PRELIMINARY

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SOVEREIGN WEALTH FUND PORTFOLIOS

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October, 2010

ABSTRACT

Sovereign wealth funds (SWF) have the potential to impact global capital markets, but how they do so depends upon their objectives. Using a novel micro-based dataset of SWF investments in public equities, private firms, private equity and real estate, we test for the importance of various objectives using data on their investment decisions. We find that financial investor objectives help to explain their investment decisions, but there is great variation across funds. Considering state planning as an alternative objective significantly increases explanatory power, particularly for the less-transparent funds. We explain 14-27% of the industry and region variation in SWF risky portfolios across three asset classes with 33-43% of the explained portion of most large Middle Eastern SWFs coming from state planning measures. Recognizing this dimension to SWFs suggests they will have a much more pronounced effect on industries central to country strategic plans and more pronounced impact on local and regional markets, rather than a general impact on the efficiency of capital markets. Consistent with this, SWFs are also more likely to invest with larger stakes bringing control in particular industries (especially finance, but also transport, telecommunications and energy) and in particular regions (the Middle East and Asia). SWFs own 4.8% of worldwide finance company public equity, of which over half is invested with control stakes of over 5%. The perceived threat to sovereign ownership of North American and European markets seems minor, but the possibility that SWF dominate industries and regions seems valid.

Sovereign wealth funds (SWFs) have existed for many decades, but starting in 2006, less than two dozen funds have grown to control $2.7 to $3.2 trillion in assets (GAO, 2008). Their size, their lack of short-term liabilities, and their freedom to invest in multiple asset classes, combine to give SWFs the potential to impact global capital markets, but how they do so depends upon their objectives. One possibility is that they are motivated solely by securing appropriately risk-adjusted financial returns, which predicts broad industry and geographic diversification in their portfolios, as well as across alternative types of risky assets. An alternative possibility that has received much less attention is that they are best thought of as industrial planners, using their financial portfolios of risky assets to try to achieve industrial objectives. Considering this objective seriously leads to quite different implications predicting for example more domestic and regional investments, and more focused allocations to achieve planning objectives. The implications of which of these objectives dominate SWF investment decisions extend not just to the ultimate owners of the sovereign wealth (the citizens), but, may carry over to effects on the cost of capital and asset prices across investment classes, industries and geographies.

Until now, the biggest obstacle standing in the way of understanding the significance of SWFs for global finance has been the lack of data. A few SWFs (e.g., Norway and Alaska) are completely transparent, but these are simply not representative of the group as a whole. No law requires private investors to divulge portfolio holdings, but in the case of SWFs, some home country laws go so far as to make portfolio revelation a criminal offense.[1] And looking just at the few reported international public equities holdings which are readily available will not answer these questions, for this is only a small portion of their portfolio.

This paper assembles data on holdings across all asset classes for all of the important sovereign wealth funds from 1999-2008, including the less transparent Middle Eastern and Asian funds. We focus on those funds with more than $10 billion in assets as of 2007, leading us to focus on 20 funds, accounting for $2.3 trillion in assets under management by market estimates, averaging $ 116 billion per fund. Our data collection results in information on $2.03 trillion in assets under management, including detailed information on $1.43 trillion in risky assets (see

[1] Concerns about this lack of transparency prompted some funds to sign onto a global agreement of generally accepted principles and practices for funds, called the Santiago principles. But the principles remain on a "voluntary basis, each of which is subject to home country laws, regulations, requirements and obligations." See http://www.iwg-swf.org/pubs/gapplist.htm.

Table 1). It is these detailed holdings which make our data unique; the data are not just reported holdings of international publicly traded firms that have been used by a variety of recent studies,[2] but include firm or property-level data for public and privately held assets, complete with a time-series calculation of value. These non-public market holdings are significant, with private equities and real estate accounting for as much as public equity investments (and more than two times the international public equity holdings). With these data, we can test whether their objectives are best characterized as being driven by financial objectives or by industrial planning objectives, as well as identifying how significant is the heterogeneity in the set of SWFs and where SWF influence might affect markets or industries.

The dependent variable which we try to explain is SWF risky portfolio weight for three asset classes (public equity, private equity and real estate) broken down by either seven world regions or thirteen industries. We ignore fixed income because countries often use a SWF to diversify holdings from the central bank or other agencies to risky assets. We regress the portfolio allocation weights on two financial benchmarks, non-financial income risk hedging variables, and industrial planner incentives and execution variables. Our benchmarks are the world capitalization weights and an average pension fund allocation (using CEM Benchmarking data), which we home bias to the SWF home country to mimic the home bias in the pension data.

We find that SWFs allocate across risky asset classes more like the capitalization benchmark, but allocation across regions and industries more like a home-biased pension fund. We find a mixed bag of evidence for taking on more risk if the SWF's country has more foreign reserves (i.e., they hold risk-free bonds in their treasuries), and weak and sometimes conflicting evidence for income variance and covariance hedging.

We then construct industrial planner variables. Many countries state a desire to develop industries to help diversify their economic base focusing on industries that have less volatility, and that can provide sustainable employment for local citizens. Similarly, they state a desire to develop basic physical and financial infrastructure to facilitate development of such industries. Countries also state a desire to expand in areas where they already have skill and potentially

[2] See Bortolotti, Fotak, Megginson and Miracky (2009), Kotter and Lel (2008), Dewenter, Han and Malatesta (2008), and Fernandes (2009)

superior information. We construct measures to identify the incentive and execution of these goals.

We find that SWFs allocate toward industries mentioned for industrial development in the national strategic plans (not SWF mandates), especially for countries whose incentive to diversify the country may be larger – those whose oil reserves are running out sooner. We also find that SWFs allocate portfolios to reflect their perceived skill (measured as the portion of domestic investments in the industry which are invested with control over 20%), especially in private equity and for SWFs in which the board has little eternal financial education or asset management experience.

The main take away from the paper comes from breaking down the variation explained by the financial investor and state planner variables. Our main industry-geography specification has an R-Square of 0.14. Looking at the sum of square residuals explained by the model *by SWF*, we find that the model does extremely well for SWF we might expect (GIC Singapore, Alaska, and Norway), but also does well for some of the largest Middle Eastern SWFs (Qatar, ADIA, Dubai World, Kuwait and Dubai Holding) and smaller ones (Kazakhstan Global, Mubadala and Bahrain). The more interesting finding of the heterogeneities by SWF regard what portion of the explained portion of the portfolio are accounted for by the financial investor versus state planner variables. We find that, as expected, Alaska, GIC Singapore and Norway look very much like financial investors (75-80% of the empirical prediction comes from applying the financial investor estimates). However, for the large Middle Eastern SWFs for whom we do a good job of explaining their portfolios as a whole, state planning accounts for 33-43% of the variation explained, suggesting a significant role for state incentives in the investments. For smaller Middle Eastern SWFs and China, state planning accounts for over half of the variation explained.

What are the implications? In the final table, we revisit portfolio dollar allocations with these state planning results in mind. We document a series of facts that SWFs own 4.3% and 6.4% of public equity in Asia and the Middle East respectively, and 12% of private equity (companies, not funds) in the Middle East. They own much smaller portions of public market in the West, on the order of 1-2%. However, they own 4.8% of worldwide public equity in finance

companies, and 70% of this is invested actively (with a control interest of over 5%). They also invest actively in transport, energy and transport manufacturing. Furthermore, it is the SWFs who invest substantially as a state planner according to our decomposition who have the active stakes.

