International Evidence on the Socioeconomic Determinants of Structural Pension Reform and Implications for Social Security in the United States

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ABSTRACT

The looming Social Security financing imbalance is one of the most pressing economic issues in the United States today. The resolution will have a substantial impact on the economic and social well-being of current and future generations. To date, academic research has focused mainly on whether the United States should undertake structural reform, rather than whether it is likely. I present a detailed treatment of the latter question.

I begin by describing two theoretical pension models. I then design a framework for analyzing historical instances of reform. I also offer a theoretical model of the reform decision and design a regression model to predict the likelihood of reform based on socioeconomic parameters. Finally, I examine the implications of my results for the United States and attempt to predict the likelihood of future reform.

I find four critical themes underlying the determinants of reform: the importance of the near-term demographic distribution, the need for easy access to transition financing, the consideration given to beneficial outcomes outside the pension sphere, and the failure of relative returns to impact the reform decision.

I determine that the variables driving cross-country comparisons of reform likelihood are the age dependency ratio (the ratio of workers to dependents), the overall level of taxes and the rate of national saving. Propensity to reform within a country over time is influenced by the presence of well-developed financial markets and a fiscal surplus. I conclude that the probability of reform in the United States has risen substantially in recent years and will continue to do so in the near future.
# TABLE OF CONTENTS

1 – Introduction 1

2 – Pension Theory 4
   2.1 – Comparative Returns 4
   2.2 – Risks 6
   2.3 – Funding Transition Costs 7

3 – Historical Analysis 9
   3.1 – Model Development 9
   3.2 – Reform in Developed Countries 11
   3.3 – Reform in Latin America 13
   3.4 – Reform in Central and Eastern Europe 15
   3.5 – Comparisons 17

4 – Model and Data 19
   4.1 – Theoretical Model 19
   4.2 – Sample Set 21
   4.3 – Variable Selection 23
   4.4 – Variable Analysis 24
   4.5 – Interpretation of Results 25

5 – Econometric Analysis 28
   5.1 – Estimators 28
   5.2 – Expectations of the Model 31
   5.3 – Results 35
   5.4 – Conclusions 37

6 – Implications for the United States 40
   6.1 – Historical Comparisons 40
   6.2 – Empirical Modeling 41
   6.3 – Interpreting the Empirical Results 42
   6.4 – Projecting Future Reform Possibilities 44
   6.5 – Conclusions 46

7 – Conclusion 48

8 – Tables and Graphs 51

9 – Reference List 62
1 - INTRODUCTION

The United States currently faces one of the most important social and economic questions in its history, what to do about Social Security. The old age pension program implemented by President Roosevelt has been remarkably successful in alleviating elderly poverty. But the financial burden is rapidly becoming untenable and significant changes will have to be made to the program if it is to remain financially solvent.

How best to reform the program is a contentious issue, and one that played an important role in the most recent presidential elections. Some advocate a careful adjustment of taxes and benefit payments to ensure the program’s solvency while keeping its basic structure intact. Historically, this has proven to be a short-lived solution. Others advocate more comprehensive structural reforms that would substantially change the character of the program.

The outcome of this debate will have far reaching economic and social consequences. Social Security is the single largest budget item of the Federal government and the debt owed to current workers is greater than twice the official national debt. Social Security benefits are the primary source of income for millions of elderly Americans. The decisions made now will affect the quality of life of both current and future generations of Americans.

The United States is not alone in facing this monumental decision. Over one hundred countries have some type of old age pension program and virtually all suffer from substantial fiscal problems. Internationally, the effort to address the situation has already begun. Numerous countries have reformed their programs, either by adjusting the financial balance or less commonly through a structural reform. An examination of
these international efforts offers many clues to the likelihood of structural reform in America, as well as the shape that such a reform could be expected to take.

In the twenty-two years since Chile became the first country to adopt a privatized system, a handful of other countries have made comparable changes to their pension systems. The majority of economic research on pension reform has focused on whether a country should reform, specifically by trying to determine if the economic and social benefits of reform outweigh the costs. Comparatively little research has been done on the related question of whether a country is likely to reform. Yet this question may be of comparable importance for policy makers since the benefits of reform are largely irrelevant for a country that is unable or unwilling to confront the economic, political and social obstacles to reform. Furthermore, long-term planning, both for citizens and governments requires a reasonable expectation about the nature of the system that is likely to be in place in the future.

My research focuses on testing a few hypotheses about the likely socioeconomic drivers of the decision to undertake structural pension reform. These are the demographic and macroeconomic variables affecting the viability and relative performance of a pay-as-you-go (PAYGO) system, the importance of access to transition financing and the weight of factors unrelated to pension scheme success in the decision-making process.

In particular, I hope to determine which of the demographic and economic factors that impact the results of the theoretical pension schemes outlined in the next section also impact the decision to reform. As I will demonstrate, factors such as the age dependency ratio (the ratio of working-age population to retirees), the population growth rate, GNP
growth and inflation all affect the viability as well as the relative success of the alternative pension schemes. I hope to determine which, if any, of these factors plays a significant role in the decision to undertake structural reform.

As I will also show, the costs of financing the transition from a PAYGO to a privatized scheme can be substantial. Access to “cheap” (financially and politically) financing, through increased taxes or the issuance of debt may substantially increase policymakers’ willingness to undertake structural reform, while high costs in the form of voter dissatisfaction or increased future borrowing costs may deter reform efforts.

Finally, as I will discuss in a later section, there appear to be a number of historical instances of reform in which expected benefits entirely unrelated to the relative merits of the different pension schemes were given great weight in the decision-making process. In particular, policymakers have chosen to undertake reform for the purposes of increasing national saving, promoting financial market development and to signal international creditors and institutions.

To test the above hypotheses, I begin with a discussion of the theoretical implications of PAYGO versus funded pension systems. I build a model to classify the structural pension reforms that have occurred to date and use it as a framework for a discussion of historical trends in pension reform. Next I build a theoretical model of the structural pension reform decision. Based on the model and the prior analysis, I choose a set of candidate variables and conduct univariate tests as well as apply an econometric model. In each of these sections I attempt to link the discussion to the central hypotheses outlined above. Finally I comment on the implications of my results for the prospects for reform in the United States.
2 - PENSION THEORY

There are two financing alternatives for a government-sponsored pension scheme. The most commonly employed is a debt-based scheme that pays benefits using current revenues. This is referred to as a pay-as-you-go, or PAYGO scheme. The alternative is a funded scheme in which contributions are saved to pay future claims. The funding mechanism has a substantial effect on the economic and social impact of the pension program.

2.1 - COMPARATIVE RETURNS:

In a PAYGO scheme benefits are paid to retirees using tax receipts from current workers. Consequently, the benefit is a function of the ratio of workers to retirees, or the age dependency ratio, as well as the average wage rate and the prevailing tax rate:

\[ \text{Average benefit} = \left(\frac{\text{workers}}{\text{retirees}}\right) \times \text{average wage} \times \text{tax rate} \]

Though this precise benefit formula is rarely used in practice, the relationship must hold over time for the system to be self-funding and solvent (Schieber, Shoven 1999). From the government’s perspective, the dependency ratio and average wage rate are both exogenously determined variables so it can only affect benefits by adjusting the tax rate. Even seemingly small unfavorable trends can wreak havoc with the financial balance of a PAYGO scheme. A shift in the age dependency ratio from 3:1 to 2:1 requires a 50% increase in taxes to maintain a constant benefit (Schieber, Shoven 1996).

In exchange for their tax payments, the government makes a promise to repay workers in the future. Given that the government is unlikely to renege, these IOUs are correctly viewed as an economically significant form of debt (Geanakaplos 1998). It will meet these future debt obligations by taxing future workers (Davis 1995). The
sponsoring government is perpetually rolling over its debt obligation by borrowing from the current cohort of workers to pay the debt owed to current retirees.

If the government is borrowing from its citizens under a PAYGO scheme, it obviously cannot be saving as well. In an unfunded PAYGO scheme, no assets are accumulated to pay future obligations. Consequently, capital appreciation cannot be relied upon to ensure an acceptable rate of return to the program’s “investors”.

