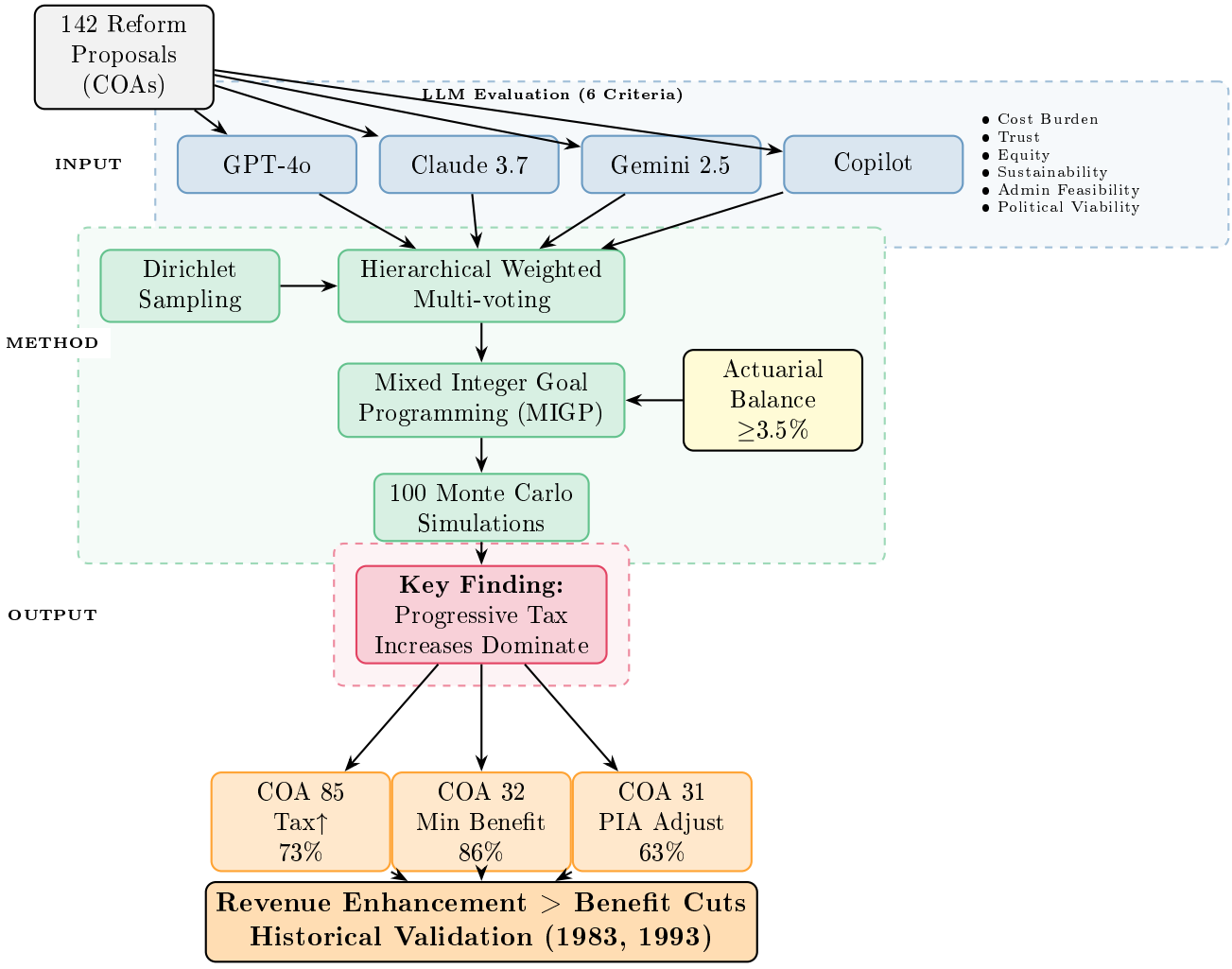
Graphical Abstract

Balancing Policy Objectives in Social Security Reform Using Hierarchical Weighted Multi-voting and Monte Carlo Mixed Integer Goal Programming