In sum, we conclude that although SWFs do look somewhat like financial investors, the industrial planning hypothesis provides significant incremental explanatory power. These results suggest that we think about SWFs and their potential impact differently. First, it suggests that we need to acknowledge and address the significant heterogeneity across funds. The most transparent funds like Norway are simply not representative of the group as a whole. Second, and more importantly it suggests that SWFs will have a much more pronounced impact on industries central to industrial plans and on local and regional markets, rather than a general effect on the efficiency of capital markets.

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.[3] 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 in addition to returns, 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

[3] Bortolotti, Fotak, Megginson and Miracky (2009) provides a summary of this literature.

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 introduces our core empirical specification. Section III lays out our two primary hypotheses of investment objectives, the empirical proxies to capture these objectives and introduces univariate comparisons of SWF funds against these portfolios. In section IV we restate our empirical specification given these proxies then test the financial investor and industrial planner hypotheses and conclude in section V.

I SWF Portfolio Data

There are a number of state-owned entities that are active in global financial markets. For example, central banks usually invest foreign exchange reserves in international fixed income, and state-owned operating companies often extend operations worldwide through acquisitions. The SWFs that have become the focus of most attention in recent years are neither of these categories, but rather something else – a state-owned investment company that has a long-time horizon and consequently the ability to invest in a wide range of asset classes. Many of the countries that own these funds, such as the first SWF the Kuwait Investment Authority, have used revenue from sale of natural resources to fund their SWFs. Other countries, such as Singapore and China, have used other sources to start their SWFs including savings, foreign currency reserves from trade surpluses as well as the transfer of wealth with legacy state-owned companies.

In selecting SWFs for study in this project, we apply a filter from a commonly used definition in the literature (the Monitor Group definition of a sovereign wealth fund, included as appendix A) and further limit 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

two requirements lead us to focus on 17 funds.[4] While restricted to a relatively small number of funds, this list accounts for almost all of the money in SWFs; namely, $2.27 trillion in end-of-year 2008 wealth according to Preqin (2009), even after recent losses. We gather data on their investments from 1990 until 2008, focusing in this paper on the 1999-2008 where there are more funds and the data quality is better.

Across funds, transparency by the SWF is fairly low as a whole.[5] A few funds (e.g., Norway and Alaska) do disclose their holdings, but these are the exception rather than the rule. Even among some high transparency funds (e.g., Singapore's Temasek), transparency does not imply a disclosure of the fund's portfolio. The inclusion of the less transparent funds is essential for our research questions because public concerns about non-economic motives driving decision focus precisely on these funds.

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 private valuation.

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 information on financial markets. 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,

[4] 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. This draft does not include data for one of these funds -- Khazanah Nasional of Malaysia.

[5] 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).

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.

Because the reconstruction of the portfolios has been a lengthy process, we relegate details of these efforts to the appendix. Nonetheless, there are a couple of things worthy of note. First, 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, our effort spends as much attention on gathering the private investments as the public ones. Finally, as the public has learned from the challenges facing Dubai, 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.

Table 1 summarizes the results of this data collection effort for 2008[6], showing that we have identified investments accounting for 2.03 trillion, just 13 percent less than the public estimates of 2.33 trillion (in columns 1-3). Our calculated total is based on thousands of investments in public equities, private equities and real estate. Not surprisingly, the gap between our and public estimates is greatest for the least transparent and large funds of Kuwait and the Abu Dhabi Investment Authority, where public estimates also have significant variance. 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.

Columns 4-6 of Table 1 break down the 2.03 trillion of our estimate to three categories. Column 4 reports the risky portfolio in public equities, private equities and real estate for which we know the *individual* investments. A portion of these amounts are indexed public equities; we infer the individual assets for these from global index holdings. Columns 5 and 6 reports our estimate of fixed income holdings and hedge funds/other alternatives holdings (not including real

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

estate and private equity) respectively, which we calculate "bottom up".[7] In no cases did we apply market estimates of allocations in any form. In everything forward from here in the paper, we ignore the figures in columns 5 and 6, focusing only on the risky portfolio identified in column 4, because even if our data here were comprehensive, it might be misrepresentative of the government's overall strategy given the portfolios held by central banks and other agencies.

III Data

Our objective is going to be to assess whether and to what extent SWF portfolios are consistent with an allocation of a financial investor or industrial planner. The dependent variable we are interested in explaining is the SWF portfolio weights across risky asset classes, industries and geographies. We will regress these portfolio weights on a set of financial investor variables and a set of state planner variables. Our emphasis will be on the decomposition of variance explained by financial investor and state planner variables. We then look at the heterogeneity of explanatory power as well as objectives across SWFs; namely, which SWFs have more or less of their portfolios explained by financial investor or state planner objectives. With this in mind, we describe the data.

III.1 Financial Investor Benchmarks

The stated objectives of many, if not most, of the SWFs assert the primacy of risk-adjusted returns.[8] This is also the view of many in the financial community.[9] To capture financial investor objectives, we use two benchmarks.

[7] By "bottom up", we mean that we take the value of the risky assets which we have identified and apply the percentage given by the SWF as to how much fall in fixed income and other alternatives asset classes. The exceptions here are for funds that provide the exact amounts in these classes, Norway and Alaska for example provide complete annual details, as has China Investment Corporation, and for Libya we know how much total wealth was transferred to the SWF and thus can calculate fixed income as that which has not yet been invested in equities over time.

[8] 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."[8] 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

The first benchmark is the proportion of world capitalized value in the asset class, geography and industry. For equities we simply use the world market capitalization from all traded companies in Datastream broken down by industry and country. 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).[10]

The calculation of the capitalized value of world private equity is more challenging. We use data from Orbis on private companies in Europe.[11] Orbis's data on European private firms is generally considered to be quite comprehensive, because of their long history of collecting data and because of disclosure requirements from European tax authorities.[12] The limitation of these data is that we can only consistently get company name and revenues; we use the private firm revenue multiple of 0.7073 from Moskowitz and Vissing-Jorgensen (2002) to calculate valuations. We then aggregate to fourteen industries.

For other countries, we use the ratio of private equity-to-public equity capitalization (specific for each of the fourteen industries) as calculated above, applied to each country's public market capitalization by industry. However, for the United States, we follow Moskowitz and Vissing-Jorgensen (2005), who calculate a ratio of private-to-public equity capitalization in the U.S. to be much lower (0.79) than that for our European calculations (2.5), consistent with regularity that more companies are traded in the U.S. than in Europe. We impose the overall private-to-public calculation of 0.79 for North America, but keep the industry proportional adjustments to the public equity market as implied by the Orbis private-to-public industry weights for Europe.

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." [8]

[9] 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

[10] 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.

[11] Orbis is a Bureu Van Dijk database that includes all companies in AMADEUS.

[12] 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).