Instead, the “return on investment” in a PAYGO pension scheme is determined by demographic and macroeconomic trends. If tax rates remain constant, the only way to increase benefits is with a larger tax base. The tax base expands if more workers are paying taxes because of population growth or because workers have more taxable income due to wage increases. Mathematically, the return on a PAYGO system is:

\[
\% \text{ return} = (1 + \text{wage growth}) \times (1 + \text{population growth}) - 1
\]

A PAYGO system delivers a high return to investors when the population is growing quickly and when wages are rising. Under these conditions, the results for pensioners are excellent.

A funded system utilizes a more typical saving mechanism; worker contributions are saved to pay future claims. In this case returns are dictated by the return on the investment vehicle chosen, usually government bonds or common stocks. The annual real rate of return on a privatized, prefunded system is:

\[
\% \text{ real return} = \frac{1 + \text{nominal return}}{1 + \text{inflation rate}} - 1
\]

Returns on a funded system are determined by inflation and the factors affecting the nominal return: economic growth, asset allocation and administrative and transaction costs.
2.2 - RISKS:

Their supporters portray both schemes as the less risky option. The reality is that each faces substantial risks that are difficult to compare quantitatively.

PAYGO schemes face three primary risks: demographic, economic and political. Demographic risk is the possibility that the ratio of workers to retirees in the future will be insufficient to provide adequate pension benefits without onerous levels of taxation. This is a possibility if the rate of population growth slows significantly or if the proportion of the population that is elderly rises. Economic risk derives from the ability of the wages of future generations to support an acceptable level of pension benefits for retirees. Low or negative GDP growth, as well as low or negative wage growth, may seriously impair the capacity of the economy to support expected benefits. Finally, political risk arises from the ability of the government to renege, or more commonly modify downward, its pension promises to retirees (Davis 1995). The law generally does not guarantee pension benefits and their continued provision is at the whim of the legislative body. Proponents of privatized schemes point out the seriousness of this risk in cases where the currently legislated tax-benefit framework is fiscally unbalanced.

The primary risk of funded pensions is that accumulated assets will be insufficient to support an adequate level of benefits. This stems from two sources: inflation risk and market risk (Davis 1995). Inflation is a considerable worry in countries with high or hyperinflation. The value of accumulated retirement assets can be degraded dramatically by even brief periods of high inflation. There is also the more general market risk that the invested assets will not perform commensurately with the overall market (Geanakoplos 1998). Finally, a number of the social protection features naturally
afforded by a PAYGO scheme are lost in a privatized system. These include risk sharing and insurance.

2.3 - FUNDING TRANSITION COSTS:

An important consideration in the decision to reform is the cost of funding the transition. Recall that in a PAYGO scheme, no real assets are accumulated. A financing gap arises in the transition because the first generation under a privatized system is saving for its own retirement rather than providing for the preceding cohort. The “savings” of the retired cohort, however, were used to fund the previous generation’s retirement. The result is that there are no assets provisioned for the current cohort of retirees. Active workers who have paid substantial sums into the existing PAYGO system face the same situation. There are two solutions to this problem.

The first, and more commonly adopted solution is to fund the transition by issuing government bonds to pensioners for the estimated net present value of their contributions. The other alternative is to raise taxes sufficiently to fund the costs of the retirements of both cohorts. The former has the advantage of flexibility because the cost of transition can be dispersed over a potentially infinite number of generations (Geanakoplos 1998) whereas taxation forces the entire incidence of the cost on the current generation of workers. However, the amount of debt required often make this an untenable solution.

The financing method has a substantial impact on the political and economic costs and benefits of the privatized system. Raising taxes is generally a difficult political proposition. On the other hand, assuming a large amount of additional debt may be undesirable in the eyes of international creditors (a point later discussed in greater detail).
The transition financing also has important economic implications. Proponents of reform point to higher savings rates and resultant higher rates of economic growth as a substantial benefit to privatization. However, if the transition is financed through the issuance of debt, there will be no net effect on national saving. If higher taxes are levied, national saving is only impacted if the government reduces spending in other areas commensurately.
3 - HISTORICAL ANALYSIS

The choices facing reform-minded policymakers are more complex than choosing between a pure PAYGO or privatized system. Myriad compromise solutions exist and often a mixed scheme that combines elements of both schemes is implemented. In fact, only about one fourth of reform efforts to date may be correctly described as total privatizations\(^1\). Furthermore, pension reform has been primarily concentrated in a few geographic regions, but isolated examples can be found in far corners of the world. Consequently, categorizing reform is not a straightforward task. Yet some methodology for thinking about the different reforms that have occurred is necessary. Numerous authors have devised classification schemes to aid in the study of pension reform. However, these systems are generally adequate to explain the structural differences in the schemes (Brooks 1998, Espina 1996, Mesa-Lago 2001) or their historical context (Muller 1999), but not both.

3.1 - MODEL DEVELOPMENT:

There are two possible means of classification. One is to try to devise a system to explain the decision to reform. This may be based on the geographic or economic characteristics of the sample states. The other possibility is to try to describe the structure of the reforms undertaken, possibly partial or total privatization. For the purpose of this study though, an ideal classification would contain some information about both.

The concentration of reformers in Latin America and the Caribbean (LAC) is well known and well documented. Less famous but equally meaningful is a small concentration in Central and Eastern Europe (CEE). The remainder of the reformers

\(^1\) Even in these instances, there is a great deal of policy variation. For example, the source of transition financing and whether a base level of income is guaranteed.
cannot be easily grouped geographically. Most are clustered in Western Europe. But this classification excludes Australia, a notable reformer, and is consequently unsatisfying. However, if we consider a category of developed countries (DC) instead, we both alleviate this problem and strengthen the classification system by highlighting its non-geographic component. Though LAC and CEE are geographic categorizations in name, they are in reality describing economic, social and political groupings as much as geographic ones.

As described, the classification system offers no information about the structure of the reform. For this I utilize the World Bank percent privatization measure, described in greater detail in the empirical section of this paper (Brooks 1998). Brooks estimates the expected percentage of future benefits provided by the privatized component of a reformed system. In cases of complete privatization, this value is 100%. Though not completely descriptive, this measure is a good indicator of the aggressiveness of the reform.

Graph 1 depicts the sixteen countries that are both included in the empirical study and estimated in the Brooks paper. The y-axis is the Brooks privatization estimate and the x-axis is time. The countries are color-coded according to the categories described above.

The graph hints that the categorization scheme has some merit. The three sets of countries are clearly grouped both along the time series and in the degree of privatization, suggesting that both the decision of when to reform and the structure of that reform can be traced to common underlying factors within the groups.
The reasons for reform across categories are often similar, particularly in the cases of Latin America and Eastern Europe. However, the relative importance of the various factors differs, causing the divergent patterns in structural outcomes witnessed. The legacy scheme also plays an important role in determining the course of reform (Bonoli 2000, Brooks, James 1999).

3.2 - REFORM IN DEVELOPED COUNTRIES:

The wave of reform in the developed countries took place primarily in the late 80’s and early 90’s. Policymakers were motivated by increasing concern about the long-term solvency of their pension programs due to changing demographic and economic conditions (Brooks 2001). As discussed previously, an elderly population adversely affects the economics of a PAYGO pension scheme. Demographic predictions made the future look even bleaker than the present. The demographic changes predicted for a few developed countries over the next 30 years are displayed in Table 1 (Bonoli 2000). One interesting observation is that within the context of the developed countries, the demographic problems of the reformers are not notably more severe than non-reformers, suggesting that the severity of the demographic situation is not the sole determinate of the propensity to reform.

The goal of pension reform in developed countries was simply to rebalance the finances of the system and ensure its long-term stability (Espina 1996) while ensuring the continuation of reasonable levels of benefits. This did not necessarily imply a structural reform. Numerous developed countries chose to stabilize their pension schemes by making parametric changes instead2. In this context, adding a privatized pillar was

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2 Possible parametric changes include raising the retirement age, changing the benefit indexation calculation, raising payroll taxes, etc.
considered quite radical, though in comparison to the Chilean reform that preceded it, partial privatization was a relatively moderate step. The reforms generally involved scaling back the size of the public PAYGO benefit in favor of a private pillar which is governmentally managed in some cases and occupationally based in others. In addition, voluntary private schemes were encouraged.

