considering and testing for the empirical importance of economic objectives that predict tilt in portfolios. This provides more nuanced conclusions about SWFs that capture some of the important heterogeneity across these funds. In focusing on portfolios, our paper is closer to Chhaochharia and Laeven (2008), with important distinctions being that we are looking at their full portfolio rather than restricting attention to their international holdings of public equities, our investigation of a much larger (and different set) of SWFs and our consideration of a wide range of economic motivations for explaining portfolio choices.

The rest of the paper is organized as follows. Section I describes the data for constructing the SWF portfolios and summarizes the overall portfolio values. Section II presents the portfolio tabulation results relative to two benchmarks. Section III reports the main empirical tests of the financial investor and state planner hypotheses as well as the heterogeneity and ownership results. We discuss implications of these results in section IV and conclude in section V.

## I. Data

### *I.1. SWF Sample*

A number of state-owned entities are active in global financial markets. Central banks tasked with stabilization usually accumulate and invest foreign exchange reserves in international fixed income. State-owned operating companies often use their profits to extend operations worldwide through acquisitions. State-owned pension funds accumulate savings from individuals and invest, generally conservatively, to ensure sufficient liquidity to cover pensioner liabilities. SWFs belong to none of these

categories; they are instead a state-owned investment company, claiming a long time horizon and consequently the ability to invest in a wide range of asset classes.

To capture these distinctions in our data collection we restrict our attention to those SWFs that satisfy a commonly used definition in the literature (the Monitor Group definition of a sovereign wealth fund, included as appendix A). Because some countries mix stabilization and non-stabilization goals under one SWF entity, we restrict our attention to the risky portfolios that we define to exclude fixed income.[2]Finally, we restrict our attention to funds with significant investments, which we classify as having at least $10 billion in assets under management in public reports as of end of year 2007. These requirements lead us to focus on 20 funds that we identify in Table 1.[3] This list of funds accounts for almost all of the money in SWFs; namely, $2.33 trillion in end-of-year 2008 wealth according to Preqin (2009), even including the losses of that year. Our sample for this paper covers 1999-2008.

Funds in our sample are the largest, most important and widely recognized SWFs. These include old funds, such as the Kuwait Investment Authority, that had its origins back in 1953, as well as recently formed funds such as the China Investment Corporation, founded in 2007. These funds differ not only in age, but also in the primary source of wealth. Many funds, particularly in the Middle East, and the few western funds from Norway and Alaska, rely on wealth arising from natural resource extraction. Others, particularly in Asia such as Singapore's Temasek and GIC, use foreign currency reserves from trade surpluses as well as the transfer of wealth with legacy state-owned companies as the basis for their funds savings,. Finally, we do not employ any filter based on ex ante transparency, which across funds is low.[4] A few funds (e.g., Norway and Alaska) do disclose their holdings, but these are the exception rather than

[2]Such a filter, for example, leads us not to examine a Chilean fund sometimes described as a SWF that has all of its portfolio in highly liquid fixed income securities.

[3] Abu Dhabi Investment Authority (ADIA), Abu Dhabi Investment Council (ADIC), Alaska Permanent Reserve Fund, Bahrain Mumtalakat Fund, China Investment Corporation (CIC), Dubai Holdings, Dubai World, Government of Singapore Investment Corporation (GIC), International Petroleum Investment Corporation of Abu Dhabi (IPIC), Investment Corporation of Dubai, Kuwait Investment Authority (KIA), Khazanah Nasional of Malaysia, Libya Investment Authority (LIA), Mubadala Development of Abu Dhabi, Norway Government Pension Fund- Local, Norway Government Pension Fund - Global, Qatar Investment Authority (QIA), and Temasek Holdings of Singapore.

[4] Two of the more commonly used measures of transparency are the Linaburg Maduaell transparency scores, available at swfinstitute.com and the Truman governance scores (Truman, 2007, 2008).

the rule. Even among some high transparency funds (e.g., Singapore's Temasek), transparency does not imply a disclosure of the fund's portfolio.

To put together portfolios, we start at the most direct source, the SWF itself. Like other private investors, SWFs are not required to disclose their portfolios. Some disclose their target asset allocations in percentages, and they all must disclose large stake holdings in public equity as required by regulatory agencies. They often do disclose ownership in select domestic private endeavors (such as building projects) and previously state-owned entities like utilities or transport. Even when a SWF reveals holding equity in a company, the stake held is often not given, and almost always the SWF does not provide a valuation of their private equity investments.

The holdings that are not disclosed are not transparent or easily accessible, but we found that a great number of them are not totally under the radar of public knowledge. The data challenge we undertake is to uncover the existence of a holding, often from range of agencies that specialize in gathering business information regionally. With this information we then do a case study on each company via international news sources to fill-in missing ownership stakes and transaction histories, dynamically valuing all public companies, private companies, properties, and private equity fund investments, and then doing broad sweeping searches to make sure we did not miss anything. In doing so we are very careful to identify all subsidiaries of the SWF, as often the investments are in the name of a subsidiary rather than the corporate parent.

For domestic and regional public equity holdings we use local sources such as *The Business Times of Singapore* and *AME* and *Zawya* (both Middle Eastern business sources). These sources provide much more comprehensive information on activities and holdings than is available if one restricts attention to standard international sources like Capital IQ or Thomson One Banker. Second, we spend as much attention on gathering enough information to identify, value and determine the ownership stake in private investments as for investments in public equities. Finally, as the 2008-2009 challenges facing Dubai suggest, real estate holdings can be significant across SWFs, and we use a variety of approaches to

value the investments in active as well as properties under development. Because the reconstruction of the portfolios has been a lengthy process, we relegate details of these efforts to the appendix.

### *I.2. SWF Portfolio Statistics*

Table 1 summarizes the results of this data collection effort for 2008[5], showing that we have identified investments accounting for 2.04 trillion, just 13 percent less than the public estimates of 2.33 trillion (columns 1-2). Our calculated total is based on more than 26,000 unique companies and even more transactions (we have multiple transactions for many companies) in public equities, private equities and real estate. While we have undoubtedly missed some investments where there is very little publicly available information as to the extent and nature of investments such as hedge fund investments, these data are to our understanding the most comprehensive micro based accounting of SWF investments available to date.

In columns 3-7 of Table 1 we break down our 2.04 trillion estimate along four dimensions. Column 3 reports the value in the risky portfolio in public equities, private equities and real estate for which we know the *individual* investments or know enough to identify industry and geography for these investments. Column 4 is other public equity investments which we know to be indexed; we infer the industry and geography of these investments by utilizing decompositions of global and local market indexes. In column 5 we identify the number of individual companies, private equity funds and properties used in arriving at these totals for risky investments, with a much greater number naturally coming from Alaska and Norway as these funds provide specific holding of even very small stakes. For many of these companies we have multiple transactions, as over time the company has increased or decreased its stakes.

In column 5 we report our estimate of fixed income holdings and in column 6 hedge funds/other alternatives holdings (not including real estate and private equity) respectively. To produce these last two columns we use either the exact amounts in these classes provided for those funds which produce such

[5] We have all years from 1998-2008; the choice of presenting 2008 figures in Table 1 is just for clarity of exposition.

detail or can be inferred from public statements (e.g. Alaska, Norway, CIC, Libya), and when this is not available we take the value of the risky assets which we have identified and apply the percentage in such categories given by the SWF as to how much fall in fixed income and other alternatives asset classes. As mentioned above, because fixed income holdings may be used for stabilization purposes, or are close substitutes for other government funds in central banks that are used for such purposes; we do not consider them in the analysis of risky portfolios to which we now turn our attention.

### *I.3. Defining Benchmarks*

The stated objectives of many, if not most, of the SWFs is to maximize risk-adjusted returns.[6] This is also the view of the objectives of SWFs according to many in the financial community.[7] To capture portfolio investor objectives, we use two benchmarks.

The first benchmark we employ is the proportion of world capitalized value in the asset class, geography and industry. For equities we use the world market capitalization from all traded companies in Datastream broken down by industry and country and do this for each year in our dataset. For real estate, we take advantage of an investment advisor method that calculates investable real estate as a function of GDP (Prudential Real Estate Investors, 2010).[8]

The calculation of the capitalized value of investable world private equity is more challenging. We use data from Orbis on private companies in Europe and then extrapolate findings from here for other

[6] The Norwegian Government Pension Fund, for example, states "The Fund shall be safely managed based on the objective of high return subject to moderate risk." And the Alaska Permanent Fund's goal is to achieve a "five percent real (above inflation) rate of return in accordance with the Prudent Expert Rule."[6] Similar language is employed by less transparent funds. The Abu Dhabi Investment Authority, for example states "ADIA's decisions are based solely on its economic objectives of delivering sustained long-term financial returns." The China Investment Corporation states in its annual report that "Our mission is to make long-term investments that maximize risk-adjusted financial returns for the benefit of the State, our shareholder." [6]

[7] For example, "At the end of the day, sovereign wealth funds are just institutional investors that look to make returns for their shareholders," Hani Kablawi, Bank of New York Mellon Corp, Dec 7, 2009

[8] Prudential real estate investors calculates the value of the commercial real estate market as: Value of Real Estate = 45% x GDP x (GDH/Threshold GDH)^1/3, where GDH is per capita GDP and threshold GDP is, for countries with less than the threshold GDP, defined as $20,000 in 2000, adjusted for inflation to be $24,921 in 2009. In 2009, Prudential applied ad hoc adjustments to Singapore, Hong Kong, and the United Kingdom, as well as to the Gulf States. Without a series of adjustments from Prudential, we phased out the Gulf States adjustment prior back to 2006 and kept the other adjustment throughout our sample.

geographies.[9] Orbis provides data for an extensive set of private companies across eastern and western Europe, much of it drawing on disclosure requirements from European tax authorities.[10] This source consistently reports company revenues, and we combine this with a private firm revenue multiple of 0.7073 calculated in Moskowitz and Vissing-Jorgensen (2002) to produce valuations that we then aggregate to fourteen industries. This suggests the capitalization of private companies is 2.5 times public equities. For non-European countries aside from the US, we take this ratio of private equity-to-public equity capitalization found in Europe (specific for each of the fourteen industries) and apply this to each country's public market capitalization by industry. For the United States, we use Moskowitz and Vissing-Jorgensen (2005) calculated ratio of private-to-public equity capitalization of 0.79 public equities, consistent with the higher fraction of assets in public markets in the US.

As a second benchmark, we use the allocation of large pension plans that meet similar criteria as our SWFs – they have $10 billion in assets in 2007 and invest across a range of asset classes.[11] This data is drawn from CEM benchmarking, a Toronto based consultancy that collects information on allocations, costs and returns for a large sample of international pension plans from 1990-2008. The CEM dataset, used in a number of recent papers (French (2009), Dyck and Pomorski (2010) and Bauer and Frehen (2008)), has data on pension fund and related holdings for 842 funds over the period 1992-2008. In 2008, the database covers assets of about US$6 trillion, and represents approximately 40% of US defined benefit assets, 65% of Canadian defined benefit assets, $1.6 trillion in European assets, as well as 11 Australian/New Zealand plans .. Requiring that funds have over $10 billion in assets in 2007 restricts our attention to 90 pension funds that meet this criterion in 2007.