Our second benchmark is a pension fund benchmark reported in Dyck and Pomorski (2010) calculated from CEM Benchmarking. Pension funds arguably are institutional investors similar in nature to SWFs in that they are very large, have open access to intermediation into all asset classes, and can absorb liquidity risk implied in alternative asset classes because of their long horizon.[13] (We consider how SWF horizons affect allocations later in the paper.) The CEM dataset, used in a number of recent papers including Ken French's presidential address (French, 2009) and Bauer and Frehen (2008), has data on pension fund holdings for 716 funds over the period 1992-2008. In 2008, 345 pension funds participated, accounting for $4.8 trillion in assets, with $2.3 trillion coming from non-US funds. To match size with our SWFs, we use allocations over time for only 90 pension funds, those with assets under management of over $10 billion for 2007.

We use CEM 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 reproduce individual companies (and thus countries and industries) of the MSCI indexes annually with IShares portfolios, 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 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. 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.

[13] 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.

The final piece is to allocate geography and industry breakdowns for private equity. We have no other detail in CEM, other than knowing the overall allocation to this asset class and knowing that this investment is done overwhelmingly through private equity funds. Thus, we use the time series of overall private equity fund investment found in Capital IQ to determine the country distribution of the investment. We apply industry breakdowns in proportion in to the public market in each country. Finally, we impose the home bias in private equity fund investing implied by the Canadian pension funds.

III.2 Univariate Comparisons of SWF and Financial Investor Benchmarks

Table 2 presents the SWF risky portfolio weights by geographic region, and in panel B data on regional allocations for benchmark financial investor portfolios. For each SWF, we first create a time-series average, from the years covered and then take an equal average across SWFs. The first conclusion we draw from Table 2 is the importance of looking broadly at SWF investments, for we see that public equities comprises less than half their portfolios. Combined, private equities and real estate account for 48% of their risky portfolios. And 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, Kuwait and GIC Singapore, as well as the quasi-indexed investments of Norway and Alaska.[14]

Comparing this allocation relative to the pension fund benchmark allocation provides some perspective on how unusual are their private equity and real estate holdings for an institutional investor. For these funds, risky portfolios are overwhelmingly pursued through public equities (85%) while private equities account for just 5 percent and real estate 10%. Looking at world capitalization, using our estimates based on Orbis, provides a different perspective, for here it appears as if the SWF are still underweighted on private equities. Our estimates suggest that potentially investable private equities account for 52 percent of world capitalization.

A second conclusion that emerges is that SWFs pursue a very different geographic slant in investment than suggested by financial investor benchmarks, and the differences are greatest

[14] 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.

in their private equity investments. SWFs have much more pronounced allocation to Middle East and to Asia, particularly in their private equity investments - home regions to the vast majority of SWFs. The gap between SWF and reference financial investor benchmarks is again seen most clearly in comparing with the pension fund investor benchmark, that shows only 1% to the Middle East and 3.5% to Asia. SWFs allocate 47 percent and 23 percent respectively, to the Middle East and Asia, with higher allocations in each of the risky asset classes. SWF allocations also exceed the world capitalization benchmarks, but by smaller amounts.

Taken together, this preliminary data paints a different picture of SWFs. It suggests that the impact on global markets may be greater for private equities, where there is both significant dollars at stake as well as significant stakes by company, which we pick up on later in the paper. Second, it suggests that the impact might be greatest for regional rather than Western markets. Accounting for real estate investments, which are predominantly local, further reinforces the importance of domestic assets in SWF portfolios. And it is precisely in these companies where ownership stakes are largest.

To address the question of whether there is an industrial focus to investments, we break down SWF investments into 14 industries for public and private equities in Table 3. The table shows again that SWFs vary dramatically from financial investor benchmarks.

Column 4 which combines the public and private equity industry allocations shows that the industry of greatest SWF influence is financial services, which accounts for 20.7 percent of SWF portfolios, coming primarily from public equities, but also through private equities. This exceeds pension fund allocations by 10 percent. The two other industries that show the most striking variation are energy and transportation. In both areas, SWF are again overweighted against both the pension fund and world market capitalization benchmarks. Finally, SWFs are much more heavily weighted in real estate than pension fund benchmarks, although there is no difference against the world capitalization benchmark.

III.3 Non-Financial Income Hedging Variables

The comparative statistics suggest a limit to the power of benchmarks to explain investment allocations; however, it may be that SWFs incorporate non-financial income risk

hedging in their allocations. The non-financial income risk literature[15] predicts, first, that SWFs should have a lower appetite for risk if the variance of national income is high, assuming a positive correlation between income and risky asset returns, or vice versa if the correlation between income and risky assets is negative. Following Massa and Siminov (2006), we construct *StDev(National Income)*Sign* as the standard deviation of SWF home country income times the sign of the correlation of the GDP with the market global return.

Second, SWFs should adjust allocations toward industries or geographies negatively correlated or uncorrelated with income stream. We use the 19 year, rolling correlation of SWF country GDP and value weighted returns in the geography-industry sector. As in the variance variable, the sign of the relationship between GDP and market returns matters. Again following Massa and Siminov (2006), we split the correlation effect according to whether national income is positively or negatively correlated with returns.

Most of the non-financial income literature focuses on individuals' portfolio choice between fixed income and public equities; in these dimensions the notion of hedging away from risk (away from equity) is fairly straightforward. In our case, we have multiple risky asset classes. Dimmock (2009), in studying endowments, also considers multiple risky asset classes. His approach to understanding income risk hedging is to allow hedging to be identified uniquely for each asset class. Our main specification follows this approach, by interacting the variance and correlation income hedging variables with indicators for asset class.

We also employ a second method of asserting risk on the industry-geography-asset class portfolio choices by multiplying the hedge variables by the industry-geography betas to see whether hedging alters the appetite for beta-measured risk. This method is straightforward and appealing for public equities. For real estate, we use publicly traded real estate industry betas for the entire real estate holdings. This is imperfect in that the real estate betas from the market will be higher than private property holdings, but since beta risk for real estate is not a perfect

[15] Guiso, Jappelli, and Terlizzese (1996), Heaton and Lucas (2000), Vissing-Jorgensen (2002) look at fixed income versus equity allocations and find evidence for hedging the variance of non-financial income with portfolios exposure to equities, but little-to-no evidence of hedging of the correlation of income with the market. Dimmock (2009) finds that universities with greater non-financial income risk shift endowments towards fixed income and away from alternative assets. Massa and Siminov (2006) offer evidence that investors in fact tilt their portfolios *toward* industries and geographies correlated with their non-financial income sources of risk, offering an explanation that such behavior reflects investing toward greater familiarity in an information-constrained world.

concept for portfolio risk, we think the bias goes in the correcting direction. 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).[16]

III.4 State Industrial Planner Variables

The state may have a developmental agenda akin to a state planner driving its portfolio choice. Governments are interested in long-term sustainable employment for their citizens. Diversifying the economic basis can help in achieving this goal, a particularly important objective in countries that rely on natural resource wealth with a finite life. This can also be seen as a 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 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).

We construct state planner variables that measure state planning in execution and variables capturing country dimensions that seemingly enhance the state's incentive or mechanism for industrial planning. The first state planning variable, *Industrial Plan,* is a dummy variable constructed by reading country strategic plans (as opposed to SWF documents), that codes an industry 1 if it is signaled-out for development. The second state planning variable, S*kill*, is the proportion of the domestic investment in each industry that is invested with controlling stake (of over 20%). SWFs may view themselves as investors with superior information or skill in particular sectors or industries and are willing to take active positions to capitalize on that knowledge.