While the limited aims of reform efforts contributed to the comparatively moderate results, political considerations also played an important role. The difficulty of pension reform in developed countries is commonly ascribed to the political sensitivity of the issue. Legislating pension reform is politically delicate because of the concentration of vested interests and the diffuse, deferred benefits (Madrid 2000). These difficulties are believed to be particularly acute in the representative democracies of the developed countries, where the elderly often represent a large and powerful voting bloc (Muller 1999). Under these circumstances, limited reforms that appease varied interested groups stand a greater chance of success.

However, among the developed nations there does not appear to be a direct relationship between the degree of democracy and a propensity to undertake structural reform. While reformers in the United Kingdom were not subject to a lot of political interference (Bonoli 2000), the same cannot be said of the Swiss reformers. In Switzerland, the first developed country to reform, the indirect support of as much as 80% of the electorate is generally required to make policy decisions due to the structure of the legislative body (Bonoli 2000).

A better explanation is the willingness of policymakers to craft compromise solutions that are acceptable to potential dissenting groups (Bonoli 2000, Queisser 1998).
This helps to explain why privatizations in developed countries have tended to retain substantial PAYGO pillars and other elements of the pre-reform schemes. Decreasing the size of the public pillar and simultaneously mandating private pensions is often a more politically feasible means of introducing a privatized component to the system.

A unique feature of the developed country reforms is the emphasis on occupational pensions as an alternative to public schemes. Strengthening of the framework for private pensions and encouragement through tax incentives and other means are common tactics. This emphasis on private institutional pensions can be explained by the pre-existence of functioning capital markets and an appropriate legal and regulatory framework as well as long-standing experience with employer-provided pensions. One striking characteristic of the reformers among the developed countries is that they all had an unusual amount of prior experience in the provision of occupationally based pensions prior to reform (Brooks 1998).

The limited aims of pension reforms in developed countries produced limited results. Only in a few cases were privatizations implemented. The decision to undertake structural reform in lieu of parametric reform within the developed countries cannot easily be tied to the severity of the demographic crisis or the degree of democracy as many have speculated. A much stronger link can be made to functioning capital markets and prior experience with private pensions.

3.3 - REFORM IN LATIN AMERICA:

While reform in the developed countries was motivated primarily by the harmful impact of an aging population on the economics of a PAYGO pension system, this explanation is unsatisfying in the case of the Latin American reformers. The elderly
segment of the population is relatively smaller in Latin America than Western Europe (Schieber, Shoven 1996) and is not expected to age as quickly. The reforms must be motivated by other causes. The wave of reforms in LAC countries is best understood as an attempt by policymakers to use pension reform as a tool to achieve unrelated policy goals.

Chile’s privatization of its pension scheme was initially unexciting to the rest of the LAC countries because it was implemented by a military dictatorship and the approach was believed to be impractical in a democratic state. However, the apparent success of the reform did not go unnoticed by its neighbors, and may have inspired them to reform their own systems (Schieber, Shoven 1996). Among the benefits to the Chilean economy that were attributed to the reform were an apparent increase in national saving\(^3\) and the rapid development of modern financial markets (Vittas 1998). Chile’s apparent success in these areas was an important factor in the decision of many Latin American countries to follow suit (Madrid 2000).

Insulating the economy from the deleterious effects of capital flight was a primary goal of policymakers in Latin America, which had been harmed repeatedly by debt and exchange rate crises in the past. Policymakers saw pension reform as a way to address this issue by stockpiling a source of domestic capital and developing local financial markets (Edwards 1996). The presidents of both Mexico and Bolivia referred in public speeches to the beneficial effects of increased national saving and capital market development they expected to accrue from pension privatization (Madrid 2000).

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\(^3\) Whether or not pension privatization actually increased national saving in Chile is a matter of considerable debate. The most recent evidence seems to indicate that the net effect on saving is actually negative due to the debt used to finance the cost of the transition (Mesa-Lago 1994).
Gaining credibility with foreign lenders and the international investment community was another important reason for the privatizations (Baer 1994). Pension reform was seen as an excellent way to signal international creditors and institutions that a country was committed to supporting policies to promote economic growth and stability. This was regarded as critical to ensure the continuation of loans and aid from international sources. The World Bank, a noteworthy advocate of pension privatization and a major creditor of numerous LAC countries, played an important role in the Latin American reforms (Ney 2000).

Argentina is a notable exception to the trend of complete privatizations in Latin America. This may be because in the broader privatization of state-owned assets that was occurring at the time, Argentina was more interested in maximizing short-term income than in developing capital markets (Baer 1994). It is also possible that as the first LAC country to privatize after Chile, complete privatization was still considered unachievable by a democratic government.

3.4 - REFORM IN CENTRAL AND EASTERN EUROPE:

Examining the reasons for reform in CEE countries involves revisiting many of the themes from the wave of reform in both developed and Latin American countries. The divergences can be explained by the different historical contexts. “When comparing Latin America and CEE countries, it is important to bear in mind that the populations of [CEE countries], due to the heritage of the old system, expect more from the government” (Fougerolles 1996). Furthermore, CEE policymakers intentionally distanced themselves from LAC reform models, believing that the Chilean dictatorial
model was inappropriate (Muller 2001) and that Latin America was a less-developed region (Orenstein, 2000).

The decision to privatize public pension systems in Eastern Europe cannot be understood separately from the historical transition in 1989 (Muller 1999). The economies of Eastern Europe virtually collapsed in this period, with output falling fully 50% in some countries and unemployment rising dramatically (Fultz 2001). This created a situation comparable to the demographic crisis in developed countries, in which the number of workers was insufficient to support the cohort of retirees (Fultz 2001, Muller 1999). Table 2 compares the system dependency ratio and the demographic dependency ratio for four CEE countries, the United States and Switzerland in 1992. The comparatively large gap in the CEE countries is indicative of this problem (Fougerolles 1996). The financial imbalance created by this situation was sufficient to compel reform in a number of CEE countries.

At this time, there was a widespread movement to privatize large numbers of previously state-owned assets. There were numerous difficulties inherent in this effort, particularly a lack of domestic capital to purchase the assets and a lack of financial markets to properly price them (Jenkins 1991). Privatizing the pension schemes presented itself as a solution to both of these problems. The capital accumulated due to pension privatization would help to absorb the newly private assets and the fund companies would aid in their pricing. The strengthening of financial markets was perceived as an additional benefit (Jenkins 1991).

Prior to privatization of the public schemes, a number of countries tried to promote voluntary funded systems. These may be viewed as a proxy for West European
occupational schemes (Muller 1999). Participation in the voluntary schemes was disappointing, however (Fultz 2001). This may have been because the concept of a privatized system was so at odds with the state-run organizations more familiar to Eastern Europe (Heubeck 1999), whereas developed countries had a long-standing familiarity with the concept of private pensions. However, when a compulsory privatized system was offered as an alternative to the public PAYGO scheme in Hungary and Poland, the response was overwhelming, so much so that it endangered the arranged transition financing (Fultz 33). This suggests a lack of confidence that the PAYGO system would be able to pay the promised benefits (Jenkins 1991).

The reforms instituted in Eastern Europe were generally the least aggressive among the three categories. The primary motivations for reform were escaping the negative impact of a declining economy on the PAYGO system and creating a source of capital to absorb the shares arising from the privatization of state-owned assets. These goals could be achieved without complete privatization of the pension systems. Furthermore, the social and cultural displacement caused by the reforms acted as a limiting factor in the degree of privatization.

3.5 - COMPARISONS:

A few common threads run through all three groups. Whether caused by economic decline or changing demography, financial imbalance in the existing PAYGO system provided a powerful incentive for reform. Whereas in LAC and CEE countries this was due mostly to economic decline and low contributor participation, in developed countries it stemmed primarily from looming demographic trends and slowing rates of economic growth.
In LAC and CEE countries, pension reform was undertaken in the context of a broad privatization of state-owned enterprises. The attendant need for a larger domestic capital base and stronger financial markets as well as the signaling power of privatization were strong additional encouragements to reform (Brooks 2001). Whereas in CEE countries, these considerations seem to have been a means to an end, in LAC countries they were at times perhaps the most important consideration. This suggests a possible explanation for the variance in the degree of privatization in the two regions. The World Bank and foreign creditors played an important role in compelling pension reform as well.