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AI-Augmented Multi-Criteria Optimization for Social Security Reform



Highlights

Balancing Policy Objectives in Social Security Reform Using Hierarchical Weighted Multi-voting and Monte Carlo Mixed Integer Goal Programming

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- AI-augmented optimization identifies robust Social Security reform portfolios
- Progressive tax increases dominate across 100 simulations with diverse weights
- LLM evaluations scale multi-criteria analysis beyond traditional expert panels
- Revenue enhancement outperforms benefit cuts for solvency and public trust
- Framework validated by convergence with 1983 and 1993 legislative reforms

Balancing Policy Objectives in Social Security Reform Using Hierarchical Weighted Multi-voting and Monte Carlo Mixed Integer Goal Programming

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Abstract

Social Security faces structural insolvency by 2033, requiring comprehensive reform that balances competing policy objectives under binding fiscal constraints. Traditional policy analysis struggles with this challenge: expert panels cannot systematically evaluate large proposal sets, single-objective optimization ignores critical trade-offs, and ad hoc weighting schemes obscure normative assumptions. We address these limitations through AI-augmented multi-criteria decision analysis, employing four Large Language Models as evaluative proxies to assess 142 reform proposals across six policy dimensions: individual cost burden, trust, equity, sustainability, administrative feasibility, and political viability. Monte Carlo simulation with Dirichlet-sampled weights tests robustness across 100 optimization runs representing diverse value systems, with all solutions satisfying the statutory 3.5% actuarial balance requirement. Progressive revenue enhancement emerges as the dominant strategy, with tax base expansion consistently outperforming benefit reduction and privatization alternatives across all value weightings. Notably, these findings diverged from researcher priors, demonstrating that systematic multi-criteria frameworks can challenge initial expectations through structured evaluation. The approach offers a scalable, reproducible methodology for navigating multidimensional trade-offs in complex policy environments where traditional expert elicitation proves infeasible.

Keywords: Social Security Reform, Mixed Integer Goal Programming, Monte Carlo Simulation, Large Language Models, Policy Analysis

1. Introduction

Social Security (SS) is the cornerstone of retirement security in the United States, supporting approximately 9 in 10 Americans 65 years of age and older. In 2023, 77.8% of benefits were paid to retirees and their dependents, while 11% went to disabled workers and 11.2% to survivors of deceased workers [1]. Despite its critical role, the Old-Age and Survivors Insurance (OASI) Trust Fund is projected to deplete its reserves by 2033 under intermediate assumptions, as expenditures have systematically outpaced revenues [2].

OASI is funded primarily through payroll and self-employment taxes, with surplus income invested in interest-bearing federal securities [3]. In 2023, total outlays reached $1.237 trillion, exceeding income of $1.167 trillion. The Trustees Report forecasts that total costs for the combined OASI and Disability Insurance (DI) programs will exceed total income beginning in 2024 and continuing every year through at least 2098 [2]. The trust fund reserve ratio is expected to decrease from 188% in 2023 to just 84% by 2030 [1]. Under intermediate and high-cost projections, reserves will be exhausted by late 2033 and 2031, respectively. By statute, the SSA is prohibited from disbursing benefits beyond amounts held in its trust funds [4].

Figure 1 illustrates historical and projected trends in contributions, cost, income, and reserves for both OASI and DI. The forecasts are based on a third-order polynomial that closely matches the projections from the Trustees Report.

While Congress has implemented multiple reforms over decades to address solvency challenges including the 1983 Amendments that raised taxes and retirement ages [7] and the 1993 expansion of benefit taxation [8], fiscal pressures persist. Selecting among competing reform proposals requires balancing often-conflicting objectives including fiscal sustainability, equity, individual burden, and public trust, all within binding legal constraints.