[16] 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.

The importance of industrial planning objectives is likely to depend on a variety of factors. Our third through sixth state planning variables are the horizon until the main source of revenue for the SWF runs out, the level of industrial diversification in the country, the age of the SWF (newer may mean more immediate mandates) and the proportion of the population that is young (under the age of 20). These variables capture the urgency the state may feel to create alternative labor opportunities for the population. Finally, the last variable captures the politicization of the fund. We gather board member names and track what percent have or have had affiliations with the government.

III.4 Specification & Variable Statistics

The simple linear specification is: $\omega_{bft} = X_{bft}\mathrm{B} + S_{bft}\Psi + \varepsilon_{bft}$, in which, we regress the SWF portfolio weight ω on financial investor benchmark variables *X* and state planner variables S. We include 20 SWFs denoted by index *f*, unbalanced covering the years 1998-2008 with time denoted *t*. Rather than get notationally caught up in multiple index dimensions, we denote the asset class-industry-geography "bin" as *b*, with 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. We first show some estimations collapsed to industry-asset class (17 X3 bins).

The financial investor variables *X* are:

(X.1) *Capitalization* benchmark: *Mean Asset Class* allocation,

(X.2) *Capitalization: Bin* allocation (which sum to 1 across bins),

(X.3) *Pension Fund*: *Mean Asset Class* allocation,

(X.4) *Pension Fund: Bin* allocation (which sum to 1 across bins),

(X.5) Correlation of the industry-geography bin's performance with the SWF county GDP $(Corr(GDP,IndustryRegion))^{+}$, scaled by the log of national income over the SWF time series average portfolio size, or zero if the sign of the correlation of the bin's performance with SFW country GDP is negative

(X.6) Correlation of the industry-geography bin's performance with the SWF county GDP *(Corr*(*GDP*, *IndustryRegion*))¯, scaled by the log of national income over the SWF time series average portfolio size, or zero if the sign of the correlation of the bin's performance with SFW country GDP is positive

(X.7) Standard deviation of SWF country GDP, scaled by log of national income over the SWF time series average portfolio size, times the sign of the correlation of country GDP with world market returns. (*StDev(GDP)*Sign*)

(X.8) Log of *Foreign Reserves* divided by national income.

Five points are worth note about the benchmark variables. First, we include the average benchmark allocations to the asset class X.1 and X.3 as separate variables from the overall allocation weights X.2 and X.4, so that we can investigate allocations across asset classes. Second, it is worth re-iterating that the pension fund benchmarks have built-in home bias specific to the SWF, whereas the capitalization benchmark does not. Third, we scale the hedging variables by GDP to reflect the importance of hedging to the portfolio following, e.g., Heaton and Lucas (2000). Fourth, the correlation variables of the industry-geography with all of the hedging variables speak to a shift in the risk-return preference for that bin; thus we need to multiply the variable by the riskiness of the bin. We do this by multiply the hedge variable times an indicator for the asset class and by multiplying each variable by the beta of the bin in question (as described in section III).

The state planner variables are:

IP.1 Whether or not the industry is in the country strategic *Industrial Plan*

IP.2 *Industrial Plan* times the number of years until *Oil* runs out

IP.3 *Perceived Skill* of the SWF in the industry, defined as the percentage of domestic investment in the industry invested with control (>20% stake), or the mean of skill across all SWFs if the particular SWF does not invest in the bin industry.

IP.4 *Perceived Skill* times *Board Experience*

SWFs no doubt have serial correlation in asset allocations. We focus on a very conservative model in which we cluster standard errors at the SWF level following Bertrand, Duflo and Mullainathan (2004). We then 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.

Also, technically, we should implement 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 a clustered standard errors model, we do not have sufficient observations to implement this model. However, we follow Beckwith (1972) and show robustness to a model in which one bin (real estate) is left out, such that the residual can force the adding-up. Since our results do not materially differ, we ignore this constraint so that we can present implications for all regions and industries, not just in comparison to the omitted categories.

Summary Statistics

Table 4 will be included in a future draft.

IV. Results

IV.1 Estimations

In Table 5 we begin by exploring the power of financial investor objectives to explain the industry and asset class selection of SWF investments, collapsing the geography. The dependent variable is the SWF portfolio weight to real estate and to the 13 industries each for public and private equity. We have such data for 20 SWFs and for an average of 6 years per SWF.

We begin in column 1 by seeing how the financial investor variables do; namely, they provide substantial explanatory power, producing an R-Square of 0.191 percent, with the vast majority of explanatory power coming from the pension fund benchmark and the capitalization mean asset class allocation. The 0.191 percent of explained variation, though, is an overstatement of the

explanatory power of the financial investor perspective for the national income variation hedging variables comes in with the opposite to the predicted sign. In column2, we introduce industrial planning variables alone. These variables produce an R-Square of 0.11, with significant signs consistent with our predictions. SWFs allocate their portfolios toward country strategic industrial plan industries, especially when the oil reserves are running out. SWFs also allocate toward perceived skill industries, especially when the board has less asset management education or experience.

Column 3 integrates the financial investor and industrial planner variables. The important change in column 3 is that we find encouraging results in the financial investor hedging. In particular, once the industrial planning is incorporated, SWFs appear to take on more risk if they have greater country foreign reserves, and SWFs whose income is negatively correlated with the world market (oil countries) hedge toward more risk, consistent with theory. Column 4 reproduces the results of column 3 using the Prais-Winsten AR-1 GLS estimation. Note that the serial correlation rho (reported at the bottom of the table) is substantial, at 0.858, as we would expect. However, this specification produces very similar results to column 3, with less conservative standard errors. It does reinforce the robustness of these results.

The final four columns look within the allocations of public equity (columns 5-6) and private equity (columns 7-8). We only include the pension benchmark because the capitalization benchmark across industries within a asset class has no power (and with the clustering, we need to be somewhat parsimonious). The pension benchmark is very large in magnitude and significance for public equities and weaker for private equities. Hedging is almost absent. The industrial planning variables show up strongly significant in both public and private equity, with the role of the strategic industrial plan being augmented in private equity.[17] In fact, because of the importance of industrial plan for private equity allocations, the R-Square is higher in the private equity specifications (0.210) than the public equity ones (0.146).

In Table 6, we explore the ability of financial investor and industrial planner perspectives to explain variation in industry choice across geography. Recall that geography includes the home country as one region, and that the pension benchmark is home-biased as if it were a

[17] We will discuss the economic meaning of these coefficients in a future draft. We apologize for the omission.

pension fund in the SWF country. Thus, it is not surprising that the pension variables keep significant explanatory power, even across geographies. Together, the column 1 financial investor variables add up to an R-Square of 0.077. Because the capitalization benchmark is the wrong sign and significant, we throw it out in the remaining columns, to not attribute explanatory power to the negative result. Column 2 shows that the industrial planning variables also do very well, all with the predicted signs and a total R-Square of 0.61. We add one extra variable relative to Table 5 – the perceived skill interacted with a domestic country variable. Our interest, from anecdotal evidence, is whether SWFs who perceive themselves to have alpha in particular industries take that skill into other goegraphies. We find evidence for this. The majority of the economic magnitude on perceived skill is for investing at home. Perceived Skill* Domestic has a coefficient of 2.807 relative to 0.470 without the interaction. Nevertheless, both coefficients are positive and significant. SWFs are six times more likely to use perceived skill at home, but they do significantly tilt their portfolios abroad to perceived alpha industries.