[9] Orbis is a Bureu Van Dijk database that includes all companies in AMADEUS.
[10] We limit our search to active, private companies with more than 1,000,000 USD in revenues in their last reporting year. We use hand and computer searches to avoid duplicate companies and companies that are not investable (e.g. the Post Office which is 100 percent state-owned).
[11] Dyck and Pomorski (2010) show that larger funds are more likely to have higher allocations to alternatives, even controlling for liquidity risk. We can empirically control for potential differences in investment horizon by including a variable for the percentage of liabilities associated with retirees, which is a reasonable proxy for the time horizon of the fund.

We use CEM data to construct the pension fund benchmark portfolio. CEM provides the asset class percentage breakdowns directly for each pension fund. Within public equities and real estate, CEM has information on the geographic breakdown of assets to the United States, EAFE (Europe, Australia and Far East) and emerging markets. Within these geographies, most funds indicate that they benchmark to the MSCI index for that region. We infer their effective holdings of individual companies (and thus countries and industries) using IShares portfolios as a measure of MSCI indexes, which are designed to track the MSCI indexes with minimal tracking error.

An important facet of pension investing is a home bias in investments, which we agnostically take as a feature of the pension allocations. CEM provides more detail on geography for Canadian pension funds, which we use to construct a time series of pension home bias (as a percentage of the portfolio). We want to have this home bias in our pension plan benchmark. To accomplish this in our tests we first de-home bias each of the 90 pension fund portfolios by reducing the exposure to the pension fund home country in proportion to Canadian home bias percentage and then, for each SWF, we home bias the allocations to the home country of each SWF, making a benchmark pension allocation as if the pension fund resided in, e.g., Singapore, the Emirates or Kuwait.

The final step in assembling the benchmarks is to allocate geography and industry breakdowns for private equity. As a measure of the industry and geographic mix of private equity investment, we use data from Capital IQ. Finally, we impose the home bias in private equity fund investing implied by the Canadian pension funds.

## II. Portfolio Tabulations Results

### *II.1 Comparisons of Portfolio Weights: SWF and Financial Investor Benchmarks*

Our first set of findings emerges from the summary statistics in Tables 2 and 3, namely that SWF portfolios are dispersed across risky asset classes, very home biased, and with a specific industry tilt. Table 2 panels A and B presents the risky portfolio weights of SWFs and the benchmarks, respectively,

and shows these weights by geographic region. The SWF weights are an equal weighted average across the 20 SWFs of a time-series average within the SWFs.[12]

We begin by observing that the combined private equities and real estate holdings account for almost half the portfolio (48%). The extent of the investments in non-public equities makes them quite distinct from their large pension plan investor peers, who have only 5 percent in private equities and 10 percent in real estate and other real assets. The risky asset class allocations of SWFs look much more in line with those of the capitalization benchmark, a point that will show in the estimations.

SWFs have a specific geography tilt. Compared to the capitalization (pension plan) benchmark, SWFs invest 9.5 percent (19.6) more of their overall portfolio in Asia and 34.9 (35.9) percent more in the Middle East. Also important in Table 2 is the fact that SWFs invest almost all of their European and North American investments through public equity.[13] Said another way, the local regional focus is much stronger in private equity and real estate, asset classes which investors are more like to hold with active or controlling interests. That the home bias is stronger in non-liquid asset classes is at least consistent with or suggestive of state planning. Also, note that investments in Europe, the Pacific and North America are more likely to be made through the more transparent public equity markets..[14]

Table 3 repeats the cross-tabulation exercise for industries. In their financial portfolios SWFs overweight energy, with an allocation that exceeds pension plan allocations by 6.4 percent and that exceeds the capitalization benchmark by 11.4 percent. A similar pattern of industry overweighting occurs in transportation (7.1 and 6.0 percent higher than the pension and capitalization benchmarks respectively). Both of these results are surprising given that the countries that are home to SWFs are often heavily weighted in these industries in their domestic production and are the polar opposite of what would be

[12] Because our analysis is in portfolio weights, all statistics are equally weighted, not value weighted.
[13] The fact that only half of the SWF portfolio is in public equities and that the geographic distribution is different in public equities than the rest of the portfolio reinforces our belief that analyzing the entire portfolio is the right approach to inferring objectives.
[14] The public equities allocation we report is an overstatement of investments where SWF have potential control rights, for it includes large indexed positions by SWFs like ADIA and GIC Singapore, as well as the quasi-indexed investments of Norway and Alaska. Norway invests relatively small stakes in a large number of companies (7,900 in 2008) and only has stakes in excess of 5 percent in 3 companies.

predicted assuming investors seek to hedge such income risk through their financial portfolios.[15] Relative to the capitalization benchmark alone, SWFs overweight finance, telecommunication and utilities as well. As the estimations later show, it appears that the industry mix of SWFs is more in line with the pension fund benchmark than the capitalization one.

### *II.2. SWF Ownership Stakes*

We next report summary statistics on ownership stakes across industries and geographies which provides a preliminary indication of the importance of different objectives in assembling these portfolios. To the extent that ownership concentration is present and more likely in specific industries and geographies, this suggests factors other than the diversification objectives of a financial investor are in play. For control rights to be useful for industrial planning, they are predicted to be greater for industries targeted by industrial plans and for domestic investments where planning objectives are ultimately realized. Larger stakes empower an investor with the information or influence to address planning goals.

Table 4 reports SWF ownership positions in value rather than as allocation weights. Columns 1 to 3 report how much of the world market capitalization is held by the 20 SWFs in the sample, and column 4 reports what percent of the SWF value is invested actively, defined to be holding more that 5 percent of the shares outstanding. We only report the public equities active percent. Real estate (not included in Table 4) and private equity direct investments are almost always held either entirely or in joint ventures by SWF. Thus, regional control rights on average would increase if we included these asset classes.

Two noteworthy observations emerge from Panel A. First the 20 SWFs own 2.0% of the world public equity market, representing 4.3% and 6.4% of the public markets in Asia and the Middle East. Second, consistent with expectations, active stakes are most likely in the two regions home to most SWFs of Asia and the Middle East, with 80% of the stakes having control rights.

[15] Singapore, Malaysia, Norway and the Gulf States have large shipping and air transportation sectors.

Panel B, which explores industry allocation, gives us two additional, parallel findings. SWFs own 4.8% of the global public market in finance company stocks. Furthermore, in some of the industries over-weighted in portfolio weights – finance, transportation, and telecommunications, – SWFs invest more than a third actively with over 5 percent stakes.

The summary of Table 4 is our second main finding: SWFs invest actively (with control rights) in both public and private sectors but primarily in finance, transportation and telecommunications. Twenty SWFs own 2% of the global public equities, but much more in Asia and the Middle East and in specific industries. SWFs own 4.8% of the finance industry.

## III. Empirical Results

We now turn to an empirical model to test for the explanatory power of different objectives in explaining portfolio choices. Our empirical model most closely follows the portfolio choice specification of Massa and Siminov (2006). They test whether a benchmark and income hedging variables have explanatory power for investors portfolio choices. Whereas they focus just on financial investor related benchmarks and hedging variables, we take the analysis further to introduce measures of industrial planning objectives. As we will see, industrial planning predicts different portfolio choices.

### *III.1 Empirical Model of Financial Portfolio Investor*

Imagine a portfolio choice problem:

$$\omega_{bft} = X_{bft}\mathrm{B} + Z_{bft}\Gamma + \varepsilon_{bft}.$$

Portfolio weight ω is indexed by SWF *f*, time *t* and "bin" *b*. To simplify discussion, we refer to the asset class-industry-geography "bin" as *b*, with at most three asset classes (private equity, public equity, real estate), seven geographies (including the home country) and thirteen industries for the equities asset classes and just one industry for real estate. Thus, at most there are 2x7x13+1x7= 189 bins in which a SWF can invest its risky portfolio.

$X_{bft}$ are the set of benchmark variables, consisting of *Capitalization*: *Mean Asset Class* allocation, *Capitalization: Bin* allocation (which sum to 1 across bins), *Pension Fund*: *Mean Asset Class* allocation, and *Pension Fund: Bin* allocation (which sum to 1 across bins and are home biased specifically for each SWF). We include the average benchmark allocations to the asset class as separate variables from the overall allocation weights so that we can investigate allocations across asset classes.

$Z_{bft}$ are the set of income risk hedging variables, which require a little discussion. Following the work of Bodie, Merton and Samuelson (1992), Guiso, Jappelli, and Terlizzese (1996), Heaton and Lucas (2000), and Vissing-Jorgensen (2002), we have two theoretically-motivated types of hedging variables. First, there are variables which increase or decrease an overall appetite for risk. (These variables fall under the notion of "variance" variables in the aforementioned literature.) Second, we include variables which increase or decrease the appetite for investment in a particular "bin". (These variables are the "covariance" hedging variables.)

We include three risk-preference variables. First is a wealth effect variable. Depending on the nature of risk aversion, overall investor wealth can change portfolio allocation preferences (Merton, 1992). SWFs in countries with more sovereign wealth as a whole might have a greater appetite for risk. We assume a sample country has two wealth stocks – the state's holding of fixed income securities (held both by the central bank and the SWF) and the wealth of the underlying assets producing the flows to the SWF. We estimate the latter, following the endowment literature, using the capitalized value of current cash flows into the SWF.[16] The second risk preference variable is the amount of fixed income held, in both the SWF and foreign reserves, relative to the overall SWF portfolio.

The final risk preference variable is the typical non-financial income risk variable, the standard deviation in non-financial income. Measuring income that the government allocates to the SWF is a little tricky in our setting. Rather than using the cash flow received by the SWF, which are lumpy and

[16] The endowment literature uses the capitalized value of expected future donations as another source of wealth (Merton, 1992; Dimmock, 2009). We approximate cash flows using a moving average of the cash flows into the SWF for three years centered on the current year.

represent only a limited number of years, we link these flows to their source and examine the riskiness of that source. In some SWFs net inflows are tied explicitly to government revenues from their natural resource (e.g. Kazakhstan global), while in others the connection is less direct. In almost all cases, it appears dependent on level of government fiscal revenues with surpluses creating larger inflows into the SWF. Given this pattern, we adopt as our primary measure of the riskiness of non-financial income the standard deviation in *fiscal revenues* as a percent of GDP. This variable is appealing not only in its availability for extended periods of time, but also in its co-varying with the source of risk, e.g., oil industry in economies dependent on oil wealth.[17] Following Massa and Simonov (2006), we interact this variable with the sign of the correlation of income (fiscal revenues) with market returns. The notion here is that if income risk is negatively correlated with market returns, more income variance may be a good natural hedge.