This paper introduces a novel optimization framework that integrates Mixed Integer Goal Programming (MIGP) with Hierarchical Weighted Multivoting informed by evaluations from Large Language Models (LLMs). We assess 142 proposed SS reform Courses of Action (COAs) against six policy objectives, using ratings from four state-of-the-art LLMs: ChatGPT-4o [9], Claude 3.7 Sonnet [10], Gemini 2.5 Pro Experimental [11], and Microsoft Copilot [12]. To capture evaluative diversity, we draw construct-level and

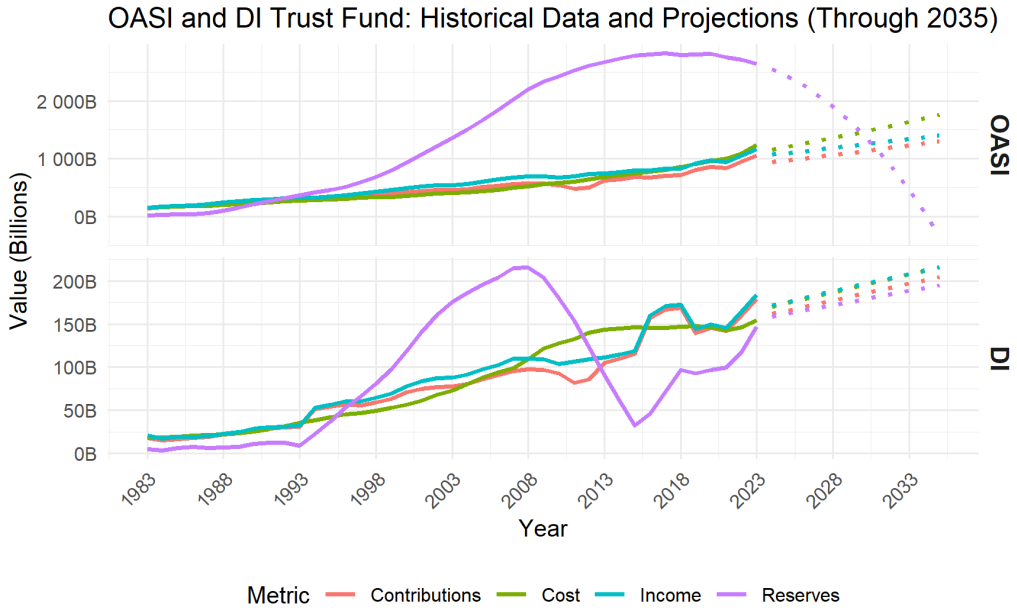


Figure 1: OASI and DI Trust Fund contributions, cost, income, reserves, and forecasts [5, 6].

within-LLM weights from Dirichlet distributions. Each candidate solution must satisfy targets including the statutory long-term (75-year) actuarial balance requirement of at least 3.5% of payroll contributions [2]. Across 100 simulated optimization runs, the model identifies reform portfolios that minimize deviation from target policy goals while remaining within fiscal and legal bounds.

The remainder of this paper is organized as follows. Section 2 reviews the literature on Social Security reform challenges, policy optimization methods, and emerging applications of artificial intelligence in policy evaluation. Section 3 details our methodological framework, including data preparation, LLM-based scoring, and the MIGP model formulation. Section 5 presents results from our computational experiments. Section 6 discusses policy implications, limitations, and directions for future research. Section 7 concludes.

2. Background and Research Gap

2.1. Social Security's Solvency Crisis and Reform Imperatives

The Old-Age and Survivors Insurance (OASI) Trust Fund faces imminent insolvency, projected to deplete its reserves by 2033 under intermediate assumptions as expenditures systematically exceed revenues [2]. This structural imbalance reflects fundamental demographic shifts: increased life expectancy has extended benefit payment periods substantially beyond original program assumptions [13], while declining labor force participation rates have reduced the contributor base relative to beneficiaries [14]. Accelerated population aging as the Baby Boom generation transitions into retirement [15] has fundamentally altered the worker-to-beneficiary ratio undergirding Social Security's pay-as-you-go financing model. The trust fund reserve ratio is expected to decrease from 188% in 2023 to just 84% by 2030 [1]. Recent analysis of French pension reforms [16] similarly demonstrates the limitations of single-dimension policy adjustments, finding that retirement age increases alone failed to stabilize dependency ratios, ensure intergenerational fairness, or maintain fiscal balance without comprehensive, multi-objective policy integration.