Column 3 of Table 6 reports our main estimation result. Integrating financial investing and industrial planning, we can explain 14.2 percent of the portfolio weight variation across asset class, industry and geography. The pension benchmark variables strongly predict portfolios, as do our industrial plan and perceived skill variables. The results is robust to the GLS-AR1 specification in column 4. We return to the column 3 results in a moment to further understand the variance explained by SWF.

Columns 5-8 repeat the exercise from Table 5 of just looking within the public equities portfolio (columns 5-6) and then within private equities (7-8). Here, we find that the pension allocations fail at being able to explain the private equity portfolio. We find some evidence for correlation hedging, in both public and private equities. The industrial planning variables also seem to explain the portfolio allocations in both public and private equities, although the perceived skill variables are much weaker in public equities in the AR specification.

IV.2 Inference from Estimations for Heterogeneity and Meaning

The objective of the paper is not just to look for significance of coefficients but to explain the variance across SWF portfolios, to assess how much wealth is being invested with financial

versus state planning motives, and to look at heterogeneities of how well we do in accounting for variation by SWF. We begin by breaking down R-Square:

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

ω, $\hat{\omega}_{FI}$, $\hat{\omega}_{IP}$ 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 industrial 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$_{SWF}$. A little algebra leads to a decomposition of R-Square into three components:

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

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, focusing on column 3, Table 6 results. As we noted in the prior section, the financial investor and industrial planner model explains 14.2 percent of the variation in risky portfolio holdings across industries 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, all three Dubai funds, Kuwait, Mubadala and ADIA.

The remaining two bars in Figure 1 allow us to show is that the SWFs explained extremely well by the model are primarily financial investors, but the large Middle Eastern SWFs explained still quite well are a mix of state planners and financial investors. For ease of exposition, we start by looking at the large SWFs (>$50 billion), for whom the model explains at

least 10 percent of the portfolio variation. Within this group, funds GIC Singapore, Norway, and ADIA are primarily explained by financial investor variables. A second set of these large funds, Qatar and Dubai World, have a third-to- half of their variation explained by industrial planning. For the final set of large funds, Kuwait, Investment Corporation of Dubai, Dubai Holding, and Singapore Temasek, the industrial planning variables explain the majority of explained variation. Together, these six larst two groups of SWFs account for $650 billion in wealth by our estimates, of which $553 billion is invested in risky assets. The smaller funds are more polar: most are industrial planning focused with the exception of Kazakhstan Global, Alaska, and Mubadala.

Should this be a concern, and if so, for whom? Table 7 allows look again at the regions and industries to offer assessment as to the real impact of SWFs. The first and fifth columns report the world capitalization (in US$ billion) for public and private equity respectively. Columns 2 and 3 (for public equity) and columns 6 and 7 (for private equity) report the SWF investments (in US$ billion) and the portion of world capitalization held by SWFs, respectively. Facts that emerge from Table 6 are:

(i.) SWFs own 6.4% and 4.3% of the public markets in the Middle East and Asia, respectively. Of this *almost all* is held with sufficient control interest (over 5%) to be called active investing. SWFs own 12% of private equity in the Middle East.

(ii.) SWFs own much smaller proportions of the Western and Pacific public markets (1%-2%), with little held as active investment, 15%. SWFs have almost no private equity investments in the West, Asia or the Pacific in 2008.

(iii.) SWF own 4.8% of public equity of Finance companies worldwide, investing with control interest in 70 percent of the cases.

(iv.) A few sectors seem unique in that SWF invest actively with control interest in both public and private markets – finance, energy, transportation, and transportation manufacturing.[18] Across these main four industries, SWFs hold active investments with control interest in 70% of the asset value; these assets account for 3% of world private and public capitalization for these four industries.

[18] From having done case studies on all of these companies, the reason for this fact seems to be that SWFs a combination of SWFs' inheriting state owned enterprises and SWFs using the personnel inherited from running state-owned enterprises to seek investments in sector in which they believe to have expertise.

In the next draft, we will show that the financial investor SWFs (i.e., the Western ones) are not the funds dominating the Asian and Middle Eastern markets and are not the funds investing with active control interests. Rather, it is the Middle Eastern funds and Singaporean Temasek for whom our state planning variables have explanatory power and who invest with active control interest in a concentrated set of (state planned) industries. It is not the fact that these SWFs are Middle Eastern that is the relevant take-away, but that these funds do have both industrial agenda and enough capital to impact industries and regional markets.

V Conclusion

Much of the discussion of SWFs has been framed as in friend or foe terms, focusing on the impact of SWFs from the perspective of developed western economies. The lack of information about portfolios has flamed such divergent and somewhat extreme views. In this paper we have gathered micro based evidence on SWF portfolios of not only international public equities but also domestic public equities, domestic and foreign private equities and real estate investments. This more complete characterization of SWF portfolios allows for a test of these as well as other perspectives on SWFs.

The summary data suggests a need to go beyond these caricatures of potential SWF objectives to consider other richer objectives that stem from taking a home country perspective. SWFs, especially those in very resource-driven, developing countries, have state planner agendas that are identifiable in their portfolio allocations. Two financial investor benchmarks and hedging variables are significant in explaining up to an R-Square of 16.5 percent of the variation across SWF allocations but do a better job of explaining variation for the western SWFs than the Middle Eastern ones. State planning is important for all of the large Middle Eastern and some of the Asian SWFS.

In terms of impact, the statistics from our unique data show that SWFs (the ones with state planner agenda) invest actively, with control interests over 5%, in a select set of industries – finance, energy, transport and telecommunications. In the finance industry, SWFs own 5% of overall public equity. We explain 22.6 percent of the SWF portfolio variation in the model of this paper. We leave open for our companion paper to ask how much agency issues affect the

unexplained allocations or whether agency issues affect how SWFs enter and affect these state planner industries and geographies.

Appendix A – What is a SWF?

We need to be a bit careful to distinguish SWF investments from other State-funded investments, i.e., from portfolio investments made by central banks or state-run pension funds or from operating investments made into state-owned enterprises. In order to do so, 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.[19] 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

[19] 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.

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.