Because the three risk preference variables are economic factors that suggest more or less risk-taking, we interact each of them with the beta of the industry-region, which we calculate from a 30 year inclusive period. For real estate, we use publicly traded real estate industry betas for the entire real estate holdings.[18] For private equity, we use the public equity betas and multiply each industry-geography beta times 1.73, the beta estimate from Hall and Woodward (2007).[19]

Finally, we include a covariance variable; namely the 19 year, rolling covariance of SWF country fiscal revenues as a percent of GDP and value weighted returns in the geography-industry sector. We scale this covariance and the standard deviation variable above by the percentage of wealth that is the capitalized flow of wealth to the SWF, to capture how important SWF income risk is to the fund vis-à-vis

[17] We have also explored using the growth rate of GDP as an alternative measure of the riskiness. This has some intuitive appeal, but suffers from being closer to a dividend rather than a return.

[18] This is imperfect in that the real estate betas from the market will be higher than for private property holdings, but since beta risk for real estate is not a perfect concept for portfolio risk, we think the bias goes in the correcting direction.

[19] The beta estimates for venture capital range from less than 1 to 3.2. Buyout is thought to be closer to 1. We cannot disentangle private equity in buyout versus venture, although the bulk of firms are startup, and thus choose to use Hall and Woodward's (2007), relatively conservative venture estimate of 1.73 for both.

their other wealth. Table 5 presents summary statistics of our dependent variable and all of the explanatory variables used in the analysis.

Given that positions are often held for long periods of time, SWFs no doubt have serial correlation in asset allocations. To capture this, our main regressions use a conservative model in which we cluster standard errors at the SWF level following Bertrand, Duflo and Mullainathan (2004). We also implement a GLS model with an AR1 component, estimated in the two-step (Prais-Winsten) method in which the serial correlation parameter is first estimated from residuals and then inserted in the equation.[20]

### *III.2 Results: Explaining SWF Portfolios with Financial Investor Variables*

Tables 6 reports our first set of estimations of the 20 SWF portfolio weights (which sum to 100) across bins where we have an unbalanced panel with an average of 6 years of data per SWF. In column 1, we look at just the importance of the pension fund and capitalization benchmarks. Consistent with data in table 2 and 3, some of the power comes from the ability of the statistically significant capitalization benchmark to explain choices across asset class, but within the asset class what is most important is the pension benchmark. We are primarily interested in the size of the economic significance of these variables, rather than the coefficient magnitude, since we are in constrained setting; these variables alone produce an r-squared of 7.2 percent.

Column 2 adds in the hedging variables. We find significant results consistent with SWFs doing some hedging. The greater the proportion of wealth from fixed income, the more risk is taken. In addition, if the standard deviation of non-financial income is higher, SWFs tilt away from risky bins. However, interestingly we do not find that SWFs hedge their non-financial risk in their industry choices, instead seeing a positive and insignificant coefficient on the covariance term. The hedging variables do not

[20] We recognize that technically a cleaner implementation would involve a model in which a portfolio adding-up condition is implemented via a constrained system (e.g., McGuire and Weiss (1976) applied to portfolios in Dimmock (2009)). Because of the limited number of SWFs, particularly in the clustered standard errors model that we use for our main specification, we do not have sufficient observations to implement this model. What we can do is to follow the approach of Beckwith (1972) by examining robustness of our findings to a model in which one bin (real estate) is left out, such that the residual can force the adding-up.

increase the overall explanatory power of the model from column 1, suggesting at least for the moment that hedging is not a powerful component of SWF decisions. Column 3 repeats the exercise of column 2 using the GLS – AR1. The AR component is high, as one might expect.

Columns 4 through 6 subsample the data. Column 4 reports the results with the real estate asset class thrown out, to ensure robustness to imposing a Beckwith (1972) method of handling the adding up constraint. The results do not materially differ.

Columns 5 and 6 report are perhaps more interesting. In Column 5, we look just at the portfolio allocations within public equity (re-weighting to sum to 100 again). For this analysis, we can add two more hedging variables to elicit decision making of SWF managers. It might be that private equity portfolio across industries can be thought of as fixed, as an endowment. Do SWF managers hedge away from the risk by adjusting the public portfolio away from these industries. The variable *PE Weight* is the overall private equity weight in the portfolio for that industry-geography bin. The second additional variable is a risk preference variable. Does the overall sum of portfolio weights in real estate and private equity for that SWF year affect the appetite for risk in public equities choice? We multiple this sum by the industry-geography beta.

The positive and significant coefficient on the benchmark in column 5shows the power of financial investor objectives. However, of particular interest is the negative sign on the coefficients on the hedging variables. Counter to the prediction that SWFs will use their public equity investments to hedge risk arising from existing and less liquid positions in industries arising from their private equity investments, we find that private equity investments predict public equity investments in the same industries and geographies and that the larger the size of their non-public equity investments, the greater the weight on more risky industries-geographies.[21] In the next section, we present the industrial planning hypothesis, which provides one rationale for this result. Column 6 shows results for just private equity. The benchmark fails to explain the portfolio allocations at all, as do all the hedging variables.

[21] We limit to comparison to just the pension fund benchmark to avoid the effects of multicollinearity. The correlations in industry distributions among benchmarks are high in public equities.

### *III.3 Inclusion of State Industrial Planning into the Model*

The financial investor perspective ignores an essential feature of SWFs - they are owned by the state. As Ang (2010) emphasizes, this makes their management fundamentally different from ordinary investment management companies, and to maintain legitimacy they need to attend to wider political and economic factors. States may use SWFs to achieve industrial planning objectives, using these vehicles as one tool to achieve specified national developmental goals and/or exploiting perceived skills the state has in particular industries. We focus on this alternative objective, in part, because this is what a number of funds explicitly say is motivating their investment patterns. For example, Mubadala, an Abu Dhabi SWF states: "Mubadala is a catalyst for economic diversification of Abu Dhabi."[22] It has bought stakes in foreign companies, and/or established domestic joint ventures with the desire to exploit foreign firms knowledge and skill and bring them to bear for domestic development purposes. Or consider the statement of the objectives behind the largest CIC controlled holding that "was established to invest exclusively in domestic state-owned financial institutions on behalf of the state in order to improve governance and preserve and enhance the value of state-owned financial assets."[23]

The desire to use a sovereign wealth fund to pursue developmental objectives can be rationalized on social welfare grounds, although it need not be driven by such logic and could emerge for other political reasons. This can also be seen as an alternative hedging strategy, but instead of predicting not investing in industries highly correlated with current income risk, it predicts investing in industries that have the long-run potential to diversify the employment returns to the economy. In the short run, these industries may even be highly correlated with their background risk. A developmental agenda may be social welfare maximizing if the overall returns to its citizens are higher because sector development enhances the present value of future returns to human capital or because citizens benefit from a more

[22] Mubadala Annual Report 2008.
[23] This industrial planning perspective has been underemphasized in the academic literature, but has not been ignored in policy-oriented papers (e.g. Santiso (2009)).

diversified economy. For example, investments that generate spillover effects on local companies by enhancing transmission of knowledge and technology may increase the returns to the stock of domestic human capital. Or it may be that society utility (not just financial wealth) may be higher when labor income is less tied to a dominant income sector (e.g., oil).

The SWF may also be used as a tool to exploit perceived skills the state has in particular industries or superior information it has about particular industries. For a number of countries, the initial 'endowment' of the fund includes state-owned enterprises that may or may not be partially privatized, or alternatively the state has controlling stakes in enterprises for many years. This close proximity to industries may lead SWF managers to believe they have superior information or skill about the industry, and they may seek to exploit this in their investment patterns, producing a geographic or industry tilt to their portfolios. For example, Temasek of Singapore was given the state's stake in Singapore airlines, and Temasek's subsequent investments in a series of airlines in the region could be related to a perceived ability and knowledge in this sector. This argument is closely related to the explanation offered for the patterns of investing in Massa and Siminov (2006).

Our primary measure of state planning is based on the existence of a national (not SWF) *Strategic Plan* for the nation, and, if so, on the specific industries highlighted in that plan. We search for a plan that predates our data and code things straightforwardly with dummy variables if one of our fourteen industries is featured prominently in the industrial plan. These plans tend to feature vertical industries targeted for development, as well as in some cases industries like finance and telecommunications, that are viewed as infrastructure and aid in development across a set of industries. Summary stats appear in Table 5.

Two weaknesses of the *Strategic Plan* variable are that it does not give an indication of why sectors might be targeted and that it is almost entirely targeted on domestic industries. As a second measure we introduce the variable *Business Opportunity Public Good.* This is an *ex ante* measure of the degree of potential justification for government intervention in industries on market failure grounds, using

data from OECD indicators of Regulation Impact, developed and described in Conway and Nicoletti (2006), and used in many studies. This database is based on two inputs, the first being for each country and year a measure of the degree of regulation of the industry based on factors such as industry concentration, barriers to entry, etc. The second input, is an industry's exposure to regulated industries based on input and output tables. By using the input-output tables, this captures the 'knock-on' effect of regulation across a wider set of industries and produces a continuous measure of regulation impact across all of our industries. SWFs may think of investment in sectors with a high regulation impact as those where there are public goods characteristics so leaving decisions to the market alone may produce inefficient outcomes. To be usable for our purposes, we need to take the industry specific data for each year and country in our database and produce an average value. To do this we focus on the average for New Zealand, the United States, Australia and Canada, using the weighted (to market capitalization) average of ISIC codes for these countries in our 13 industries.[24] In these countries, the regulated environment is most likely to capture true market failures across industries as there is less of a tradition of state ownership and fewer historical rigidities that may influence industry structure.

We construct a third state planning variable labeled *Perceived Skill. Perceived Skill* is intended to capture the possibility that the state possesses information and potentially skills in an industry. It is possible (indeed, likely given the statements by Temasek) that SWFs capitalize on that knowledge both domestically and abroad. Here we take advantage of the fact that we have also collected information on the ownership stakes in all investments. The skill variable in an industry can take a value between 0 and 1 and is based on the proportion of the domestic investment in that industry that is invested with controlling stake in the prior year (where we define a controlling stake as a stake over 20%). Note, this is not based on the level of investment in that sector, solely on whether the proportion of the assets in that

[24] The OECD produces this regulatory impact measure for three categories: all frirms, for publicly-owned firms, and for non-publicly owned firms. We use the measure for non-public firms which is very highly correlated with the measure for all firms. A final note is that we did not want a measure specific to each country, as that would already capture some of that which the SWF is doing, rather than a motivation to invest to create viable sector.

sector where the state has control. To avoid extreme values, for industries in which the SWF has no investment, we use the mean proportion from all SWFs.