Among developed countries, the degree of democracy undoubtedly affects the type of structural reform undertaken, though it is not clear that it substantially affects whether it is undertaken. Of greater significance is policymakers’ adeptness at crafting a solution that satisfies a wide range of interested parties. Finally, prior experience with private pensions is the most significant determinant among developed countries.
4 - MODEL AND DATA

I have examined both the theoretical alternative pension schemes and historical examples of their implementations. The next steps are to construct a theoretical model to describe the reform decision presented above and then utilize the model in an econometric analysis.

4.1 - THEORETICAL MODEL:

The decision to undertake structural pension reform in a country rests with a decision-maker that may be an individual or a legislative body. In all but the initial case of Chile, the decision maker(s) were democratically elected. As such, the basis for the theoretical model is an entity that wishes to gain re-election, either for itself or for like-minded individuals in its political party. I assume that the best way to do so is to generate satisfactory economic and social outcomes across a variety of issues for a utility maximizing constituency. In the case of pension reform, one may view a positive outcome as a weighted combination of a policy decision’s impact on the results of the pension scheme and all other economic and social outcomes.

Determining what constitutes a successful pension outcome is not necessarily straightforward and may vary across individuals. While ex post the most successful outcome is obviously the one offering the highest return, ex ante it may be the case that limiting risk and ensuring a stable payout, rather than a large one, are equally important goals. This is particularly true in the case of public pensions because the government is in most cases the provider of last resort.

A combination of demographic and economic factors determines the success of a pension scheme, whether measured by return or risk. These are predominantly derived
from the theoretical pension models described earlier and include the age dependency ratio, population growth, inflation, and GNP growth (refer to the theory section for an explanation of how and why).

The decision to reform necessarily implies the decision to assume the cost of funding the transition. This may be accomplished either through the issuance of debt or an increase in taxes. Presumably the financing method chosen, and possibly the decision to reform at all, is contingent to some extent on the relative cost of using debt or tax financing.

As mentioned previously, the success of policymakers is likely to be judged not only by a successful pension outcome, but by a large universe of economic and social conditions. However, for the purposes of this model I limit my discussion to those economic and social outcomes directly impacted by the pension scheme choice.

Research suggests three areas in which the decision to reform may impact the economy outside of the pension sphere.

Perhaps the most important perceived benefit of privatization is a subsequent increase in the level of national saving. Over long periods, high rates of national saving increase economic growth and consequently improve the economic situation of a policymaker’s constituency.

Rapid development of financial markets is another expected benefit of structural pension reform. Well-developed financial markets allow for the efficient distribution of capital and provide a vehicle for saving and capital accumulation. This desirable economic outcome is likely to provide an incentive for policymakers to undertake reform.
Finally, privatization is believed to act as a signal to international financial markets and institutions that policymakers are committed to policies that promote economic growth and stability. The benefits of increased access to outside capital and expertise are myriad and likely provide an incentive to policymakers to undertake reform.

The decision model helps to highlight the factors that should be included in the empirical model that I construct below. The decision by policymakers to undertake structural pension reform is understood as part of a broader attempt to gain re-election, which is accomplished by enhancing the economic and social well being of their constituents. Consequently, the pension reform decision is analyzed in the context of its impact on both the success of the pension scheme directly and the impact on unrelated areas. The model is depicted in Graph 2.

**4.2 - SAMPLE SET:**

The first step in building an empirical model was to choose an appropriate sample. The relatively small number of reforming states and their geographic concentration complicated this effort. I hoped to include as many reformers as possible in an unbiased sample set. A large percentage of reformers are in Latin America. Among the remainder, a substantial number are OECD countries. With this in mind, I defined the sample set as the OECD countries and the Organization of American States, or OAS, countries. The sample set included fifty-nine countries.

This is admittedly not the most desirable way to arrive at a sample set. However, I believe it is superior to the alternatives. One possibility would have been to define a broader sample set including Asia and Africa. However, severely limited availability of data would have made this a difficult sample set to work with. The other possibility,
utilized by Brooks and James (1999), is to handpick a sample set. Though theirs is more geographically diverse, I believe it is also more prone to selection bias.

The United States is a member of both the OECD and the OAS. However, I excluded the US from the sample set. While the results of the empirical study have lessons applicable beyond the US, the specific goal is to understand the implications of international reform efforts for the United States. Including US data in the study would influence the results in a way that would limit its usefulness as a tool for understanding US policy formation.

I included the years from 1980 to 1999 in the data set. Each data point describes a particular country in a single year. Chile was the first country to privatize its pension system in 1981. Unfortunately, few other countries reformed until the 1990’s. This creates a dilemma in two ways. The first is that a significant number of the reform data points are Chilean. The second is that including data back to 1980 enlarges the sample of non-reform data points, perhaps artificially. Chile’s reform was implemented by a military dictatorship. Consequently, the policy change did not generate significant international interest until Chile’s transition to democracy in 1989 (Brooks WP, Mesa-Lago 1994). Including data back to 1980 may imply a choice for policy-makers that they did not recognize. These considerations had to be weighed against a desire to capture broad economic trends over a long period of time.

To address this issue I ran each of the empirical models twice, including data back to 1980 in one run and 1990 in the other. In addition to addressing the above issue, this approach yielded valuable information about the sensitivity of the model to the time period examined.
4.3 - VARIABLE SELECTION:

In selecting variables for inclusion in the model I chose to focus on five areas I expected to affect the likelihood of reform. These were derived from the theoretical and historical examinations of pension reform above. They are (1) demographic factors, (2) macroeconomic variables, (3) government fiscal policy, (4) trade and (5) financial market development. In each category I chose a set of candidate variables from the World Bank Development Indicators data set. In all, I compiled twenty-five variables with five in each category.

Testing all twenty-five variables was impractical because of the limited availability of data for specific variables. My desire to test as many of these variables as possible had to be weighed against utilizing a large and representative a sample set. I used factor analysis to aid in choosing among the candidate variables. By performing a factor analysis procedure on subsets of the candidate variables, I was able to determine which variables best described the underlying economic factors I hoped to test. For example, financial market development might be represented by the market capitalization of listed companies, interest rate spreads or the amount of credit extended to the private sector. The factor analysis procedure helped me to determine that credit to the private sector best represents the trend of all the variables and hopefully, the underlying economic reality of financial market development. Using this technique I was able to narrow the list down to six variables:

*DEPEND* - Age dependency ratio (dependents [<15, >64] to working age population)

*TAX* – Central government tax revenue (% of GDP)

*DEFICIT* - Overall budget deficit, including grants (% of GDP)
SAVE - Gross domestic savings (% of GDP)

FINVEST - Foreign direct investment, net inflows (% of GDP)

CREDIT - Credit to private sector (% of GDP)

This set of variables had the fortunate combination of best representing the five categories above according to the factor analysis procedure and testing five specific hypotheses of interest (tax and deficit both fall in the government fiscal policy category but are both necessary to fully test the impact of availability of transition financing). Unfortunately, the variables are insufficient to test one additional hypothesis of interest, the impact of relative returns. For this I added three other variables:

POPGROW – Population growth rate (annual %)

INFLATE – Inflation, GDP deflator (annual %)

GNPGROW – GNP per capita growth (annual %)

Finally, I included a dummy variable for OECD membership and a time lag:

OECD – OECD member

YEAR – Time lag variable

For ease of comparison, I scaled all variables in the data set by dividing by the mean. The descriptive statistics for the variables are included in Table 3 below. The correlation coefficients are shown in Table 4.