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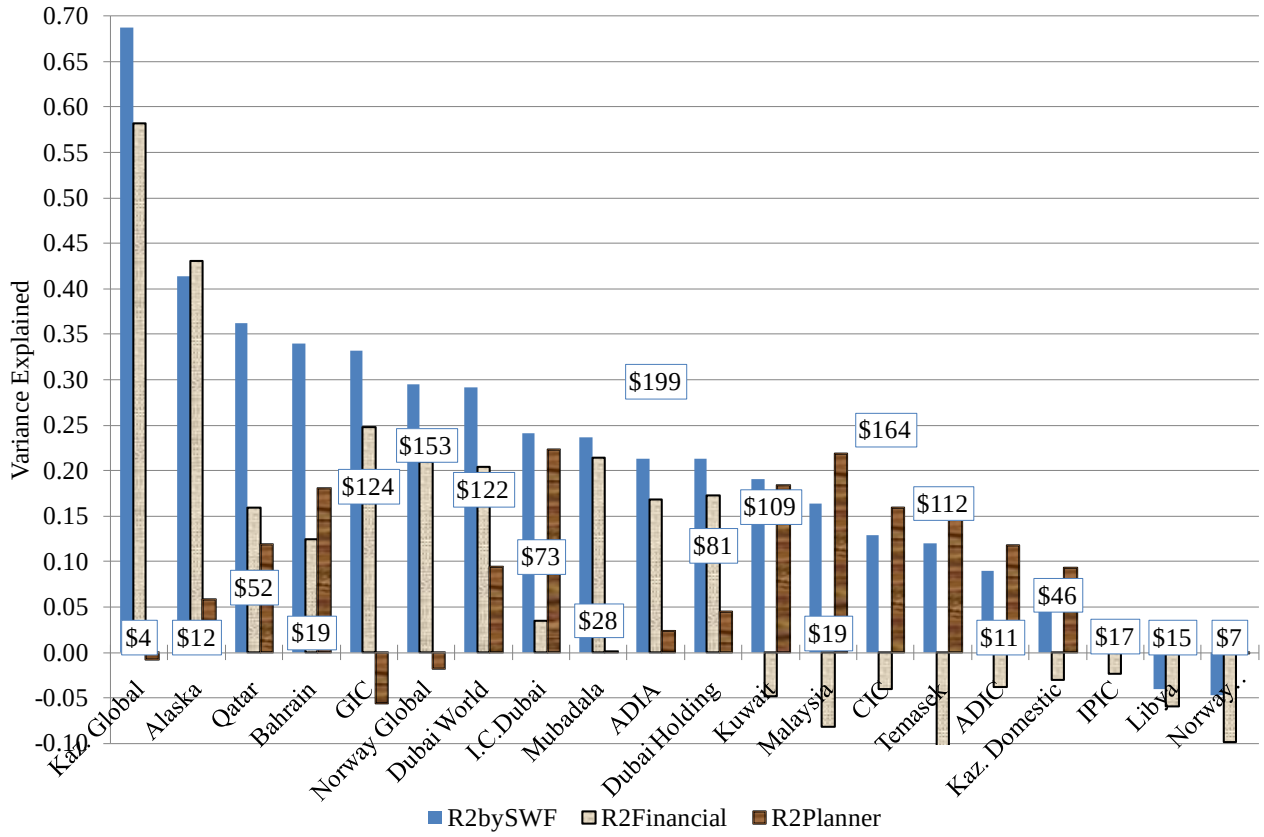


Figure 1: Proportions of Explained Portfolio Weights Explained by the Financial Investor and State Planner Variables by Sovereign Wealth Fund

The proportions plotted result from Column 3 estimates from Table 6. 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 Industrial 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. The blocks over each column report the 2008 SWF value, for reference.

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

To be included, SWFs had $10 billion in assets as of end of year 2007 and met the Monitor defintion of a SWF. Market estimates of SWF size come from Preqin and the Sovereign Wealth Fund Institute. We chose the year 2008 as an example for which market estimates were readily available. Our panel goes back as far as 1999, depending on SWF. The asterisk * denote a SWF for whom a portion of the column 4 total is indexed public equities. To ensure no double-counting, we dropped hundreds of investments made by SWF operating subsidiaries, often included in lists of SWF holdings. In column 5, the average number of companies excluing Norway Global and Alaska is presented in parentheses. Column 5 is the sample set of unique assets, not the 2008 count.

				Of this Paper's Calculated Total:			
	Estimates in Market	This Paper's Calculated Total	Difference	Risky Portfolio Specifically Identified: Equities & Real Estate	Number of Unique Companies, P.E. Funds & Properties	Bottom-up Inferred Fixed Income	Bottom-up Inferred Hedge Funds, Alternatives
	1	2	3	4	5	6	7
Abu Dhabi Investment Authority*	627,000	289,114	-322,913	217,692	101	70,922	40,058
Abu Dhabi Investment Council	combined	14,973		20,524	33	7,277	4,154
Alaska	26,700	23,307	-3,393	12,247	10,172	6,580	4,480
Bahrain - Mumtalakat	14,000	19,249	5,249	19,249	37	0	0
China Investment Corporation	200,000	261,411	61,411	164,243	16	97,168	0
Dubai Holding	103,000	81,483	-21,517	81,363	191	0	120
Dubai World	120,000	121,782	1,782	121,782	153	0	0
GIC - Singapore*	220,000	237,294	17,294	150,975	333	79,200	7,119
Investment Corp. of Dubai	82,000	74,067	-7,933	73,420	79	0	647
IPIC - Abu Dhabi	16,000	18,661	2,661	16,863	19	1,798	0
Kazakhstan National Fund*	22,700	22,072	-628	4,139	n/a	17,934	0
Kazyna-Samruk (Kazakhstan)	52,000	46,208	-5,792	46,208	101	0	0
Khazanah Malaysia	18,243	18,612	369	18,612	92	0	0
Kuwait Investment Authority*	228,000	186,715	-41,285	112,442	157	60,410	13,863
Libya Investment Authority	65,000	76,051	11,051	15,314	83	60,692	45
Mubadala (Abu Dhabi)	13,300	28,262	14,962	28,012	68	0	250
Norway Fund - Global	323,505	316,228	-7,277	153,267	14,482	162,961	0
Norway Fund - Domestic	12,342	12,342	0	6,541	253	5,801	0
Qatar Investment Authority*	60,000	58,119	-1,881	51,923	80	5,351	845
Temasek Singapore*	122,000	127,965	5,965	111,686	309	14,072	2,207
Total Funds	2,325,790	2,033,915	-291,876	1,426,500	26,759	590,165	73,789
Average Size	116,290	101,696		71,325	1,408 (124)	29,508	3,689

Table 2: Geography of SWF and Benchmark Portfolio Allocations

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)	0.131	0.093	0.007	0.231	**0.095**	**0.196**
Europe	0.170	0.048	0.010	0.228	-0.112	-0.011
Latin America	0.006	0.000	0.000	0.006	-0.051	0.001
Middle East & Africa	0.077	0.146	0.146	0.369	**0.349**	**0.359**
North America	0.108	0.005	0.018	0.130	-0.164	-0.369
Pacific	0.029	0.005	0.006	0.039	-0.115	-0.073
Total	0.520	0.296	0.187	1	0	0

Panel B: Benchmark Allocations (in percent of portfolio)

	Capitalization Benchmark Allocations				nd Benchmark Allocations			
	Public Equity	Private Equity	Real Estate	Total	Public Equity	Private Equity	Real Estate	Total
Asia (excl Japan & Middle East)	0.039	0.085	0.012	0.136	0.029	0.006		0.035
Europe	0.096	0.181	0.062	0.339	0.227	0.012		0.239
Latin America	0.010	0.041	0.006	0.056	0.004	0.000		0.005
Middle East & Africa	0.006	0.010	0.004	0.020	0.009	0.000		0.010
North America	0.135	0.106	0.053	0.294	0.465	0.035		0.500
Pacific	0.039	0.094	0.021	0.154	0.111	0.001		0.112
Total	0.324	0.516	0.160	1	0.846	0.054	0.100	1

Notes:

1. The average SWF percentage allocation is first a time series average for the SWF, then an equal average across SWFs.
2. For panel A, active public equities are defined as investments greater than 5%. All private equity investments are direct private equity in this draft (SWF p.e. fund investments not yet coded into the portfolio). We assume real estate investments are all active.
3. Explanations for the benchamrk calculations appear in section III of the text.
4. The median pension benchmark real estate allcoation is indexed to the home country, and thus the region is left blank.