As a final note, we recognize that the fact of state ownership of SWFs might lead SWF managers to pursue this objective poorly, or that they may also pursue other political or personal objectives or face additional constraints in trying to realize their objectives. For now we focus solely on the industrial planning objective to see what power this has in explaining allocation, and leave questions of ability to realize, and possibly additional objectives to future work (e.g. Dyck and Morse (2011b)).

### *III.4 Results: Explaining SWF Portfolios with Financial Investor & State Planner Variables*

Table 7 repeats the analysis of Table 6, including state planner variables, *Strategic Plan, Business Opportunity Public Good,* and *Perceived Skill*. As column 1 shows, we include two *Business Opportunity Public Good* and three *Perceived Skill* variables. Because we are agnostic whether managers might employ their perceived skill or information advantage in investing at home, in the local region, or in the rest of the world, we interact *Perceived Skill* with these three geographies. For *Business Opportunity Public Good*, SWFs might have the incentive to overcome of regulation impacts either domestically or regional (imagine benefits to Singapore if investments in Malaysia pay off). For *Strategic Plan*, almost all of the planning is done with respect to the home market only.

Column 1 reports that state planning variables also have power to explain patterns in industry choices, producing an r-squared of 5.7 percent. Higher allocation weights follow the existence of a Strategic Plan in an industry or Perceived Skill, but only in the domestic industry. That we find any result is particularly impressive as the planner variables should have no power for SWFs in countries without strategic plans[25] or that do not rely upon natural resource wealth to fund the SWFs. *Business Opportunity* is positive but not significant.

[25] Kuwait, Norway Domestic, Kazakhstan Domestic, Alaska

In column 2 we repeat column 2 of Table 6 to facilitate a discussion of how the hedging picture changes once we add the state planning variables.

Column 3 presents our third main finding of the paper. When including both the financial portfolio investor and state planning objectives, the R-Square increases to 14.3, consistent with the two sets of objectives picking up different dimensions to SWF choices. Comparison of r-squared with columns 1 and 2 reveal that the partial r-square of state industrial planner variables is 7.1 and that of the financial variables is 8.6. State planner variables thus account for 45 percent of the explained variation.[26]

Two important changes appear in column 3 with respect to columns 1 and 2. First, once controlling for the financial planner covariates, we see that *Business Opportunity Public Good* is now positive and significant, not just domestically, but also regionally.

Second, in what we think is an important reversal, the sign on the hedging variable shifts from positive to negative and becomes significant. Once we control for the tilt in portfolio coming from industrial planning objectives, SWFs do tilt away from their non-financial risk. Thus, although our initial findings support the negative hedging results of Massa and Siminov (2006), it seems that asset managers may take the lessons of financial literature and hedge risk, once they have followed what might be considered mandates for development.

What are the economic magnitudes of hedging and state industrial planning measures? To put the figures in perspective, with 189 bins, a completely equal, naïve weighting across all bins would lead to 0.529 percent weight in each bin. First, we look at the hedging variables. A one standard deviation increase (0.013) in the covariance variable induces 0.05 percent less allocation in the bin (9.5% less than the naïve weight). This magnitude, although small, is not trivial relative to the naïve weight. Likewise, for fixed industry betas, countries with one standard deviation larger fixed income of the country relative to

[26] Although we think explaining 14.3 percent of any portfolio is pretty good, especially across asset classes, we grant that 14.3 percent of the variation explained leaves a lot unexplained. Much of the residual results from our inability to capture the geography of the holdings, and our unwillingness to include ad hoc variables, e.g., a domestic dummy. If we collapse to an industry-level analysis, our r-square increase to 22 percent.

SWF assets (2.04, a huge number given some of the large foreign reserves in our sample), results in 0.038 percent more allocation to the bin (7.2% more than the naïve weight).

For state industrial planning, a one standard deviation (0.343) larger Perceived Skill in an industry induces SWF managers to invest 1.26 percent more in home country (a 227% increase from the naïve weight). Likewise, the existence of an industrial plan induces SWF managers in invest 0.717 more of their portfolio in that home industry (136% increase from the naïve weight). On average, SWFs have 3.2 such industries. A one standard deviation larger Business Opportunity Public Good score (0.087) associates with SWFs investing 0.38 percent more in the domestic and 0.24 percent more in the regional bins (a 72% and 45% increase respectively). These are very large magnitude effects. But, as we saw in the initial summary statistics tables, the biases we are trying to explain are also large.

As in Table 6, the final two columns look within the allocations of public equity and private equity. The pension benchmark is large in magnitude and significant for public equities and insignificant for private equities. The coefficient on covariance hedging remains large in both columns and significant in the public equities column. The industrial planning variables show up strongly in private equity and in public equity. In fact, because of the importance of industrial plan for private equity allocations, the R-Square is higher in the private equity specifications (0.149) than the public equity ones (0.105), even though the financial portfolio variables do poorly in explaining private equity allocations.

Also interesting in column 7 is the positive significance of *Perceived Skill* in the foreign market. This is at least consistent, if not suggestive of, SWFs who want to invest outside their local region with control doing so in private equity markets to avoid public scrutiny. We return to this point when we look at ownership in the next section.

One final noteworthy point emerges from the public equity column in Table 7 (column 6). In the parallel specification from Table 6 without the inclusion of the state planning variables, the private equity "endowment" hedging variable and the alternatives risk-preference hedging variable were both of the wrong sign and significant. SWFs seems to tilt toward public equity industries in which they have large

private equity stakes and toward more risky public equity industries, the more alternatives they have in their portfolios. Both of these results, which are counterintuitive, can be explained by state planning; they become insignificant in Table 6.

### *III.5 Heterogeneity in the Importance of Objectives among Sovereign Wealth Funds*

In this section, we explore how financial versus state planning objectives matter across the heterogeneity of SWFs. The two objectives might capture different dimensions to the same fund and/or the heterogeneity in objectives by fund. To disentangle these possibilities we look separately at the explanatory power of these financial and state planning variables for each fund and decompose the r-squared based on the objective.

To explore heterogeneity, we begin by breaking down R-Square:

$$R\text{-}Square = 1 - \frac{SSE}{SST} = 1 - \frac{\sum\left(\omega - \hat{\omega}_{FI} - \hat{\omega}_{SP}\right)^2}{\sum\left(\omega - \bar{\omega}\right)^2}$$

$\omega$, $\hat{\omega}_{FI}$, $\hat{\omega}_{SP}$ and $\bar{\omega}$ respectively refer to (without fund, time and asset-class-industry-geography bin subscripts) the SWF portfolio allocation (the dependent variable), the predicted portfolio weight using just the financial investor variables, the predicted portfolio weight using just the state planning variables and the average allocation (which equals 1 divided by the number of bins). The summation is over all observations in a general setting, but we are going to do this summation over all observations for each SWF, creating an R-Square$_{SWF}$. With a little algebra, we decompose the R-square into three components:

$$R\text{-}Square_{SWF} = R\text{-}Square_{FI,SWF} + R\text{-}Square_{SP,SWF} - \left(1 - \frac{\sum 2\hat{\omega}_{FI}\hat{\omega}_{SP}}{\sum\left(\omega - \bar{\omega}\right)^2}\right)_{SWF},$$

In short, an R-Square for each of the set of objective variables and then a "covariance R-Square", the part of the explained sum of square errors which both variables explain.

Figure 1 presents the results of this decomposition for column 3, Table 7 results. As we noted in the prior section, the financial investor and industrial planner model explains 14.4 percent of the variation in risky portfolio holdings across industries, geographies and three asset classes. This does not mean that the model does equivalently well across SWFs. In Figure 1, the first bar (the medium grey/blue one) presents the R-Square$_{SWF}$, with the SWFs ordered on this variable. The model fits the portfolios best for the Kazakh Global Fund (a pure indexer). Some other portfolios are explained extremely well by the model, including SWFs one might guess – GIC Singapore, Alaska, and Norway – and including ones one might not expect – Bahrain, Qatar, and two Dubai funds.

The remaining two bars in Figure 1 show that the SWFs explained very well by the model (over 25 percent of the variation explained) are primarily financial investors with the notable exceptions of Bahrain and the Investment Corporation of Dubai. Of the SWFs explained still reasonably well (with 15 to 25 percent of the variation explained), half are state planning (development SWFs); namely Kuwait, Temasek and Malaysia. The SWFs to the extreme right in Figure 1 are not captured well by the model, but to the extent that the model has some power, it is usually in the state planning variables.

### *III.6 Results: Explaining SWF Ownership Stakes*

Recognizing the importance of state planning objectives generates additional predictions about the size of SWF stakes; in particular, more state planning should imply the need for larger stakes that generates information or influence to address planning goals. To explore these predictions, we test for the ability of planning objectives to help explain the variation we observe in ownership stakes across industries and geographies. For these estimations, our dependent variable is a SWF's average ownership stake for a geography-asset class-industry bin, where a bin has a positive stake. If we allow non-positive holding bins, then we might well be identifying estimates off having a holding or not, not off ownership stakes conditional on holdings. Because we do not observe the ownership stakes in the indexed portions of a few SWF portfolios (tabulated in Table 1), we assume that stakes held in index funds have the

average ownership holding of the Norwegian Global Fund (0.00075 ownership stake), a very diversified, non-active manager. As in the prior tables, the first three columns are estimated with OLS with clustered standard errors at the SWF level. Columns 4-6 are estimated with GLS-AR1.

We are interested in two independent variables. First is the overall SWF R-square as pictured in Figure 1 and explained in the heterogeneity section. Figure one suggests that those SWFs who are explained best by the model are those whose portfolios look like financial investors. If so, a negative relationship between the SWF R-square and ownership stakes would be consistent with asset managers acting as passive, diversified investors seeking portfolio income.

The second independent variable is the fraction of r-square identified by the state planner variables over r-square of the financial plus state planner, or $\frac{R^2_{SP,SWF}}{R^2_{SP,SWF} + R^2_{FI,SWF}}$. Our hypothesis, supporting the evidence in the summary statistics sections from earlier, is that the more a SWF wants to enact industrial or developmental goals, the larger the ownership stakes should be. The columns going across always have a dummy for asset class (private equity and real estate always have higher ownership stakes), and we add region and industry fixed effects to ensure the results are not an industry or geography omitted variable.

We find that the SWF heterogeneity in objectives and model fit does offer explanatory power for ownership stakes. The second variable is of primary interest. In our most stringent specifications (columns 3 and 6), the coefficient on the fraction explained by state industrial planning is in the range from 0.0041 to 0.0058 and significant. The standard deviation on this variable is high (1.3), since the explanatory power of the model seems often to load on one objective or another. If the fraction explained by state industrial planning increase by one standard deviation, the coefficients imply the ownership stake would increase by 0.0056-0.0079. The mean stakeholding, conditional on non-zero holdings, is 0.0561.