4.4 - VARIABLE ANALYSIS:

Prior to building a comprehensive regression model, I hoped to investigate the variables individually to ensure a proper perspective when interpreting the regression results. The results of the statistical work below should offer the reader greater insight into what is driving the subsequent econometric model.
The countries in the sample set were grouped into four categories: early, mid, late and non-reformers. Early was defined as the period from 1980-1989, mid from 1990-1994 and late from 1995-1999. The time series was also divided according to the same intervals. In each variable, the average value for each category in each time period was calculated. The results are presented in Graphs 3A through 12A. Interpretations over time for a given category are read vertically, while cross-category comparisons of a single time period are read horizontally.

The second set of graphs is defined somewhat differently. In this case, three categories are defined: non, current and previous. Non refers to countries that haven’t yet or never reform, current refers to countries reforming during the current time period and previous refers to countries reforming in any prior time period. In each variable, the average value for each category in each time period was calculated. The interpretation in this case is different; the countries included in the categories are changing over time. Comparisons across categories in a single time period are read vertically, while the interpretation of a single category over time is read horizontally. The results are presented in Graphs 3B through 12B. The classification scheme for the two sets of graphs is described in Table 5 below.

4.5 - INTERPRETATION OF RESULTS:

The age dependency ratio graphs demonstrate the relatively high age dependency ratio of early and mid reformers. It is interesting that late reformers actually have lower age dependency ratios on average than non-reformers. Furthermore, depend for non-reformers and current reformers intersect in Graph B. This suggests that the importance of the age dependency ratio in the decision-making process has decreased over the period
of the study. It also hints that the motivation for LAC reforms differed from the other categories because they were concentrated in the late reformer group.

A similar result is seen in the credit graphs. Here there is a notable difference between the early reformers and the other groups. First movers tended to have well-developed financial markets but this was less true of later reformers. This result makes intuitive sense. Early reformers would have made policy changes in a vacuum of theoretical and historical evidence, making it unlikely that a government would risk introducing reform into unsound financial markets. Later research suggested that strong markets are not a strict prerequisite to reform (Vittas 1997), perhaps emboldening laggard reformers to go forward with less financial market preparation. In the most recent period, current reformers actually had less developed financial markets than non-reformers. This offers further support to my earlier assertion that policymakers may be reforming to force financial market development.

There is clearly a dominant international trend towards an increase in foreign domestic investment, as illustrated by the graphs. This suggests caution in interpreting the regression results for finvest because there may be a risk of spurious correlation. It is possible and even likely that there is a significant relationship between the two variables, but these results suggest caution in quantifying it. Another interesting result is the dramatic increase in foreign investment among the late reformers during the period of reform. This suggests the possibility that the signaling motivation was well founded as reform coincided with a dramatic increase in foreign investment. However, I hesitate to assume causation given the myriad other factors at work.
While non-reforms had high tax rates on average, current reformers had generally average rates. It is possible that the impact of taxes weighs most heavily on the reform decision in the upper range, meaning that inordinately high taxes are a deterrent to reform, but otherwise it has little effect. This is be consistent with my earlier analysis.

Early and mid reformers had comparatively low deficit levels, as did late reformers by the time they undertook reform. In every time period, non-reformers had the highest deficit levels, suggesting that a large deficit seriously hinders reform.

The graphs of national saving are instructive. Early, mid and non-reformers differed little in their level of national saving. However, late reformers had lower saving rates and this was particularly true in the period prior to reform. It is consistent with historical evidence that these reformers (primarily LAC countries) had boosting national saving as a top priority in implementing reform. The graph suggests that increasing national saving as a motivation for reform is a new phenomenon, but an important one.

The inflation graphs dramatically represent the Latin American hyperinflation. The late reformers are predominantly Latin American states and the high average inflation during the 80’s and early 90’s was expected. There is also a clear overall downward trend in inflation among all the categories in the sample. The skewed nature of the data suggests caution in interpreting empirical results arising from its use.

The GNP growth graphs are intriguing. Current reformers consistently have the highest rate of GNP growth among any of the groups. Those who have not reformed yet are consistently the slowest growers. This strongly suggests that a high rate of economic growth is conducive to pension reform, which is consistent with expectations. It would not be surprising to find that reform is more likely during periods of economic prosperity.
5 - ECONOMETRIC ANALYSIS

With the theoretical model and data analysis described above in mind, I built an econometric model of the reform decision.

5.1 - ESTIMATORS:

I hoped to be able to construct an econometric model that would confirm or refute the results predicted by the preceding sections. The first step in building such a model was choosing an appropriate estimator. This is complicated by the myriad possibilities for reform classification. The estimator used implies a great deal about the econometrician’s view of the appropriate method of studying reform. Binary, multinomial and continuous estimators are all potential candidates.

The most basic way to study the propensity to reform is with a binary distinction between reformers and non-reformers. This method is comparatively simple and, as long as the shortcomings of such a broad classification are recognized, also consistent. A more delicate question is exactly when the reform is deemed to have taken place. Obvious candidates are the legislation date and the implementation date. In a few cases, these differ substantially due to delays in implementing the new scheme. If the impact of the reform were of interest, the implementation date might make the most sense. However, when studying the causes of reform as in this case, the legislation date is most appropriate.

I defined a binary reform variable for each country in each year of the study. If a country had legislated a structural reform in that year or any prior year it was assigned a one. If not, the country was assigned a zero. I chose the logit model as the most
appropriate estimator for a regression with a binary dependent variable. The logit model is part of a class of binary response models of the form:

\[ P(y=1|x) = G(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k) \]

In the logit model, \( G \) is the logistic function below, which is between zero and one for all real numbers \( z \):

\[ G(z) = \frac{exp(z)}{1+exp(z)} \]

The logistic function is non-linear, and interpreting the partial effects of the beta coefficients is not as straightforward as a typical least squares regression (Wooldridge 2000). Consequently, the results are of greater value for examining directional effects and their relative magnitude rather than for the specific partial effect of an individual variable.

While building an empirical model based on a binary measure of reform was likely to yield interesting results, I hoped to add some richness to the study by increasing the amount of information contained in the dependent variable. A more descriptive measure of reform was needed. Numerous authors have attempted to categorize and group different types of reform. These are generally dichotomous or multinomial distributions between total and partial reforms. This method is unsatisfying because of the large structural differences in schemes grouped in a common category.

A study by the World Bank offers a more comprehensive way to measure reform. The study uses the approximate percent privatization of the new scheme. The author calculates the approximate percentage of future benefits provided by the privatized pillar as a percentage of the total benefit under the reformed system (See Brooks 1999 for a more detailed discussion). This is a rough measure of the percent privatization of the system (Brooks WP). Countries that have a pure PAYGO system are scored as a zero
while a completely privatized scheme is scored as a one. The percent privatization according to the World Bank method along with the year of reform legislation is included in Table 6 below.

I defined another reform variable, this time a fraction between zero and one inclusive, corresponding to the World Bank percent privatization estimate. I chose the tobit model as the most appropriate estimator. The tobit model is appropriate for a dependent variable that is continuous over positive variables but is bounded by zero on the downside where a zero outcome occurs in a non-trivial number of cases (Wooldridge 2000). The model is not a perfect description of the reform possibilities available because the reform outcome cannot be greater than 100%, meaning that it is bounded on two sides. However, it should yield reasonable results for these purposes.

The reader will note that a time failure model might also have been an appropriate choice for an estimator. This is a common approach to studying pension reform. However, it is a strong assumption that reform decisions are final and not subject to re-evaluation by policy makers. Yet this is the implication of any type of time failure model in which reformers are subsequently dropped from the sample set.

While the dominant international trend is clearly away from PAYGO schemes, it is possible that in the future instances of de-privatization will occur. It is difficult to argue with certainty that a prolonged economic slump or capital market underperformance would not convince policymakers to re-examine their programs at the request of unhappy constituents. A more generalized conceptual framework such as the one utilized in this study allows for this possibility.
5.2 - EXPECTATIONS OF THE MODEL:

Each variable included in the model was meant to test a specific hypothesis about the causes of pension reform. These hypotheses are derived directly from the theoretical and historical analysis discussed earlier. For each variable, I explicitly restate the hypothesis and the expected effect of the variable on the model.