Congress has enacted multiple reform packages to address previous solvency crises. The Social Security Amendments of 1983 introduced partial taxation of benefits, gradually raised the full retirement age, and increased payroll taxes [7]. The 1993 Omnibus Budget Reconciliation Act expanded benefit taxation for higher-income earners [8]. While these measures temporarily restored solvency, they have not countered long-term structural pressures. More recently, policy analysts have continued advocating incremental approaches. Diamond and Orszag [17] proposed balanced packages combining modest payroll tax increases, elimination of the taxable earnings cap for high earners, and targeted benefit reductions through modified indexing. The Brookings Institution [18] and Center for Retirement Research [15] have similarly endorsed hybrid approaches preserving the program's fundamental architecture while making parametric adjustments. The Congressional Budget Office periodically analyzes policy options [19], consistently demonstrating that solvency can be achieved through various combinations of revenue enhancements and benefit adjustments. However, traditional methods struggle to systematically evaluate which specific combinations best satisfy multiple competing objectives simultaneously.

2.2. Traditional Approaches to Social Security Reform Analysis

Policy analysis for Social Security reform has relied primarily on three approaches, each with distinct strengths and limitations. First, actuarial modeling provides the gold standard for fiscal impact assessment. The Social Security Administration's Office of the Chief Actuary produces detailed 75-year projections for proposed reforms [2], quantifying effects on trust fund solvency, program cost, and benefit adequacy. These projections excel at financial forecasting but do not systematically integrate broader policy concerns such as distributional equity, political feasibility, or administrative burden. Second, qualitative policy frameworks structure reform evaluation across multiple dimensions. The Government Accountability Office [20] proposed four criteria for assessing reform proposals: financing sustainable solvency, ensuring adequacy and equity, modernizing the program to respond to societal changes, and facilitating implementation and administration. While valuable for organizing policy deliberation, these frameworks remain descriptive rather than prescriptive tools—they identify relevant considerations but do not optimize across competing objectives or identify superior policy combinations. Third, expert-driven reform proposals combine analytical judgment with policy priorities. Prominent examples include comprehensive packages from academic economists [17], think tanks [18], and research centers [15]. These proposals reflect deep domain expertise but necessarily embody particular normative priorities and may not represent optimal solutions across alternative preference structures.

Notably absent from Social Security reform analysis is the application of formal multi-criteria decision analysis (MCDA) or optimization methods. While MCDA techniques such as goal programming have been applied extensively to other public policy domains—including healthcare resource allocation, transportation planning, and environmental policy—no prior research has employed these methods for Social Security portfolio optimization. This methodological gap is particularly significant given that Social Security reform inherently involves navigating trade-offs across multiple competing objectives (fiscal sustainability, equity, efficiency, political feasibility) while satisfying binding statutory constraints (75-year actuarial balance requirements). Traditional approaches either privilege fiscal considerations over other legitimate policy concerns or rely on unstructured expert deliberation without transparent, reproducible evaluation criteria.