**IV – Discussion**

Recognizing the role of industrial planning objectives in portfolios has broader implications for the effects of SWFs on global capital markets. To the extent that these objectives are permanent characteristics this suggests a continued tilt in investments to specific industries and geographies. If other investors do not perfectly respond to these inflows by reducing their demand, this will lead to price and resource allocation impacts. Also, recognizing the lexicographic ordering of importance of investments first to those investments associated with industrial plans and then to those not associated with plans, suggests that SWFs may respond differently to external shocks, using those non-plan investments to cushion the impact of shocks. This is counter to the prediction that SWFs would increase investments to respond to short-term mispricing as they would if they were solely long horizon financial investors and offers one explanation for the relative lack of SWF investment in the midst of the financial crisis.

Our results suggest that for the new institutional investor class of SWFs a form of politics influences portfolio choices and approaches to management. This developmental agenda is not altogether surprising, and is much less objectionable than some voiced political concerns about SWFs. As Rajan (2010) has recently emphasized, successful development in emerging markets has not been based solely on free markets dictating the allocation of resources, but has relied upon a heavier hand of the state in directing economic activity.

One interesting aspect about this form of state capitalism is that the government is spurring investments in specific industries not through more conventional means such as debt finance or state ownership. Relative to these mechanisms, investment through often minority equity stakes has some significant disadvantages. The state cannot as easily direct economic activity to fulfill market failures, if that is its intention. There are also advantages in achieving political goals, as this has the potential to redirect more resources as this is a form of leveraging of state investments. It actually leads to significant real leveraging, if the invested firms borrow in private markets to support this activity as we saw in Dubai. Whether the advantages outweigh the disadvantages and this is a sustainable proposition remains an open question.

## V - Conclusion

In this paper we have assembled a novel data set of SWF portfolio holdings. We analyze their portfolios, and try to understand the investment objectives driving those portfolio decisions. We distinguish two broad objectives: portfolio investment vs. state industrial planning allocation. We then introduce measures to capture these objectives and examine their power to explain portfolio allocations.

One view is that they are motivated solely by securing appropriately risk-adjusted financial returns, predicting broad industry and geographic diversification in their portfolios, as well as across alternative types of risky assets. This portfolio investor view has power to explain portions of their portfolio allocations, but leaves much to be explained. We find that considering the possibility that portions of their portfolios are driven by a desire to achieve industrial planning objectives provides significant additional explanatory power. This objective predicts more domestic and regional investments, and more focused allocations consistent with announced planning objectives, and we also see this in the data. Considering both objectives also helps us to understand better the heterogeneity across funds, with some driven solely by portfolio investor objectives, others by industrial planning objectives, and many apparently addressing both. State industrial planning is important for all of the large Middle Eastern and some of the Asian SWFS.

Showing that funds pursue industrial planning objectives does not mean that they necessarily do this well, or that this is the best mechanism to achieve these objectives. The attempt to achieve planning objectives by taking equity stakes in private companies also raises questions whether this is the best mechanism to achieve these objectives, and how sustainable is this approach. There are alternatives, including direct state subsidies delivered either through state owned enterprises or through direct subsidies to private firms. This could very well be done poorly, or a mechanism that provides some political cover for other activities. Looking solely at portfolios cannot address these questions, but we need to turn to returns, a topic we pick up in ongoing work (Dyck and Morse (2011b)).

*Appendix A – What is a SWF?*

We employ a commonly used definition provided by the Monitor group, which defines SWF to be: (a) wholly owned by a sovereign government, but organized separately from the central bank or finance ministry; (b) an investment fund rather than an operating company; (c) an investor that makes international and domestic investments in variety of risky assets, (d) and is charged with seeking a commercial return; and (e) a wealth fund rather than a pension fund – not financed with contributions from pensioners and does not have a stream of liabilities committed to individual citizens and state-owned enterprises.

*Appendix B – SWF Portfolio Data Collection*

The strategy to re-construct hidden portfolios has three steps. First we identify all of the subsidiaries acting as the investing entities. SWFs usually only partially disclose their organizational structure delineating the names of the investing entities underneath the SWF. We cross-reference our entity list with subsidiaries listed in Bloomberg, Capital IQ, Zawya, Thomson, and the SWF Institute. To ascertain that we capture the all SWF entities which are making investments of any magnitude for the parent SWF, we work backwards from the known portfolio companies owned by the SWF. Knowing these companies allows us to search Factiva news articles and SDC transaction data to identify the exact entity doing the investing. Our overlap is high across these methods, but each step added more entities and allowed us to understand the relationships among entities.

Second, we search for transactions and ownership data involving these entities through a host of possible sources – including entity websites, Amadeus, Bloomberg, Capital IQ, Compact D, Datastream, Dealscan, Dow Jones Zawya, Edgar/SEC, Galante's Alternative Investment Sources, SDC/Thomson One Banker, and Venture Xpert. These sources do not capture all of the investments and usually do not give us the value of the holdings unless the transaction is a high-profile event. However, the union of transactions and holdings captured in these data sources provide a starting point for performing case studies of each transaction. By this we mean that for each company the SWF supposedly invests in, we search extensively in world news sources (via Factiva and Google in multiple languages sometimes) to ensure that we have multiple records of the initial transaction or certification that the holding exists, that we reconcile any increases in stake or divestments with additional transactions, and that we can put a stake on each holding. In the process, we get a very detailed picture of the SWF's operations and are often led to additional investments made by the funds either from articles on known transactions or via broad sweep searches.

Third, we value the holdings dynamically. The valuation of each company at each point in time is particularly tricky. For publicly traded companies, this is a straightforward task, and a dynamic picture of equity stakes is sufficient. However the private equity and real estate holdings require some assumptions. In particular, the best that we can often do is the equity stake (usually), an initial transaction value (sometimes) and yearly revenue or net income numbers (often) for the company to which we apply an industry-region multiple. When we only observe revenue numbers for some points in time, we have to infer growth with the industry. We mark these for incorporating this forcing in the analysis. If we are missing financials altogether, we use output measures (e.g., dry weight tons for shipping and passengers for airlines), which we try to capture yearly. Although our valuations are far from perfect, we think that our errors will not create biases in the residual portfolio and note that our errors are likely to be the greatest for the smaller companies in the portfolios who are less likely to issues newswires on performance or publish financials.

The next step is to value each of the assets dynamically for the three asset classes. For publicly traded companies, this is a straightforward task; we simply download stock trading data from Thomson and Bloomberg and apply the prices or market capitalizations to the dynamic picture of shares held or equity stakes.

For direct private equity holdings, we have a few different levels of data availability and thus approaches. If we know the investment and divestment amount (or a valuation at an IPO), we calculate the gross return and allocate this return over time scaled to be proportional to the three-digit SIC code return for the region.[27] If we observe the investment, the percentage held, and either a revenue, income or asset figure, we calculate a firm-specific multiple at the point of investment to allow the investment to grow with the firm. If we observe only the percentage held and a revenue, income or asset figure, we apply the three-digit industry multiple specific to region and year. Within these last two scenarios, when we lack the financials data, we capture yearly output measures (e.g., dry weight tons for shipping and passengers for airlines) and apply up publicly traded comparables output-to-value multiples. Finally, in the few cases in which we only know the investment amount and nothing else, we apply industry growth for the region.

The third asset class needing valuations are properties. As in private equity, if we know the transacted prices of buying and selling a completed structure, we calculate the gross return and allocate this return over time scaled to the real estate return for the regional area. If we know the purchase price only, we grow the transacted price with the regional area return for the years held. If we know when a property was purchased but not the price, we use heuristics valuation based on property size, location and type, assuming that all properties are class A commercial, residential, retail, or lodging. After looking up the sizes in Factiva, Google or Zawya, we convert all size measures (e.g., apartment units, retail spaces, hotel rooms) to square footage and use the Collier data for region price per square foot for the transacted year as the purchase price. We then grow this value with the region area growth rate.

[27] The return for year *t* is $exp(ln(X/YearsHeld)*IndustryReturn_t$, where *X* is the investment gross return (divestment divided by the investment) scaled by the region industry return over the period. The regions are defined as Asia, Europe, Latin America, Middle East & Africa, North America, Pacific and home country. To calculate the region returns and the region multiples, we use all firms in the Thomson OneBanker database, which includes Worldscope and Datastream data.

*References*


Ang, Andrew, 2010, “The Four Benchmarks of Sovereign Wealth Funds”, Columbia Business School Working Paper.

Bauer, Rob and Rik Frehen, 2008,“The Performance of US Pension Funds: New Insights into the Agency Cost Debate,” SSRN Working Paper.

Beckwith, Neil E., “Regression Estimation of the Time Varying Effectiveness of Advertising,” unpublished paper, 1972.

Bertrand, Marianne, Duflo, Esther, Mullainathan, Sendhil, 2004. "How Much Should We Trust Differences-in-Differences Estimates?," The Quarterly Journal of Economics, MIT Press, vol. 119(1), pages 249-275

Bitler, Marianne P., Moskowitz , Tobias J., Vissing-Jørgensen, Annette, "Testing Agency Theory with Entrepreneur Effort and Wealth." *Journal of Finance*, 2005, *60*(Issue 2), pp. 539

Bodie, D., R. Merton and W. Samuelson, 1992, “Labor supply flexibility and portfolio choice in a life cycle model, “ *Journal of Economic Dynamics and Control*, 16, 427-449

Conway, Nicoletti, 2006. "Product Market Regulation in the Non-Manufacturing Sectors of OECD Countries: Measurement and Highlights," OECD Economics Department Working Papers 530, OECD Publishing

Dimmock, S. 2009, “Background Risk and University Endowment Funds,” working paper, Michigan State University.

Dyck, Alexander and Adair Morse (2011b) “Asset Management, Sovereign Incentives and Governance: Return Implications for Citizens”.

Dyck, Pomorski , 2010, “Is Bigger Better? Size and Performance in Pension Plan Management” *Social Science Research Network Working Paper Series*

French, Kenneth, 2008. "Presidential Address: The Cost of Active Investing," Journal of Finance, American Finance Association, vol. 63(4), pages 1537-1573

General Accounting Office. 2008. “Sovereign Wealth Funds: Publicly Available Data on Sizes and Investments for Some Funds Are Limited,” GAO 08 946.

Guiso, Luigi, Jappelli, Tullio, Terlizzese, Daniele, 1996. "Income Risk, Borrowing Constraints, and Portfolio Choice," American Economic Review, American Economic Association, vol. 86(1), pages 158-72

Hall, Robert, Woodward, Susan E., 2007. The Incentives to Start New Companies: Evidence from Venture Capital," NBER Working Papers 13056, National Bureau of Economic Research, Inc.