Table 3: Industry Breakdown of SWF and Benchmark Portfolio Allocations

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	0.018	0.008		0.026	-0.012	-0.027
Consumer Services	0.049	0.020		0.069	-0.264	-0.034
Energy	0.051	0.097		0.148	**0.114**	**0.064**
Fabricated Products	0.007	0.000		0.007	-0.019	-0.027
Finance	0.163	0.044		0.207	**0.100**	0.011
Food	0.015	0.003		0.018	0.000	-0.006
Healthcare	0.025	0.003		0.028	-0.004	-0.056
Materials	0.028	0.023		0.051	-0.028	-0.011
Real Estate	0.001	0	0.188	0.188	0.012	0.087
Technology	0.022	0.005		0.027	-0.014	-0.058
Telecommunications	0.061	0.011		0.073	0.032	0.001
Transportation	0.036	0.050		0.086	**0.060**	**0.071**
Transportation Manufacturing	0.019	0.012		0.031	0.005	-0.013
Utilities	0.028	0.014		0.042	0.019	0.000
Total	0.520	0.292	0.188	1	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	0.020	0.018		0.038	0.050	0.003		0.053
Consumer Services	0.043	0.290		0.333	0.096	0.007		0.103
Energy	0.027	0.007		0.034	0.078	0.005		0.084
Fabricated Products	0.007	0.019		0.026	0.033	0.001		0.034
Finance	0.065	0.042		0.107	0.185	0.010		0.196
Food	0.009	0.009		0.018	0.022	0.002		0.024
Healthcare	0.027	0.005		0.032	0.079	0.006		0.085
Materials	0.023	0.055		0.079	0.058	0.003		0.062
Real Estate	0.004	0.012	0.160	0.176	0.001	0.000	0.100	0.102
Technology	0.028	0.013		0.041	0.080	0.005		0.084
Telecommunications	0.034	0.007		0.041	0.067	0.005		0.072
Transportation	0.007	0.019		0.026	0.014	0.001		0.015
Transportation Manufacturing	0.015	0.011		0.026	0.042	0.002		0.044
Utilities	0.015	0.008		0.023	0.040	0.003		0.043
Total	0.324	0.516	0.160	1	0.846	0.054	0.100	1

Notes: See Table 2

Table 5: Explanations of SWF Portfolio: Industry Estimation

Dependent Variable: SWF Portfolio Weight X 100					Within Public Equity		Within Private Equity	
	Cluster	Cluster	Cluster	GLS - AR1	Cluster	GLS - AR1	Cluster	GLS - AR1
	1	2	3	4	5	6	7	8
Pension Benchmark Weight	63.23***		55.60***	54.58***	80.90***	81.03***	46.98*	41.81***
	[13.29]		[13.37]	[7.029]	[16.07]	[11.68]	[22.89]	[9.337]
Pension: Asset Class Mean Weight	49.53		46.76*	23.09**				
	[29.81]		[24.50]	[9.810]				
Cap Benchmark Weight	-1.677		-2.421	-0.627				
	[1.717]		[2.805]	[4.127]				
Cap: Asset Class Mean Weight	106.3**		103.7***	73.14***				
	[43.82]		[34.62]	[8.303]				
Foreign Reserves*Beta	0.058		0.333***	0.136*	0.353	0.266	0.460*	0.192
	[0.052]		[0.093]	[0.074]	[0.282]	[0.349]	[0.237]	[0.165]
$Corr_{GDP,Industry}^{+}$*Beta	0.058		-0.072	-0.382	0.519	0.656	0.316	-0.180
	[0.208]		[0.481]	[0.393]	[1.424]	[1.743]	[0.508]	[0.855]
$Corr_{GDP,Industry}^{-}$*Beta	0.296		0.896***	0.425*	0.928	0.722	0.467	0.513
	[0.194]		[0.296]	[0.232]	[0.845]	[1.137]	[0.749]	[0.528]
$StDev_{GDP}$ *$I^{+/-}$*Beta	1.373***		0.074	0.473	3.329*	3.119	-0.834	0.184
	[0.382]		[0.599]	[1.064]	[1.637]	[4.000]	[1.602]	[2.153]
Industrial Plan		41.81**	33.37**	36.40***	32.10**	46.64***	60.79***	68.84***
		[14.63]	[11.74]	[3.515]	[11.74]	[13.86]	[17.44]	[13.28]
Industrial Plan *Oil Depletion		-0.439**	-0.346**	-0.386***	-0.317**	-0.480***	-0.602***	-0.699***
		[0.155]	[0.123]	[0.0385]	[0.125]	[0.150]	[0.186]	[0.143]
Perceived Skill		6.766***	7.890***	2.202***	12.38***	7.279***	26.28***	12.14***
		[1.497]	[1.417]	[0.785]	[3.349]	[2.710]	[4.411]	[2.173]
Perceived Skill*Board_Experience		-8.442***	-7.883***	-2.430*	-9.373**	-6.076	-29.44***	-17.96***
		[2.173]	[1.767]	[1.345]	[4.073]	[4.527]	[6.868]	[3.693]
Constant	-4.271	1.935***	-5.125**	-2.824***	-1.416	-0.622	-1.813*	0.47
	[2.489]	[0.615]	[1.965]	[0.513]	[1.332]	[1.304]	[0.990]	[1.091]
Observations	3321	3321	3321	3321	1599	1599	1599	1599
Rho (Two Step Prais)				0.858		0.700		0.802
R-squared	0.191	0.110	0.274	0.139	0.146	0.071	0.210	0.074

Notes

1. The dependent variable is the SWF portfolio weight to real estate (1 obs) or to public or private equity in one of 13 industries (26 obs) for the years covered by that SWF. Thus the observations are 20 SWFs X 27 industry-asset class combinations X 6 years.

2. Financial Investor Benchmark Variables: 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.

3. Hedging Variables: Correlation(GDP, Industry) is the correlation of the SWF country GDP with the industry. StDev(GDP)* I+/- is the standard deviation of home country GDP times the sign of the correlation of GDP with the industry. Both are multiplied times the industry beta, where the beta for private equity is further multiplied times 1.73 as described in the text.

4. Industry Planner Variables: Industrial plan is the region mean of the industry being mentioned in the country's strategic plan. Board_Experience is probability that a board member has financial education or asset management experience. SkillIndustry is the proportion of domestic investment invested in that industry with control (>20% stake). OilDepletion is years until depletion of oil reserves.

5. Standard errors are clustered at the SWF level in all columns except 4, 6 and 8, in which a GLS -AR1 estimation uses the Prais Winsten procedure.