2.3. Operations Research Methods and Artificial Intelligence in Policy Analysis

Operations research methods, particularly goal programming, provide a mathematical framework for optimizing decisions involving multiple competing objectives and constraints. Goal programming, introduced by Charnes and Cooper [21], minimizes deviations from target goals while respecting hard constraints. Charnes and Collomb [22] demonstrated early applications to economic stabilization policy, establishing precedent for using goal programming in public sector decision-making. Mixed Integer Goal Programming (MIGP) extends this approach to problems involving discrete decision variables—such as whether to adopt or reject specific policy reforms—making it well-suited for portfolio optimization problems. Multi-choice goal programming further enhanced these methods by allowing decision-makers to specify multiple aspiration levels for objectives, accommodating uncertainty in target specification. More recently, Ahmad [23] used multi-objective model for optimizing the socio-economic performance of a pharmaceuticl supply chain, illustrating its utility.

Recent advances in artificial intelligence, particularly Large Language Models (LLMs), have opened new possibilities for policy evaluation. LLMs such as GPT-4 [9], Claude [10], and Gemini [11] demonstrate sophisticated reasoning capabilities across diverse domains. Safaei and Longo [24] systematically tested AI's capability to generate policy analysis, finding that LLMs can produce plausible, persuasive, and useful policy recommendations comparable to those of human analysts. Their evaluation examined AI-generated policy briefs across dimensions including problem definition, evidence synthesis, stakeholder consideration, and recommendation quality. While they found AI outputs generally credible, they noted limitations in contextual nuance and stakeholder sensitivity that experienced policy analysts provide. However, existing applications of AI in policy analysis have focused on text generation and summarization rather than structured multi-criteria evaluation. To our knowledge, no prior research has integrated LLM-based assessments within a formal optimization framework for policy portfolio selection.

2.4. Research Contribution

This study addresses these methodological gaps by making five distinct contributions. First, we present the first application of Mixed Integer Goal Programming to Social Security portfolio optimization, enabling systematic

evaluation of discrete reform combinations while satisfying binding statutory constraints. Second, we introduce a novel integration of LLM-based multi-voting for policy evaluation, leveraging four state-of-the-art language models (ChatGPT-4o, Claude 3.7 Sonnet, Gemini 2.5 Pro Experimental, and Microsoft Copilot) to assess reform proposals across six policy dimensions: fiscal sustainability, equity and fairness, economic efficiency, political feasibility, administrative practicality, and public trust. Third, we implement a hierarchical weighting scheme with Dirichlet-distributed uncertainty to capture variation in how different evaluators might prioritize competing policy objectives. Fourth, we systematically evaluate 142 Social Security reform Courses of Action (COAs) derived from congressional proposals, think tank recommendations, and academic research. Fifth, we develop a transparent, reproducible framework generalizable to other high-stakes policy domains requiring multi-objective optimization under legal and fiscal constraints.

Our approach combines the rigor of mathematical optimization with the breadth of AI-assisted policy assessment. By incorporating evaluative diversity through multiple LLMs with stochastically varied weights, the framework captures uncertainty in normative policy judgments while maintaining strict adherence to statutory requirements. This integration represents a significant methodological advancement, providing policymakers with a systematic, transparent tool for identifying reform portfolios that balance competing objectives while satisfying non-negotiable legal and fiscal constraints.

3. Methodology and Framework

This section presents the methodological framework for evaluating and optimizing Social Security reform proposals using a stochastic mixed-integer goal programming (MIGP) model enhanced by hierarchically weighted multi-voting. The framework combines multi-criteria evaluation, Dirichlet-sampled probabilistic weighting, and constrained optimization to simulate policy selection under uncertainty and competing objectives. Reform proposals are evaluated across a fixed set of economic, political, and administrative criteria, with all solutions required to meet the statutory threshold for long-term actuarial balance. The full simulation-optimization architecture is illustrated in Figure 2.