Heaton, John, Lucas, Deborah, 2000. "Portfolio Choice and Asset Prices: The Importance of Entrepreneurial Risk," Journal of Finance, American Finance Association, vol. 55(3), pages 1163-1198

Massa, Massimo and Andrei Simonov. 2006. “Hedging, Familiarity and Portfolio Choice”; *Review of Financial Studies*

McGuire, T.W., Weiss, D.L., Logically Consistent Market Share Models II. J. Marketing Research, 13 (1976), 296-302

Merton, R., 1992, “Optimal Investment Strategies for University Endowment Funds,” in R. Merton (ed.) *Continuous Time Finance – Revised Edition*, Blackwell: Malden, MA.

Moskowitz, Tobias, Annette Vissing-Jorgensen The Returns to Entrepreneurial Investment: A Private Equity Premium Puzzle? , 2002, *American Economic Review*, Vol. 92 No. 4, 745-778

Prudential Real Estate Investors, 2010

Rajan, Raghuram, 2010, *Fault Lines: How Hidden Fractures Still Fracture the World Economy*, Princeton University Press: Princeton, NJ

Santiso, J, 2009. “Sovereign Development Funds: Financial Actors in the Shifting Wealth of Nations,” Chapter 16, *New Perspectives on Sovereign Asset Management*, editor Malan Rietveld

Truman, Edwin M., 2007, "Sovereign Wealth Funds: The Need for Greater Transparency and Accountability", *Peterson Institute Policy Brief* No. PB07-6. August.

Truman, Edwin M. 2008a. "A Blueprint for Sovereign Wealth Fund Best Practices," Peterson Institute for International Economics, Policy Brief 8-3.

Vissing-Jorgensen, Annette 2002. "Limited Asset Market Participation and the Elasticity of Intertemporal Substitution," Journal of Political Economy, University of Chicago Press, vol. 110(4), pages 825-853

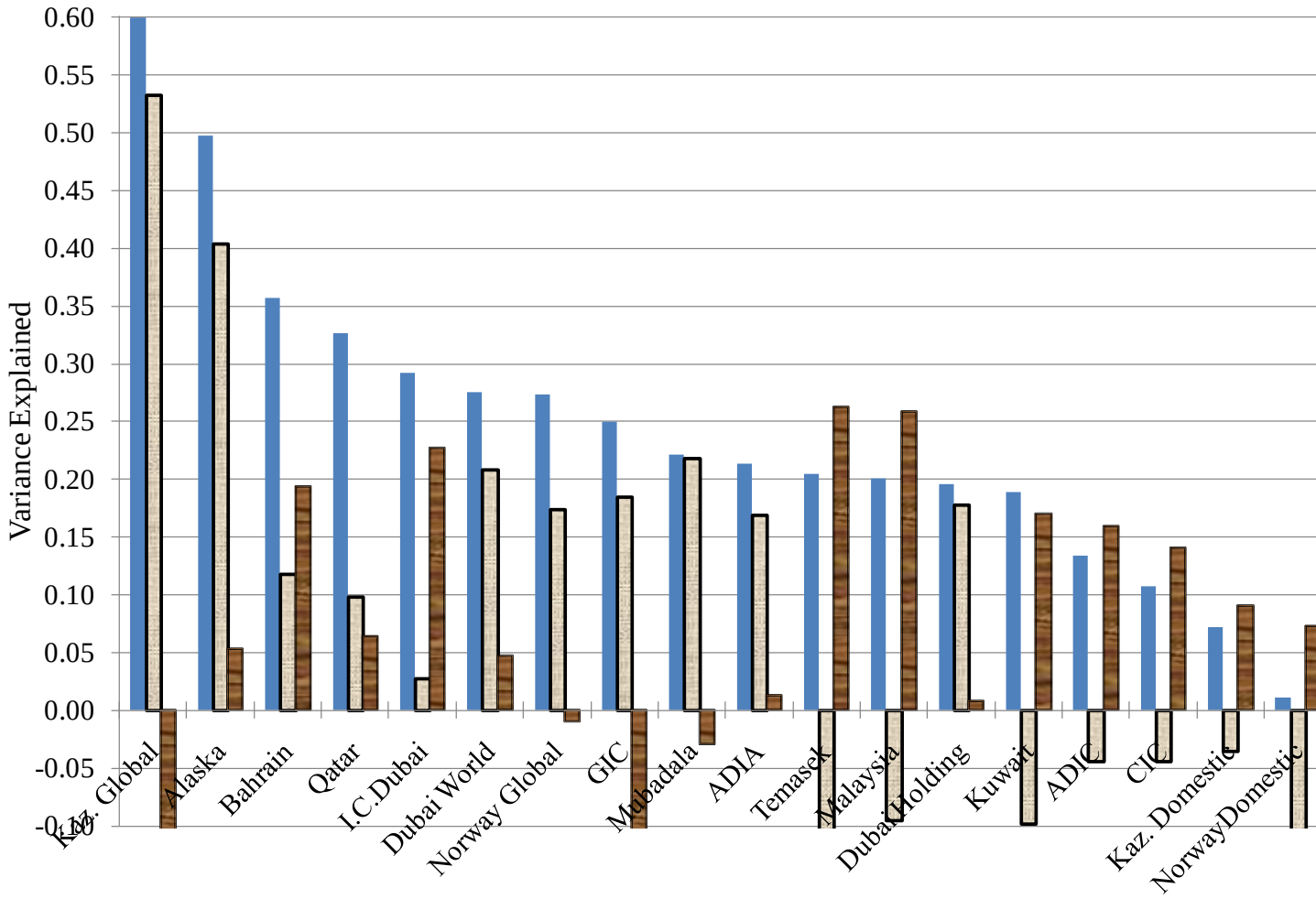


**Figure 1: Heterogeneity in Proportions Explained and Objectives**

The proportions plotted result from Column 3 estimates from Table 7. As described in the text, we decompose the SWF Overall RSquare (in blue, the first bar) into RSquare Financial Planner (in textured grey, the second bar), RSquare State Planner (in dark brown, the third bar) and a covariance RSquare. Thus the bars display the proportion of variance explained overall and by each of the objective variable sets.

**Table 1 - Sovereign Wealth Funds Holdings for 2008: Our Data and Market Estimates**

Included SWFs meet the Monitor definition of a SWF and had at least $10 billion in assets as of end of year 2007. Market estimates of SWF size come from Preqin and the Sovereign Wealth Fund Institute. The data presented here are for 2008, with our unbalanced panel starting in 1999. Column 3 and 4 are used in the analysis. Specifically identified means that we have the specific company or property information. Column 5 lists the number of companies over the sample period. This number is much smaller than the number of transactions. The number in parentheses excludes Alaska and Norway.

| | | | Of this Paper's Calculated Total: | | | | |
|---|---|---|---|---|---|---|---|
| | Estimates in Market | This Paper's Calculated Total | Risky Portfolio Specifically Identified: Equities & Real Estate | Risky Portfolio Indexed | Number of Unique P.E.Funds, Properties & Firms | Bottom-up Inferred Fixed Income | Bottom-up Inferred Hedge Funds, Other |
| | 1 | 2 | 3 | | 4 | 5 | 6 |
| Abu Dhabi Investment Authority | 627,000 | 289,154 | 60,257 | 138,671 | 101 | 58,700 | 31,526 |
| Abu Dhabi Investment Council | combined | 14,896 | 10,736 | | 33 | 2,377 | 1,783 |
| Alaska | 26,700 | 28,756 | 17,696 | | 10,172 | 6,580 | 4,480 |
| Bahrain - Mumtalakat | 14,000 | 19,321 | 19,321 | | 37 | 0 | 0 |
| China Investment Corporation | 200,000 | 261,412 | 164,244 | | 16 | 97,168 | 0 |
| Dubai Holding | 103,000 | 81,483 | 81,363 | | 191 | 0 | 120 |
| Dubai World | 120,000 | 121,782 | 121,782 | | 153 | 0 | 0 |
| GIC - Singapore | 220,000 | 235,250 | 54,538 | 67,168 | 333 | 79,200 | 34,344 |
| Investment Corp. of Dubai | 82,000 | 74,056 | 73,409 | | 79 | 0 | 647 |
| IPIC - Abu Dhabi | 16,000 | 18,601 | 16,804 | | 19 | 1,798 | 0 |
| Kazakhstan National Fund | 22,700 | 22,072 | 0 | 4,139 | n/a | 17,934 | 0 |
| Kazyna-Samruk (Kazakhstan) | 52,000 | 46,209 | 46,209 | | 101 | 0 | 0 |
| Khazanah Malaysia | 18,243 | 17,544 | 17,544 | | 92 | 0 | 0 |
| Kuwait Investment Authority | 228,000 | 191,477 | 89,189 | 24,893 | 157 | 60,410 | 16,985 |
| Libya Investment Authority | 65,000 | 76,040 | 15,303 | | 83 | 60,692 | 45 |
| Mubadala (Abu Dhabi) | 13,300 | 28,262 | 28,012 | | 68 | 0 | 250 |
| Norway Fund - Global | 323,505 | 316,228 | 153,267 | | 14,482 | 162,961 | 0 |
| Norway Fund - Domestic | 12,342 | 12,342 | 6,541 | | 253 | 5,801 | 0 |
| Qatar Investment Authority | 60,000 | 58,043 | 35,607 | 16,240 | 80 | 5,351 | 845 |
| Temasek Singapore | 122,000 | 127,734 | 111,455 | | 309 | 14,072 | 2,207 |
| Total Funds | 2,325,790 | 2,040,662 | 1,123,276 | 251,111 | 26,759 | 573,044 | 93,232 |
| Average Size | 116,290 | 102,033 | 56,371 | 56,371 | 1,408 (124) | 28,652 | 4,662 |

## Table 2: Geography of SWF and Benchmark Portfolio Allocations

Table A presents the equally weighted SWF portfolio allocations, where each SWF is based on its time series average. Panel B reprots allocations based on world market capitalization and large pension funds. In panel B the median pension benchmark real estate allcoation is indexed to the home country, and thus the region is left blank. The last two columns of panel A show the difference of the total geographic allocation between the average SWF allocations and the capitalization and pension fund benchmarks.