The global demographic shift towards an elderly population is the most significant single reason for the wave of pension reforms. Particularly in the large, developed nations facing the most severe demographic crises, the increasingly unfavorable ratio of retirees to workers, or age dependency ratio, is the most important factor in implementing pension reform. As the ratio of retirees to workers rises, it makes increasing economic sense to convert to a privatized pension scheme. However, it is also true that as the age dependency ratio rises, so too do the political barriers to implementing such a change. A high age dependency ratio implies a proportionally large number of elderly voters, the group least inclined to support the reform. Nonetheless, I expect that an elderly population will positively impact the likelihood of reform.

Credit to private markets is included as a proxy variable for financial market development broadly. Well-developed financial markets will probably make people more comfortable and more supportive of the idea of investing their retirement income in that market. Additionally, countries with developed markets tend to have more experience with private pensions through occupational schemes or voluntary public programs. However, states may use pension reform specifically to promote financial market development, suggesting the opposite relationship. Consequently, the direction of correlation is unclear and may be non-linear. It is possible that financial market
development is an inducement to reform at particularly high or low levels, but is not an important consideration at median values.

Foreign domestic investment is included in the model to test the hypothesis that interactions with international institutions and markets encourage reform. Countries that are dependent on outside financing to support domestic development may be more sensitive to international opinion in setting economic policy. Governments wishing to attract foreign investment will pursue policies designed to signal their commitment to economic progress (Brooks WP). Pension reform is increasingly viewed as a sign that a government is committed to financial stability and economic growth (Feldstein 1998). The World Bank, a prominent advocate of pension privatization, is particularly influential both as a large creditor and a “beacon to shed light on economic prospects” (Zecchini 1997). Countries competing for foreign investment may be more likely to undertake reform to make themselves more attractive to outside investors (Brooks 2001). Consequently I expect that foreign direct investment will be positively correlated with pension reform.

I expect tax rates to be negatively correlated with reform efforts. Structural reform may require raising taxes to fund the cost of transition, which is likely to be particularly unpopular in states with high existing tax rates.

Government deficit is a particularly interesting variable. Its expected influence on the reform decision is disproportionate to its economic significance. Privatization often requires the explicit recognition of a large amount of previously implicit government debt because individuals may be compensated for their accumulated benefits.

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4 I would have liked to test debt here as well, for similar reasons. However, the greater availability of data made deficit a more appealing choice. I believe that either variable would yield the same empirical result given their high correlation, but the theoretical implications of using debt are slightly different.
under the old system through the issuance of government bonds. There is little economic
difference between the two forms of debt (Geanakoplos 1998). Yet financial markets
often fail to perceive this equivalence (Queisser 1998). Consequently, policymakers may
be reluctant to recognize implicit pension obligations due to the potential adverse impact
of a large amount of additional debt. High government debt loads can negatively impact
a country’s sovereign credit rating, making borrowing more expensive (Cantor 1996).
This may make policymakers reluctant to assume the additional debt associated with
pension reform. I expect that a government’s deficit will be negatively related to the
decision to reform.

I expect national saving to substantially impact the likelihood of reform. There is
extensive theoretical work that demonstrates that pension privatization will increase
national saving (Feldstein 1998) and the relationship is broadly accepted by
policymakers, making this effect a major factor in the reform decision (Brooks 1999).
This particular source of capital has the additional advantages of being domestically
based and long-term oriented, a particularly attractive feature for countries harmed by
previous foreign capital flights (Brooks 1999). Many policymakers, particularly in
developing countries, consider this a desirable effect of reform. In fact, in many cases it
seems to be a primary reason for reform, rather than a beneficial side effect. “Indeed,
many of the reforms that have been undertaken in the last few years only begin to make
sense when viewed from this perspective” (Madrid 2000). This is presumably a greater
incentive for policymakers in countries with low savings rates and consequently I expect
low rates of national savings to be positively correlated with reform.
The above variables were chosen through the factor analysis process. As discussed above, there is a sound theoretical reason for including each in the model. However, while these variables are necessary pieces of the study, they may not be sufficient. Limiting the model to these six variables ignores a few important factors that should be examined for completeness. Each of the following variables is important to the economic results of the alternative pension models described above. They are population growth, inflation and GNP growth.

Population growth and GNP growth are important determinants of the results of a PAYGO scheme. A high rate of population growth favors a PAYGO system because the burden of supporting each generation of retirees will always be distributed over a relatively larger number of workers. A high rate of GNP growth is also important to a PAYGO system because the wage base grows in line with GNP growth over long periods and the wage base is another determinant of available benefits (Muller 2000). However, a high rate of GNP growth is also a positive for a privatized system because it tends to lead to higher rates of return on capital over time. Consequently, while I expect that population growth will be negatively correlated with reform, the effect of GNP growth is unclear.

Compared to PAYGO schemes, privatized pensions are more sensitive to inflation (Bonoli 2000). High rates of inflation are damaging to the results of a privatized scheme because the real, or after inflation, value of accumulated pension assets is smaller. While an inflationary environment is not a positive for either system, it is less harmful to a PAYGO system. Consequently, I expect that inflation will be negatively correlated with reform.
I also included in the model a dummy variable for OECD membership. This was meant primarily to account for any predisposition towards reform among LAC countries stemming from its prevalence in that region. This is referred to as a demonstration effect. In addition, OECD members tend to be larger, more developed economies where the barriers to reform are higher. Consequently, I expect that OECD membership will be negatively correlated with reform.

Finally, I included a time lag variable in the model to account for the increasing propensity to reform over time due to increased adoption among neighboring states and a consequently lower political cost. The time lag helps to alleviate spurious correlation due to variables naturally increasing over time (mainly a concern for the *credit* and *finvest* variables).

The expected relationships between the independent variables and reform are summarized in Table 7 below.

5.3 - RESULTS:

The results of the empirical analysis are presented in Table 8 below. The beta coefficients and standard error are reported, along with the significance levels of the coefficients. The reader will note that the results for eight separate models are reported. I ran two separate models, a restricted model that included only the first six variables and the time lag, and an unrestricted model that included all eleven. I also used two different estimators and two different time periods in the study. The eight models represent the various combinations. The B (binary) and P (percent) headings refer to the logit and tobit models respectively. The runs marked R are the restricted model described above while the runs marked U are the unrestricted model. Runs that included data back to 1980 are
marked as 80, while runs back to 1990 are marked as 90. So, for example, BR80 is a run of the restricted model with data back to 1980, using the logit estimator.

Graph 13 below presents the results of the models. The graph displays the results from all eight models. The included error bars depict a 95% confidence interval. The graph reveals some information about the robustness of the results across the different models. If the coefficients for a given variable vary systematically in an alternating pattern (i.e. depend) it suggests that the time period of the study is influential in determining the impact of the variable. If the variance is between the first and second four models (i.e. tax) it suggests that the variable is affected by the inclusion of the additional factors in the unrestricted model. Generally speaking, the model proved quite robust against different time periods and the inclusion of additional factors. None of the variables varied directionally across any of the models and the relative size of the coefficients was fairly constant. However, the significance of the results did vary substantially across different models.

The age dependency ratio was the most significant factor in the model, confirming the expectation that it was the dominant influence on the decision to undertake structural pension reform. It had easily the largest impact in each model and was statistically significant at 5% or better in every case. In general, its impact was greater in the models utilizing data back to 1980.

Among the remaining restricted variables, the results were mixed. Credit had a moderate impact on the model, but the coefficients were consistently significant. The positive coefficients suggest that countries with more developed financial markets are
more likely candidates for reform. *Finvest* failed to test for statistical significance in all but two models and its coefficients were economically insignificant as well.

The results for the *tax* variable were mixed. It tested both economically and statistically significant in the restricted models, but its coefficients were smaller and less statistically significant in the unrestricted models. The negative coefficient suggests that, as expected, countries with higher taxes are less likely to reform, though the magnitude of the effect was somewhat surprising\(^5\). The *deficit* variable yielded similar results, though with smaller coefficients across the various models, suggesting that large deficits are a hindrance to reform. Finally, the results for *save* were similar to *depend*, with larger, more significant coefficients in the models including data back to 1980. The negative coefficients suggest that low rates of national saving may be an impetus to reform.

Among the unrestricted variables, the most interesting result was their lack of impact on the model. None tested statistically significant in any of the models at the 10% level. Only OECD and the time lag tested economically and statistically significant.