Figure 2 outlines a simulation-optimization framework for evaluating Social Security (SS) reform proposals using multi-agent, multi-criteria decision analysis informed by large language models (LLMs). The left column de-

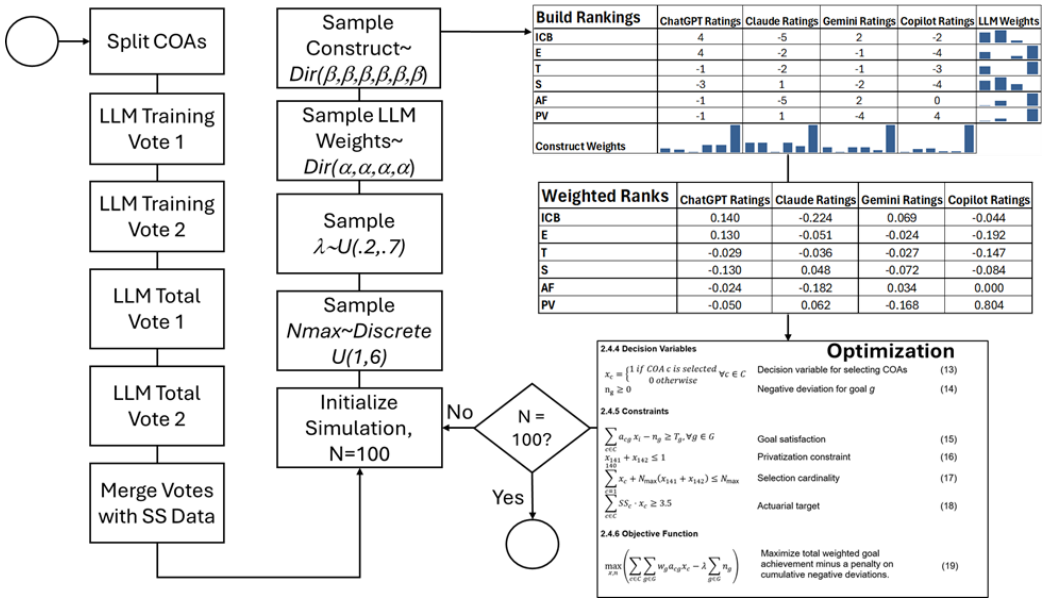


Figure 2: Methods flow for the study

picts the simulation workflow: policy Courses of Action (COAs) are split, and LLMs generate multiple rounds of evaluations across six policy constructs (ICB, E, T, S, AF, PV), each weighted using Dirichlet-sampled distributions for both construct and model importance. Randomized values for λ (penalty parameter) and Nmax (maximum number of selected COAs) are drawn for each iteration, repeated over 100 simulations. Central tables show how construct-specific ratings from four LLMs are combined using the sampled weights to produce weighted rankings. These rankings feed into a constrained mixed-integer optimization model (bottom right) that selects a subset of COAs to maximize total weighted goal satisfaction while penalizing deviations, subject to constraints on privatization, actuarial targets, and policy selection cardinality. This structure enables robust, probabilistically informed, and interpretable policy selection under uncertainty.

The MIGP formulation incorporates both binary decision variables, indicating whether each strategy (also termed Course of Action or COA) is selected, and continuous deviation (slack) variables, which quantify the extent to which selected policies meet target goals. These deviation variables allow for partial satisfaction of objectives when trade-offs are necessary. The model is classified as a mixed integer program due to the inclusion of both

binary and continuous variables.

The multi-voting component leverages classical decision science methods such as the Nominal Group Technique [25] and the Delphi Technique [26], both foundational to structured multi-criteria aggregation. In our framework, evaluations by large language models (LLMs) serve a similar role, offering diverse, model-specific judgments that simulate expert deliberation. This reflects emerging applications of LLMs in participatory evaluation and policy analysis [24]. The underlying optimization structure follows established practices in integer and goal programming, as originally formalized by Charnes, Cooper, and Ferguson [21].

3.1. Data Sources

Data for this study were drawn from 140 courses of action (COAs) evaluated by the Social Security Administration [27] for their long-range actuarial and policy impacts. We added two COAs (141-142) representing privatization proposals not evaluated by SSA. The COAs span nine policy categories: Cost of Living Adjustments (1-9), Benefits (10-60), Age-Based (61-74), Family Benefits (75-83), Taxation (84-118), Coverage and Revenue Sources (119-128), Equity Investment (129-135), Taxation of Benefits (136-140), and Privatization (141-142). Detailed descriptions of all COAs, including policy rationale, financial assumptions, and implementation considerations, are provided in Appendix A.