Panel A: Average SWF Allocations (in percent of portfolio)

| | SWF Allocations | | | | Excess over | Excess over |
|---|---|---|---|---|---|---|
| | Public Equity | Private Equity | Real Estate | Total | Capitalization | Pension Fund |
| Asia (excl Japan & Middle East) | 0.251 | 0.314 | 0.039 | 0.230 | 0.094 | 0.195 |
| Europe | 0.327 | 0.161 | 0.053 | 0.227 | -0.113 | -0.012 |
| Latin America | 0.011 | 0.000 | 0.001 | 0.006 | -0.051 | 0.001 |
| Middle East & Africa | 0.148 | 0.493 | 0.781 | 0.368 | 0.348 | 0.358 |
| North America | 0.208 | 0.016 | 0.095 | 0.130 | -0.164 | -0.370 |
| Pacific | 0.055 | 0.015 | 0.032 | 0.039 | -0.115 | -0.073 |
| Total | 1.000 | 1.000 | 1.000 | 1.000 | | |
| Asset Class Total | 0.520 | 0.296 | 0.187 | 1.003 | 0 | 0 |

Panel B: Benchmark Allocations (in percent of portfolio)

| | Capitalization Benchmark Allocations | | | | Pension Fund Benchmark Allocations | | | |
|---|---|---|---|---|---|---|---|---|
| | Public Equity | Private Equity | Real Estate | Total | Public Equity | Private Equity | Real Estate | Total |
| Asia (excl Japan & Middle East) | 0.120 | 0.164 | 0.077 | 0.136 | 0.034 | 0.117 | | 0.035 |
| Europe | 0.296 | 0.351 | 0.391 | 0.339 | 0.268 | 0.223 | | 0.239 |
| Latin America | 0.029 | 0.078 | 0.040 | 0.056 | 0.005 | 0.004 | | 0.005 |
| Middle East & Africa | 0.018 | 0.019 | 0.025 | 0.020 | 0.011 | 0.007 | | 0.010 |
| North America | 0.416 | 0.206 | 0.332 | 0.294 | 0.550 | 0.635 | | 0.500 |
| Pacific | 0.120 | 0.181 | 0.135 | 0.154 | 0.132 | 0.015 | | 0.112 |
| Total | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.900 |
| Asset Class Total | 0.324 | 0.516 | 0.160 | 1.000 | 0.846 | 0.054 | 0.100 | 1.000 |

## Table 3: Industry Breakdown of SWF and Benchmark Portfolio Allocations

Table A presents the equally weighted SWF portfolio allocations, where each SWF is based on its time series average. Panel B reports allocations based on world market capitalization and large pension funds. The last two columns of panel A show the difference between the average SWF allocations and the capitalization and pension fund benchmarks.

Panel A: Average SWF Allocations (in percent of portfolio)

| | SWF Allocations | | | | Excess over | Excess over |
|---|---|---|---|---|---|---|
| | Public Equity | Private Equity | Real Estate | Total | Capitalization | Pension Fund |
| Consumer Goods | 0.034 | 0.029 | | 0.026 | -0.012 | -0.027 |
| Consumer Services | 0.094 | 0.068 | | 0.069 | -0.264 | -0.034 |
| Energy | 0.097 | 0.334 | | 0.148 | 0.114 | 0.064 |
| Fabricated Products | 0.013 | 0.001 | | 0.007 | -0.019 | -0.027 |
| Finance | 0.313 | 0.150 | | 0.207 | 0.100 | 0.011 |
| Food | 0.028 | 0.011 | | 0.018 | 0.000 | -0.006 |
| Healthcare | 0.048 | 0.011 | | 0.028 | -0.004 | -0.056 |
| Materials | 0.054 | 0.078 | | 0.051 | -0.028 | -0.011 |
| Real Estate | 0.001 | 0.000 | 1.000 | 0.188 | 0.012 | 0.087 |
| Technology | 0.042 | 0.017 | | 0.027 | -0.014 | -0.058 |
| Telecommunications | 0.118 | 0.039 | | 0.073 | 0.032 | 0.001 |
| Transportation | 0.069 | 0.173 | | 0.086 | 0.060 | 0.071 |
| Transportation Manufacturing | 0.036 | 0.041 | | 0.031 | 0.005 | -0.013 |
| Utilities | 0.053 | 0.050 | | 0.042 | 0.019 | 0.000 |
| Total | 1.000 | 1.000 | | 1.000 | | |
| Asset Class Total | 0.520 | 0.292 | 0.188 | 2.000 | 0.0 | 0.0 |

Panel B: Benchmark Allocations (in percent of portfolio)

| | Capitalization Benchmark Allocations | | | | Pension Fund Benchmark Allocations | | | |
|---|---|---|---|---|---|---|---|---|
| | Public Equity | Private Equity | Real Estate | Total | Public Equity | Private Equity | Real Estate | Total |
| Consumer Goods | 0.060 | 0.036 | | 0.038 | 0.059 | 0.058 | | 0.053 |
| Consumer Services | 0.134 | 0.561 | | 0.333 | 0.113 | 0.135 | | 0.103 |
| Energy | 0.082 | 0.013 | | 0.034 | 0.093 | 0.099 | | 0.084 |
| Fabricated Products | 0.022 | 0.036 | | 0.026 | 0.039 | 0.020 | | 0.034 |
| Finance | 0.199 | 0.082 | | 0.107 | 0.219 | 0.184 | | 0.196 |
| Food | 0.028 | 0.018 | | 0.018 | 0.027 | 0.031 | | 0.024 |
| Healthcare | 0.082 | 0.010 | | 0.032 | 0.094 | 0.102 | | 0.085 |
| Materials | 0.071 | 0.107 | | 0.079 | 0.069 | 0.064 | | 0.062 |
| Real Estate | 0.012 | 0.024 | 1.000 | 0.176 | 0.001 | 0.007 | 1.000 | 0.102 |
| Technology | 0.087 | 0.025 | | 0.041 | 0.094 | 0.090 | | 0.084 |
| Telecommunications | 0.106 | 0.013 | | 0.041 | 0.079 | 0.096 | | 0.072 |
| Transportation | 0.022 | 0.037 | | 0.026 | 0.016 | 0.021 | | 0.015 |
| Transportation Manufacturing | 0.046 | 0.021 | | 0.026 | 0.049 | 0.044 | | 0.044 |
| Utilities | 0.047 | 0.015 | | 0.023 | 0.047 | 0.048 | | 0.043 |
| Total | 1.000 | 1.000 | | 1.000 | 1.000 | 1.000 | | 1.000 |
| Asset Class Total | 0.324 | 0.516 | 0.160 | 1.000 | 0.846 | 0.054 | 0.100 | 1.000 |

**Table 4: Sovereign Ownership of World Markets & Active Investments: 2008 Snapshot**

This table presents information on control rights associated with investments, classifying a stake as active if the SWF has 5% or more of the shares of a firm. Panel A breaks down stakes by region, and panel B by industry, in both cases presenting data for public equities and private equities separately.

| | Public Equity | | | | Private Equity | | |
|---|---|---|---|---|---|---|---|
| | Market Capitalization (billions USD) | SWF Investments (billions USD) | % World Market Capitalization Held by SWFs | % of Value Invested Actively | Private Capitalization (billions USD) | SWF Investments (billions USD) | % World Private Equities Capitalization Held by SWFs |
| Panel A: by Region | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Asia | 5,842 | 250 | 4.3% | 79.3% | 12,412 | 135 | 1.1% |
| Europe | 10,016 | 221 | 2.2% | 15.9% | 19,259 | 24 | 0.1% |
| Latin America | 1,648 | 12 | 0.8% | 1.7% | 5,759 | 0 | 0.0% |
| Middle East & Africa | 763 | 49 | 6.4% | 80.8% | 1,364 | 164 | 12.0% |
| North America | 12,714 | 154 | 1.2% | 14.1% | 10,044 | 8 | 0.1% |
| Pacific | 4,304 | 45 | 1.0% | 8.3% | 10,837 | 11 | 0.1% |
| Total | 37,447 | 731 | 2.0% | 40.8% | 59,675 | 342 | 0.6% |
| | | | | | | | |
| Panel B: by Industry | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Consumer Goods | 1,959 | 24 | 1.2% | 6.0% | 2,135 | 6 | 0.3% |
| Consumer Services | 4,527 | 69 | 1.5% | 9.3% | 33,500 | 28 | 0.1% |
| Energy | 4,002 | 59 | 1.5% | 10.5% | 848 | 96 | 11.3% |
| Fabricated Products | 895 | 11 | 1.3% | 4.4% | 2,229 | 0 | 0.0% |
| Finance | 6,221 | 297 | 4.8% | 70.3% | 5,015 | 83 | 1.7% |
| Food | 1,144 | 17 | 1.5% | 18.0% | 1,059 | 1 | 0.1% |
| Healthcare | 2,874 | 35 | 1.2% | 4.7% | 582 | 3 | 0.5% |
| Materials | 3,095 | 43 | 1.4% | 13.3% | 6,975 | 14 | 0.2% |
| Technology | 1,943 | 23 | 1.2% | 11.3% | 1,440 | 0 | 0.0% |
| Telecommunications | 3,598 | 66 | 1.8% | 45.2% | 756 | 3 | 0.4% |
| Transportation | 928 | 27 | 2.9% | 65.5% | 2,354 | 18 | 0.7% |
| Transportation Manufacturing | 1,230 | 21 | 1.7% | 33.3% | 1,261 | 41 | 3.2% |
| Utilities | 2,359 | 38 | 1.6% | 19.3% | 977 | 19 | 1.9% |
| Total (excluding real estate) | 34,773 | 731 | 2.1% | 40.8% | 59,130 | 311 | 0.5% |

## Table 5: Estimation Variables Summary Statistics

See the text for definitions. All statistics excetp one are for the full sample of 23,247, which represents 2 asset classes (public and private equity) times 7 gerographies times 13 industries plus 1 asset class (real estate) times 7 geographies. The seven geographies are Asia, Europe, Latin America, Middle East & Africa, North America, the Pacific and the home country. The industries are those in Table 4. Ownership stakes reported are those conditional on some ownership in the industry-asset class-geography bin. Ownership stakes are the equal weight average investment stake in that bin.

| | Mean | St.Deviation | Minimum | Median | Maximum | Observations |
|---|---|---|---|---|---|---|
| SWF Risky Portfolio Weight | 0.0053 | 0.0312 | 0 | 0 | 0.872 | 23,247 |
| Ownership Stake \| Stake>0 | 0.0561 | 0.1660 | 0 | 0.0008 | 1 | 11,874 |
| | | | | | | |
| Financial Portfolio Investor Variables | | | | | | |
| Pension Benchmark Weight | 0.0053 | 0.0141 | 0 | 0.0003 | 0.1519 | 23,247 |
| Capitalization Benchmark Weight | 0.0053 | 0.0129 | 0 | 0.0017 | 0.1911 | 23,247 |
| Financial (SWF) Wealth ($ million) | 76,759 | 660 | 38,538 | 87,676 | 412,389 | 23,247 |
| Non-Financial (Fiscal) Wealth ($ million) | 151,378 | 474 | 28,047 | 609,470 | 4,836,244 | 23,247 |
| Percentage Non-Financial / Wealth | 0.4977 | 0.0154 | 0.5439 | 0.2676 | 0.9962 | 23,247 |
| Foreign Reserves Value ($ million) | 71,689 | 1,594 | 31,694 | 219,570 | 1,949,260 | 23,247 |
| St. Deviation Fiscal Revenues | 2.133 | 0.001 | 1.732 | 2.278 | 13.462 | 23,247 |
| Beta | 0.840 | -4.828 | 0.868 | 1.146 | 3.723 | 23,247 |
| Sign of Correlation (Bin, Fiscal Revenues) | 0.252 | -1 | 1 | 0.968 | 1 | 23,247 |
| Covariance (Bin Return, Fiscal Revenues) | 0.0007 | -0.2061 | -0.0004 | 0.0192 | 0.3465 | 23,247 |
| | | | | | | |
| State Planning Variables | | | | | | |
| Strategic Plan | 0.1235 | 0 | 0 | 0.3291 | 1 | 23,247 |
| Business Opportunity Public Good | 0.1239 | 0.0357 | 0.0713 | 0.0870 | 0.4288 | 23,247 |
| Perceived Skill | 0.2658 | 0 | 0.1072 | 0.3433 | 1 | 23,247 |