**5.4 - CONCLUSIONS:**

Four broad trends may be drawn from the empirical work presented. These are the importance of demographic trends in the calculus of reform, the weight of transition costs in the reform process, the willingness of policy makers to use reform as a tool to achieve unrelated political and economic ends and the lack of weight given to comparative returns in the reform decision.

The dominating factor in every model was the age dependency ratio, suggesting that, as expected, the unfavorable trend of demographic factors affecting the viability of

\(^5\) There is very little discussion or explanation of this in the literature and the result suggests an area for further inquiry.
PAYGO schemes is the primary consideration in the reform decision. However, it is interesting to note that *popgrow*, which also affects the demographic distribution in the long-term, failed to test significant. Given that *depend* was a measure of the current population distribution and *popgrow* affects only future ratios, it is reasonable to conclude that policymakers give more weight to imminent near-term threats to PAYGO financing viability than to potential long-term problems.

The importance of the *tax* and *deficit* variables across the different models suggests that financing the transition costs of pension reform is an important concern for policymakers. Both variables negatively impact the prospects for reform, suggesting that if a means of transition financing is not readily available, policymakers may be reluctant to undertake reform.

The importance of domestic political considerations is also apparent in the model. The positive impact of *credit* and the negative impact of *tax* on reform suggest that politicians are sensitive to public concerns in their decision-making process. Specifically, the public may be reluctant to invest their retirement assets in unfamiliar capital markets and may also be unwilling to finance transition costs through higher taxes.

The impact of national saving on the model is an indication that policymakers are willing to use pension reform as a tool to achieve unrelated policy goals, specifically increasing national saving. This is an important realization for policy analysis because it suggests that the reform decision cannot always be explained by factors related directly to the pension scheme.
Finally, the failure of *popgrow, inflate* and *gnpgrow* to test significant suggests that the relative returns of the PAYGO and funded alternatives has relatively little impact on the decision to reform. Collectively, these variables describe the likely relative outcomes of the two alternative schemes. Their insignificance suggests that this is not an important consideration for policymakers.
6 - IMPLICATIONS FOR THE UNITED STATES

Having examined the factors influencing the reform decision internationally, it is reasonable to ask what inferences can be drawn for the current debate in the United States. The implications of my results for the US are encouraging.

6.1 - HISTORICAL COMPARISONS:

The historical analysis suggests a good chance for reform in the US. The most applicable comparison is with the developed countries. Like the developed countries included in the study, the United States faces a deteriorating demographic situation that threatens the financial balance of its PAYGO pension scheme. The United States’ particular demographic situation is unremarkable compared to its peers. However, a particularly severe demographic crisis is not necessarily a prerequisite for reform.

The much larger impact on the propensity to reform arose from prior experience with private pensions. The United States probably has more experience with self-directed retirement savings than any country in the world. 401k, IRA and employer-sponsored pensions are all widely utilized pension vehicles.

The most important barrier to reform in the United States may be the political system. An important lesson of the historical study was that successful reform efforts in developed countries involve compromise solutions that satisfy a variety of interested parties. This type of negotiation is far better suited to the multi-party systems common in Western Europe than a two-party system like that found in the United States.
6.2 - EMPIRICAL MODELING:

The empirical model suggests a set of factors to scrutinize when trying to determine the likelihood of reform in the United States. Table 9 below compares data from the developed reformers to US data in the variables included in the model.

A significant consideration in the data is the differing demographic situation of the United States. The current age dependency ratios of the DC reformers and the United States are comparable. The substantially higher rate of population growth in the United States suggests that the demographic situation may not be as unfavorable as that of other developed countries in the future. However, my empirical results suggest that near-term considerations have a much greater impact on the reform decision.

Another striking characteristic of the data is the large amount of credit extended to the private sector. The United States has well-developed financial markets in comparison to its developed country peers. Both the historical and empirical analysis suggest that well-developed financial markets substantially increase the likelihood of reform.

The low relative tax rates and substantial budget surplus are important considerations as well. As mentioned previously, funding the cost of transition to a private system may be accomplished either through increased taxation or the issuance of debt. The former is likely to be an unpopular choice in states with high existing tax rates and the latter may be impractical when a large deficit already exists. Consequently, these
two factors are substantial positive signals for the likelihood of reform in the United States. The graph clearly displays a dramatic recent upward trend in the likelihood of reform in the United States. In fact, 1999, the most recent year for which data is available, is the only year in the twenty years of the study in which all 8 models predict a probability of reform greater than 50%.

6.3 - INTERPRETING THE EMPIRICAL RESULTS:

Plotting the results of the model for a single country raises an interesting point about the interpretation of the empirical results. While factors such as the age dependency ratio and the national savings rate may vary widely across countries and affect the respective likelihood of reform, they are unlikely to vary significantly within a single country over time. A different set of variables must explain variations in the predicted probability of reform in a single country over time. The variables differ in their significance depending on whether the model is being used to make cross-country comparisons or examine the time series of a single country. Another way to view this would be to consider some variables as determining variation in the level of the reform variable across countries while others determine its variation across time in a single country.

Given the above analysis, it is not surprising that when plotted with US data the unrestricted models vary so little from the restricted models. This is due to the slow

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6 Unfortunately, the budget surplus appears to have been quite short-lived. After a brief period of surplus, the federal government is operating at a deficit again, suggesting that the opportunity for deficit financing of the transition may have passed.
changes in population growth and the comparatively steady rates of GNP growth and inflation in the United States\(^7\).

Among the restricted variables, *depend, tax* and *save* are unlikely to vary substantially over short periods. This suggests that the shape of the plots is being driven primarily by the three remaining variables: *credit, finvest* and *deficit*. The failure of *finvest* to demonstrate statistical significance suggests that the true underlying drivers of changes in the propensity to reform over time are *credit* and *deficit*. Building a restricted model consisting exclusively of the credit and deficit variables allows me to test this hypothesis. The results of the model (the variance model) are presented in Graph 15 below and are indicated by the red plot. The variance model differs from the more sophisticated model in its level, suggesting that other factors increase the likelihood of reform in the United States relative to other countries. However, the *shape* of the model is virtually identical to the other models (the correlation coefficient between the two variable model and the average of the eight original models is .93), suggesting that *credit* and *deficit* explain most of the variation in the propensity to reform for the United States over time.

For comparison, I build a model from the *depend, tax* and *save* variables, the variables that I believe influence the level of reform propensity while failing to adequately explain its variation over time. The blue line in Graph 15 indicates this model (the level model). This model explains the overall level of reform much more successfully than the model above, but fails to adequately explain the variation across time.

\(^7\) Both GNP growth and inflation vary substantially in the United States. However, it is important to remember that the model was constructed using data from a large sample of economies, many far more volatile than the United States. In comparison, the variation in U.S. data is small.
The assertions made above are based on the graphical presentation of the alternative models. However, the same result is seen in the descriptive statistics. Table 10 offers a few descriptive statistics confirming the above comments. The average difference column displays the average annual difference between the models and an average of the eight original models. The next data point is the standard deviation of this average. Finally, the correlation coefficients of the two models with the average of the other models are presented. These statistics suggest that the level model does a better job of explaining the overall value of the reform propensity but that the relationship is less consistent and that the variance model tracks the average better.

The eight original models uniformly demonstrate a recently increasing propensity to reform in the United States. A more detailed examination reveals that this change over time is driven primarily by two factors, credit to private markets and deficit. This result is confirmation of two earlier conclusions. The first is that financial market development plays increases the likelihood of reform, as countries are more willing to commit their retirement savings to well-developed, familiar financial markets. The second is that deficit financing of the transition is greatly facilitated by a favorable government fiscal situation.

6.4 - PROJECTING FUTURE REFORM POSSIBILITIES:

This study could not be considered complete without attempting to address the possibilities for reform in the future. Doing so is greatly simplified by the above analysis, which allows us to concentrate on the variance model as an indicator of the prospects for reform in the future. Plugging possible future values for credit and deficit
into the model can generate a rough measure of future prospects. The difficult question remaining is how to generate those values.