Each COA was quantitatively evaluated for its impact on the 75-year actuarial balance as a percentage of payroll, with a statutory target of 3.5% [27]. We applied additional evaluation criteria to capture multifaceted reform implications beyond fiscal sustainability, including equity, administrative feasibility, individual burden, public trust, and political viability.

3.2. Evaluation Criteria

Each COA was evaluated using seven primary constructs, each capturing a distinct dimension of reform impact:

Individual Cost Burden (ICB) measures direct financial impact on individuals through tax increases, benefit reductions, and threshold changes, with emphasis on minimizing burden on vulnerable populations.

Trust (T) assesses whether a proposal upholds Social Security's foundational principles of earned benefits, universality, and reliability, which are critical to public confidence and participation [28].

Equity (E) evaluates distributional fairness across income levels, health status, and demographic characteristics to ensure reforms do not exacerbate existing disparities [29].

Sustainability (S) considers whether reforms maintain long-term solvency without requiring frequent legislative intervention, promoting enduring fiscal health [27].

Administrative Feasibility (AF) addresses implementation practicality given current legal frameworks, institutional infrastructure, and administrative capacity [30].

Political Viability (PV) captures enactment likelihood based on public sentiment, partisan dynamics, and historical policy resistance [31, 32].

Social Security Trust Fund Effect (SS Effect) uses the 75-year actuarial balance as percentage of taxable payroll, with a statutory solvency threshold of 3.5% [27]. Privatization proposals (COAs 141-142), which are designed to replace the Trust Fund rather than shore it up, were assigned a fixed SS Effect of 3.5% to ensure comparable evaluation across all reform types.

3.3. Hierarchical Multi-Voting Framework

To systematically incorporate qualitative judgments, we employed four large language models (LLMs)—ChatGPT-4o [9], Claude 3.7 Sonnet [10], Gemini 2.5 Pro Experimental [11], and Microsoft Copilot [12]—to evaluate COAs across the first six constructs (ICB, T, E, S, AF, PV). SS Effect was excluded as it derives from SSA actuarial models.

Training Phase: Eighteen COAs were randomly selected to represent all nine reform categories (minimum two per category). Each LLM independently rated these COAs on a Likert scale from -5 (very significant negative impact) to +5 (very significant positive impact), with written justifications required for each score. Inter-rater consistency was assessed using Spearman's rank correlation coefficient (ρ) to measure monotonic co-trending and Cohen's kappa (κ) for absolute agreement accounting for ordinal magnitude differences.

Final Evaluation Phase: All 142 COAs were independently scored by each LLM. Hierarchical weights were drawn from Dirichlet distributions at two levels: across constructs and across LLMs within each construct. This probabilistic weighting captured both variation in policy priorities and differences in model perspectives. Following initial scoring, all evaluations and rationales were shared across models, allowing optional score revision

based on peer feedback. While most LLMs adjusted scores when warranted, Gemini remained largely unchanged.

Crucially, scoring divergence was treated as methodologically valuable rather than problematic. Given the abstract nature of constructs like Trust and Equity, and the multi-stakeholder nature of Social Security reform, evaluator disagreement reflects legitimate interpretive diversity. Rather than forcing consensus, we preserved this variation within the optimization framework, enhancing robustness under uncertainty. Detailed prompts used for LLM evaluation are provided in Appendix B.

3.4. Hierarchical Dirichlet Weighting Structure

To capture normative diversity in Social Security reform evaluation, we employed a two-level probabilistic weighting scheme using Dirichlet distributions. At the first level, construct weights (ICB, T, E, S, AF, PV) were sampled to reflect varying policy priorities across different value systems. At the second level, within each construct, LLM weights were sampled to represent diverse expert perspectives on the same policy dimension.