**Table 6: How Well do Financial Investor Variables Explain SWF Portfolios?**

The dependent variable is the SWF portfolio weight for 20 SWFs to public or private equity in one of 13 industries or to real estate in one of 7 regions or to real estate for all available years 1999-2008. The mean number of years in the sample is 6 years. Cap Benchmark and Pension Benchmark are the portfolio allocation weights based on total capitalization and CEM pension funds, respectively. The mean weight variable is the mean weight to the asset class (private equity, public equity and real estate) for these benchmarks. Cov(FiscalRevenues, Bin Returns) is a 19 year rolling covariance of the SWF country fiscal revenue returns with returns for the industry-geography. Fixed Income is the value of foreign reserves plus SWF fixed income divided by the SWF value plus foreign reserves. StDev(Fiscal Revenues) is the standard deviation of home country fiscal revenue dollars. Standard errors are clustered at the SWF level in all columns except 3, in which a GLS -AR1 estimation uses the Prais Winsten procedure. Column 4 excludes real estate. Columns 5 and 6 are within public equites and private equities respectively. ***, **, and * denote significance at the 1%, 5% and 10% levels respectively.

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Dependent Variable: SWF Portfolio Weight X 100 | | | | No Real Estate | Within Public Equities | Within Private Equity |
| | Cluster | Cluster | GLS - AR1 | Cluster | Cluster | Cluster |
| Pension: Asset Class Mean Weight | 55.00** | 56.06** | 39.22*** | 156.3*** | | |
| | [20.33] | [20.63] | [7.768] | [53.08] | | |
| Pension Benchmark Weight | 54.14*** | 54.13*** | 46.98*** | 30.12** | 35.82*** | -8.332* |
| | [13.75] | [13.79] | [2.378] | [11.24] | [11.12] | [4.010] |
| Cap: Asset Class Mean Weight | 107.3** | 107.6** | 88.42*** | 241.9** | | |
| | [48.48] | [48.25] | [7.780] | [87.73] | | |
| Cap Benchmark Weight | -10.11* | -10.50** | -12.00*** | -3.938** | | |
| | [4.870] | [4.816] | [2.343] | [1.410] | | |
| Fixed Income*Beta | | 0.014* | 0.013*** | 0.016** | 0.041 | 0.015 |
| | | [0.007] | [0.005] | [0.006] | [0.030] | [0.015] |
| Wealth*Beta | | -0.003 | -0.010 | 0.005 | -0.004 | 0.017 |
| | | [0.012] | [0.025] | [0.012] | [0.041] | [0.029] |
| St Dev (Fiscal Revenues) * Beta | | -0.016* | -0.012 | -0.016* | -0.014 | 0.005 |
| | | [0.009] | [0.016] | [0.009] | [0.037] | [0.117] |
| Cov (Fiscal Revenues, Bin Returns) | | 0.026 | 0.370 | -1.003 | 0.304 | 0.813 |
| | | [1.197] | [2.617] | [0.646] | [3.087] | [4.053] |
| PE Weight in Industry-Region | | | | | 0.221* | |
| | | | | | [0.120] | |
| Alternatives % Portfolio * Beta | | | | | 0.0034** | |
| | | | | | [0.0016] | |
| Constant | -0.563 | -0.587 | -0.349*** | -1.663** | 0.516*** | 1.150*** |
| | [0.355] | [0.358] | [0.070] | [0.679] | [0.101] | [0.075] |
| Observations | 23247 | 23247 | 23247 | 22386 | 11193 | 7917 |
| R-squared | 0.072 | 0.072 | 0.029 | 0.027 | 0.025 | 0.001 |
| Rho | | | 0.881 | | | |

**Table 7: How Well do Financial Investor & State Planner Variables Explain SWF Portfolios?**

The dependent variable is the SWF portfolio weight for 20 SWFs to public or private equity in one of 13 industries or to real estate in one of 7 regions or to real estate for all available years 1999-2008. The mean number of years in the sample is 6 years.The financial investor variables are the same as defined in Table 6. Measures to capture state planner objectives include Strategic Plan, which takes a value of 1 if the industry is mentioned in the country's strategic plan, Business Opportunity Public Good, which is the OECD measure of anti-competitive regulation inpact in inputs to a sector, and Perceived Skill, which is the proportion of domestic investment invested in that industry with control (>20% stake). Standard errors are clustered at the SWF level in all columns except 3, in which a GLS -AR1 estimation uses the Prais Winsten procedure. Column 4 excludes real estate. Columns 5 and 6 are within public equites and private equities respectively. ***, **, and * denote significance at the 1%, 5% and 10% levels respectively.

| | 1 | | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| Dependent Variable: SWF Portfolio Weight X 100 | | | | | No Real Estate | Public Equities | Private Equity |
| | Cluster | Cluster | Cluster | GLS - AR1 | Cluster | Cluster | Cluster |
| Pension: Asset Class Mean Weight | | 56.06** | 56.50** | 38.31*** | 163.3** | | |
| | | [20.63] | [20.06] | [7.430] | [63.55] | | |
| Pension Benchmark Weight | | 54.13*** | 59.84*** | 50.92*** | 37.25*** | 49.33*** | 7.527** |
| | | [13.79] | [13.20] | [2.299] | [10.16] | [8.389] | [3.365] |
| Cap: Asset Class Mean Weight | | 107.6** | 117.3** | 90.17*** | 263.9** | | |
| | | [48.25] | [46.73] | [7.649] | [106.2] | | |
| Cap Benchmark Weight | | -10.50** | -5.204 | -9.083*** | 0.921 | | |
| | | [4.816] | [4.523] | [2.282] | [1.428] | | |
| Fixed Income*Beta | | 0.0143* | -0.0051 | 0.0093** | -0.0011 | 0.0086 | -0.0271*** |
| | | [0.0070] | [0.0049] | [0.0046] | [0.0052] | [0.0155] | [0.0079] |
| Wealth*Beta | | -0.0027 | -0.0056 | -0.0135 | -0.0003 | -0.0016 | 0.0307* |
| | | [0.0124] | [0.0115] | [0.0240] | [0.0096] | [0.0333] | [0.0167] |
| St Dev (Fiscal Revenues) * Beta | | 0.0256 | -3.880*** | -2.963 | -4.516*** | -8.277** | -8.829** |
| | | [1.197] | [0.842] | [2.525] | [0.883] | [3.786] | [3.173] |
| Cov (Fiscal Revenues, Bin Returns) | | -0.016* | -0.006 | -0.010 | -0.005 | 0.022 | -0.042 |
| | | [0.009] | [0.006] | [0.016] | [0.006] | [0.018] | [0.080] |
| PE Weight in Industry-Region | | | | | | 0.0153 | |
| | | | | | | [0.102] | |
| Alternatives % Portfolio * Beta | | | | | | 0.000 | |
| | | | | | | [0.002] | |
| Strategic Plan | 0.667** | | 0.711** | 0.605*** | 0.532** | 1.191*** | 1.438*** |
| | [0.286] | | [0.259] | [0.088] | [0.212] | [0.411] | [0.438] |
| Business Public Good * Domestic | 3.798 | | 4.406* | 9.587*** | 3.857 | 11.81** | 19.66* |
| | [2.555] | | [2.537] | [0.686] | [2.426] | [5.078] | [10.55] |
| Business Public Good * Regional | 1.547 | | 2.472** | 1.842*** | 2.319* | 5.211** | 5.793* |
| | [1.396] | | [1.096] | [0.677] | [1.171] | [2.388] | [2.740] |
| Perceived Skill * Domestic | 3.266*** | | 3.704*** | 0.929*** | 3.760*** | 6.724*** | 7.529* |
| | [0.746] | | [0.702] | [0.104] | [0.683] | [1.755] | [3.870] |
| Perceived Skill * Regional | -0.307 | | 0.004 | 0.044 | -0.096 | 0.076 | 0.704 |
| | [0.184] | | [0.156] | [0.103] | [0.147] | [0.398] | [0.547] |
| Perceived Skill * Foregin | -0.057 | | -0.059 | -0.032 | -0.015 | 0.125 | 0.481** |
| | [0.097] | | [0.114] | [0.046] | [0.099] | [0.167] | [0.164] |
| Observations | 23247 | 23247 | 23247 | 23247 | 22386 | 11193 | 7917 |
| R-squared | 0.057 | 0.072 | 0.143 | 0.051 | 0.119 | 0.105 | 0.149 |

## Table 8: Ownership Stakes' Relationship to Objectives

The dependent variable is a SWF's average ownership stake for a geography-asset class-industry bin, *where a bin has a positive stake* . Stakes held in index funds are assumed to have 0.00075 ownership, the average holding of the Norwegian Global Fund.The first three columns are estimated with OLS, clustered standard errors at the SWF level. Columns 4-6 are estimated with GLS-AR1. The independent variables are the overall SWF R-square as pictured in Figure 1 and explained in the heterogeneity section of the text and the fraction of r-square identified by the state planner variables over r-square of the financial plus state planner variables. Standard errors are in brackets. ***, **, and * denote significance at the 1%, 5% and 10% levels respectively.

| Dependent Variable: Average Ownership Stake in Region-Industry Asset Class Bin | | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Overall SWF R-Square | -0.0268 | -0.0484** | -0.0483** | -0.0268* | -0.0385*** | -0.0389*** |
| | [0.0187] | [0.0231] | [0.0229] | [0.0161] | [0.0144] | [0.0143] |
| Fraction Explained by State Planner | 0.0082** | 0.0058* | 0.0058* | 0.0067*** | 0.0040** | 0.0041** |
| | [0.0034] | [0.0030] | [0.0030] | [0.0019] | [0.0017] | [0.0017] |
| Observations | 11874 | 11874 | 11874 | 11874 | 11874 | 11874 |
| R-Square | 0.351 | 0.483 | 0.487 | 0.203 | 0.281 | 0.284 |
| Asset Class Fixed Effects | Y | Y | Y | Y | Y | Y |
| Region Fixed Effects | N | N | Y | Y | Y | Y |
| Industry Fixed Effects | N | N | N | N | Y | Y |
| Estimation Method | | Cluster by SWF | | GLS-AR1 | GLS-AR1 | GLS-AR1 |
| rho for AR1 | | | | 0.924 | 0.908 | 0.907 |