One possibility, particularly in the case of deficit, would be to use government estimates. However, official estimates of the budget deficit are notoriously optimistic. Instead, I utilize the autoregressive integrated moving average (ARIMA) model to forecast future values. ARIMA produces a forecast using only historical data. These results are presented in Graphs 16A and 16B respectively. Historical data is in blue while ARIMA generated projections are in pink. Note that the credit data is in logarithmic form.

The ARIMA model predicts continuing growth in credit to the private sector and, interestingly, a return to fiscal deficit\textsuperscript{8}. Using these data points, I generate plots for the variance model through the year 2010. In addition, I plot the data points while adding the average difference between the variance model and the average of the eight original models, which effectively corrects for the variance model’s systematic deficiencies in predicting the level. This should produce a rough proxy of the results of the complete models projected into the future. The results are presented in Graph 18. The overriding trend is toward an increasing propensity to reform, though the negative influence of a fiscal deficit is also clear.

Given these neat results and the fairly severe simplification of my earlier model required to produce them, it is reasonable to try to evaluate how well the results fit with actual experience. In effect, I argue with the variance model that changes in the likelihood of pension reform in the United States are due to increasing private experience.

\textsuperscript{8} Using only data through 1999, the ARIMA tool predicted a return to deficit by 2003 while the government was still predicting large surpluses well into the future.
with financial markets and the fiscal health of the federal government. I demonstrated previously that prior financial market experience was the single most important determinant of reform in developed countries. I also argued that access to cheap transition financing was a necessary condition for reform. Debt financing is a much more politically viable means of funding transition costs because it does not require an explicit increase in taxes. The variance model demonstrates that reform is most likely when policymakers can offer their constituents a familiar alternative for pension reform at a relatively low cost. I believe that the smaller model is an excellent predictor of the changing likelihood of reform over periods of a few years where the much slower changing demographic and macroeconomic factors of the larger model do not play a significant role.

6.5 - CONCLUSIONS:

Examining the prospects for reform in the United States confirmed a number of earlier conclusions, specifically that well-developed financial markets and prior experience with private investment of retirement assets are important prerequisites to the reform decision. It is also clear that the government’s fiscal situation is crucial to the reform decision, perhaps because of the impact it has on the ease of financing the transition.

In comparison to its peers, the United States has a clear advantage in its overall tax level, a significant factor in the reform decision. Taxes in the United States are far lower than in the DC reformers. The dependency ratio and national saving rate, the two other factors of interest in cross-country comparison, are slightly unfavorable to the United States.
Over time, the growing familiarity with financial markets and instruments and experience with private retirement assets are a clear advantage to the United States, as is the apparently smaller deficits projected for the future.

In conclusion, the statistical signals point to an excellent chance for reform in the United States in the current decade.
7 - CONCLUSIONS

The preceding study is unusual in its focus on the causes of reform rather than its ramifications. I began by comparing the theoretical implications of PAYGO and private pension systems. This analysis suggested that demographic factors such as the age dependency ratio and population growth rate as well as economic factors such as GDP growth and inflation impact the relative success of the alternative schemes. The theoretical analysis also identified two alternative methods of financing the transition, debt and taxes, and the ramifications of each.

The historical analysis began by defining a framework for classifying previous instances of reform. The scheme classifies reformers by their geographic, economic and political characteristics as well as by a quantitative measure of the structure of the reform.

An analysis of reform efforts in developed countries suggested demographic trends and their impact on PAYGO financing as the overriding motivation for reform. Prior experience with private pensions and the associated well-developed financial markets was deemed to be a critical factor in determining whether structural reform was likely to be undertaken.

In developing countries, strained PAYGO financing was more commonly due to declines in productivity and low rates of worker participation. In many instances, factors unrelated to the efficacy of the proposed pension scheme were integral to the reform decision. These included the promotion of capital market development, increasing the rate of domestic saving and signaling to international markets and institutions.

The results of the historical analysis were generally confirmed in the empirical study. As expected, the age dependency ratio proved to be dominant in the reform
decision. Political considerations were also shown to play an important role in the decision-making process, as both the tax and credit variables proved significant to the model. Transition financing costs are also taken into account, as evidenced by the impact on the model of both the deficit and tax variables. The model also offered evidence for the conclusion that the likely relative success of the alternative schemes plays little role in the reform decision, as evidenced by the failure of the population growth, inflation and GNP growth variables to be significant.

While the empirical analysis was comprehensive, it was by no means exhaustive. In particular, it would be interesting to run the models described above utilizing data from the OECD and OAS countries separately. It is clear that the primary motivators for reform are different in the two cases and a clearer picture of this might arise from separate statistical work. It would also be interesting to repeat the study using different estimators and different statistical techniques. For example, it would be interesting to see how the results would be affected by utilizing a time failure estimator or alternatively, characterizing previous reformers separately from current reformers.

Finally, the implications of these results for the United States were examined. Comparisons with a relevant peer group were made and the suitability of the United States for reform given its highly developed capital markets and prior experience with private pensions was discussed. Further empirical analysis revealed the age dependency ratio, tax rates and national saving as the primary drivers of U.S. reform suitability in comparison to other countries while credit and deficit were determined to be the primary influences on the United States over time.
The probability of reform in the United States according to the models developed in the empirical section was plotted. These results demonstrated a substantial increase in the likelihood of reform in the last half-decade. Projections of the likelihood of future reform were made utilizing a simplified, two-variable model. This model included only the variables that had been previously determined to be driving the U.S. reform decision over time, *credit* and *deficit*. Projections of the future value of these variables were made using the ARIMA forecasting technique. Based on these results, I concluded that there is an excellent chance of some type of structural pension reform in the United States in this decade.
TABLES AND GRAPHS

TABLE 1

Percentage of Population Over Age 65

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<td>12.5</td>
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* Reformer

TABLE 2

System and Demographic Dependency Ratios, 1992

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GRAPH 1

Percent Privatization By Region
**TABLE 3**

Descriptive Statistics

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**TABLE 4**

Correlation Coefficients

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**TABLE 5**

Classification Scheme

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GRAPH 2

Illustration of Theoretical Model

Voters
Utility Maximizers
Max voter utility

Policymakers
Seek Re-election

Reform Decision
Determinants:
- Age dependency ratio
- Population growth
- Inflation
- GNP Growth

Impact on Propensity to Reform

Transition Costs
- Gov't deficit
- Taxes

Pension Success
Increase national saving
Financial mkt. development
Policy signalling

Determinants:

Non Current Previous

GRAPHS 3A, 3B - depend
GRAPHS 4A, 4B – credit

GRAPHS 5A, 5B – finvest

GRAPHS 6A, 6B – tax
GRAPHS 7A, 7B – deficit

GRAPHS 8A, 8B – save

GRAPHS 9A, 9B – popgrow
GRAPHS 10A, 10B – inflate

GRAPHS 11A, 11B – gnpgrow

GRAPHS 12A, 12B – oecd
TABLE 6

Percent Privatization of Reforming Countries

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<th>Country</th>
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<td>Bolivia</td>
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<td>1993</td>
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TABLE 7

Expected Effect on Reform

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<td>+/-</td>
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## TABLE 8

### Regression Results

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*** Significant at .01 level  
**  Significant at .05 level  
*   Significant at .10 level

## GRAPH 13

### Regression Coefficients

![Graph of Regression Coefficients](image-url)
TABLE 9

US and Developed Country Variable Comparison - 1999

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<th>COUNTRY</th>
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<th>GNPGROW</th>
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<td>31.3819</td>
<td>0.5214</td>
<td>20.2539</td>
<td>0.5229</td>
<td>1.4715</td>
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<tr>
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<td>1.5504</td>
<td>2.3524</td>
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TABLE 10

Variance and Level Models Descriptive Stats

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<th>Level Model</th>
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<td>0.01</td>
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<td>Std. Dev.</td>
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<td>0.11</td>
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<td>Corr. Coef.</td>
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<td>-0.39</td>
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GRAPH 14

Model Results for US Data
GRAPH 15

Variance and Level Model Results

GRAPH 16A, 16B

Credit Projection

Deficit Projection
GRAPH 18

Two Variable Model Projections
9 - REFERENCE LIST