Table 6: Explanations of SWF Portfolio: Industry-Geography Estimation

Dependent Variable: SWF Portfolio Weight X 100					Within Public Equity		Within Private Equity	
	Cluster	Cluster	Cluster	GLS - AR1	Cluster	GLS - AR1	Cluster	GLS - AR1
	1	2	3	4	5	6	7	8
Pension Benchmark Weight	56.09***		57.61***	49.60***	41.41***	32.29***	-2.942	-1.785
	[14.45]		[13.03]	[2.287]	[9.380]	[4.335]	[4.618]	[3.490]
Pension: Asset Class Mean Weight	58.28**		53.44**	29.82***				
	[20.93]		[18.88]	[7.493]				
Cap Benchmark Weight	-10.35**							
	[4.708]							
Cap: Asset Class Mean Weight	113.7**		105.9**	72.16***				
	[48.67]		[37.85]	[7.387]				
Foreign Reserves*Beta	-0.0088*		0.0104	-0.00124	-0.0172	-0.0163	-0.00673	-0.0096
	[0.0046]		[0.0068]	[0.0073]	[0.0237]	[0.0324]	[0.0151]	[0.0165]
$Corr_{GDP,IndustryRegion}^{+}$*Beta	-0.023		-0.026	-0.044	-0.240*	-0.267	-0.188***	-0.159*
	[0.026]		[0.043]	[0.046]	[0.131]	[0.174]	[0.063]	[0.094]
$Corr_{GDP,IndustryRegion}^{-}$*Beta	-0.001		-0.017	-0.007	0.019	0.004	0.046	-0.004
	[0.008]		[0.019]	[0.020]	[0.060]	[0.092]	[0.037]	[0.046]
$StDev_{GDP}$ *$I^{+/-}$*Beta	-0.168***		-0.068	-0.035	-0.287*	-0.270	-0.069	-0.065
	[0.035]		[0.048]	[0.082]	[0.147]	[0.297]	[0.108]	[0.165]
Industrial Plan		3.194***	3.094***	4.645***	5.260**	7.401***	6.949***	11.20***
		[1.037]	[0.876]	[0.268]	[1.967]	[0.715]	[2.325]	[0.695]
Industrial Plan *Oil Depletion		-0.031**	-0.029***	-0.047***	-0.047**	-0.072***	-0.062**	-0.110***
		[0.012]	[0.010]	[0.003]	[0.022]	[0.008]	[0.025]	[0.008]
Perceived Skill		0.470***	0.553***	0.118	0.953**	0.439	2.933***	1.553***
		[0.148]	[0.166]	[0.115]	[0.357]	[0.393]	[0.576]	[0.332]
Perceived Skill*Domestic		2.807***	3.022***	1.068***	6.169***	4.304***	6.212**	1.576***
		[0.653]	[0.801]	[0.104]	[1.557]	[0.369]	[2.598]	[0.307]
Perceived Skill*Board_Experience		-0.965***	-0.896***	-0.278	-1.423***	-0.887	-4.259***	-2.598***
		[0.172]	[0.184]	[0.196]	[0.467]	[0.649]	[0.872]	[0.558]
Constant	-0.652*	0.308***	-0.872**	-0.449***	0.068	0.320***	0.0624	0.388***
	[0.362]	[0.070]	[0.312]	[0.072]	[0.174]	[0.123]	[0.117]	[0.113]
Observations	23247	23247	23247	23247	11193	11193	11193	11193
Rho (Two Step Prais)				0.866		0.701		0.794
R-squared	0.077	0.061	0.142	0.052	0.098	0.038	0.127	0.038

Notes

1. The dependent variable is the SWF portfolio weight to real estate (1 obs) or to public or private equity in one of 13 industries (26 obs) and 7 geographies for the years covered by that SWF. Thus the observations are 20 SWFs X 27 industry-asset class combinations X 6 years X 7 geographies.

2. Financial Investor Benchmark Variables: 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.

3. Hedging Variables: Correlation(GDP, Industry) is the correlation of the SWF country GDP with the industry region. StDev(GDP)* I+/- is the standard deviation of home country GDP times the sign of the correlation of GDP with the industry. Both are multiplied times the industry-region beta, where the beta for private equity is further multiplied times 1.73 as described in the text.

4. Industry Planner Variables: Industrial plan is one if the industry region is mentioned in the country's strategic plan. Board_Experience is probability that a board member has financial education or asset management experience. SkillIndustry is the proportion of domestic investment invested in that industry with control (>20% stake). OilDepletion is years until depletion of oil reserves.

5. Standard errors are clustered at the SWF level in all columns except 4, 6 and 8, in which a GLS -AR1 estimation uses the Prais Winsten procedure.

Table 7: Sovereign Ownership of World Markets & Active Investments: 2008 Snapshot

	Public Equity				Private Equity			
Panel A: by Region	Market Capitalization (billions USD) 1	SWF Investments (billions USD) 2	% Market Capitalization Held by SWFs 3	% of SWF Holdings Invested Actively 4	Private Capitalization (billions USD) 5	SWF Investments (billions USD) 6	% Private Capitalization Held by SWFs 7	Acitve % of Overall SWF Portfolio 8
Asia	5,842	250	4.3%	79.3%	12,412	135	1.1%	86.6%
Europe	10,016	221	2.2%	15.9%	19,259	24	0.1%	24.0%
Latin America	1,648	12	0.8%	1.7%	5,759	0	0.0%	1.7%
Middle East & Africa	763	49	6.4%	80.8%	1,364	164	12.0%	95.6%
North America	12,714	154	1.2%	14.1%	10,044	8	0.1%	18.4%
Pacific	4,304	45	1.0%	8.3%	10,837	11	0.1%	26.5%
Total	37,447	731	2.0%	40.8%	59,675	342	0.6%	59.7%
Panel B: by Industry	1	2	3	4	5	6	7	8
Consumer Goods	1,959	24	1.2%	6.0%	2,135	6	0.3%	25.4%
Consumer Services	4,527	69	1.5%	9.3%	33,500	28	0.1%	35.1%
Energy	4,002	59	1.5%	10.5%	848	96	11.3%	66.0%
Fabricated Products	895	11	1.3%	4.4%	2,229	0	0.0%	8.2%
Finance	6,221	297	4.8%	70.3%	5,015	83	1.7%	76.8%
Food	1,144	17	1.5%	18.0%	1,059	1	0.1%	23.8%
Healthcare	2,874	35	1.2%	4.7%	582	3	0.5%	11.4%
Materials	3,095	43	1.4%	13.3%	6,975	14	0.2%	35.0%
Technology	1,943	23	1.2%	11.3%	1,440	0	0.0%	11.3%
Telecommunications	3,598	66	1.8%	45.2%	756	3	0.4%	47.7%
Transportation	928	27	2.9%	65.5%	2,354	18	0.7%	79.0%
Transportation Manufacturing	1,230	21	1.7%	33.3%	1,261	41	3.2%	77.4%
Utilities	2,359	38	1.6%	19.3%	977	19	1.9%	46.3%
Total (excluding real estate)	34,773	731	2.1%	40.8%	59,130	311	0.5%	58.5%