These weights were multiplicatively combined: each construct weight was multiplied by the weighted average of LLM scores within that construct, producing a unified criterion weight vector. Multiplicative aggregation preserves interaction effects and avoids overemphasizing constructs with uniform internal agreement. The resulting weight vector was normalized and applied to the evaluation matrix to form the utility function for optimization. This hierarchical structure enabled exploration of policy performance under thousands of diverse evaluative scenarios, capturing both high-level priority variation and within-construct interpretive disagreement.

4. Mixed-Integer Goal Programming Model

The optimization employed a MIGP formulation with binary decision variables for COA selection ($x_i \in \{0, 1\}$) and continuous deviation variables for each criterion ($d_j^-, d_j^+ \geq 0$). Complete model specification follows.

Sets

$$C = \{1, 2, \ldots, 142\} \quad \text{Set of COAs} \tag{1}$$

$$G = \{1, 2, \ldots, 25\} \quad \text{Set of Evaluations} \tag{2}$$

$$K = \{\text{ICB, T, E, S, AF, PV, SS Effect}\} \quad \text{Set of Constructs} \tag{3}$$

$$L = \{\text{ChatGPT, Claude, Gemini, Copilot}\} \quad \text{Set of LLMs} \tag{4}$$

Programming Data

Contribution of COA c to Goal g: $a_{cg}, \forall c \in C, \forall g \in G$ (5)

Target value for each goal: $T_g, \forall g \in G$ (6)

Stochastic Components.

Construct weights: $\alpha_k \sim \text{Dir}(1,1,1,1,1,1,1)$ (7)

LLM weights: $\beta_{kl} \sim \text{Dir}(1,1,1,1), \forall k \neq \text{SS Effect}$ (8)

Combined weights: $$y_{gl} = \begin{cases} \alpha_k \beta_{kl}, & k \neq \text{SS Effect},\ \forall l \in L \\ \alpha_{\text{SS Effect}}, & k = \text{SS Effect} \end{cases} \quad (9)$$

Goal weights: $w_g = \sum_{l \in L} y_{gl}$ (10)

Negative deviation penalty: $\lambda \sim \text{U}(0.2, 0.7)$ (11)

Maximum number of COAs considered: $N_{\max} \sim \text{Unif}\{1, 2, \ldots, 6\}$ (12)

Decision Variables

$$x_c = \begin{cases} 1 & \text{if COA } c \text{ is selected} \\ 0, & \text{if COA } c \text{ is not selected} \end{cases} \qquad \forall c \in C \quad (13)$$

Negative deviation for goal g: $n_g \geq 0$ (14)

Constraints

Goal satisfaction: $\sum_{c \in C} a_{cg} x_c - n_g \geq T_g, \quad \forall g \in G$ (15)

Privatization constraint: $x_{141} + x_{142} \leq 1$ (16)

Selection cardinality: $\sum_{c=1}^{140} x_c + N_{\max}(x_{141} + x_{142}) \leq N_{\max}$ (17)

Actuarial target: $\sum_{c \in C} SS_c \cdot x_c \geq 3.5$ (18)

Objective Function

Optimize net goal performance by maximizing weighted achievement and penalizing underperformance:

$$\max_{x,n} \left(\sum_{c \in C} \sum_{g \in G} w_g a_{cg} x_c - \lambda \sum_{g \in G} n_g \right) \quad (19)$$

4.1. Model Discussion

This stochastic MIGP framework identifies tractable Social Security reform portfolios that balance multiple policy objectives under evaluative uncertainty.

Set G contains 25 goal evaluations: 24 derived from the cross-product of six constructs (Set K, excluding SS Effect) and four LLMs (Set L), plus one SS Effect evaluation based on actuarial data.

Stochastic weighting operates hierarchically. Construct weights α_k are drawn from a symmetric Dirichlet distribution, ensuring non-negative weights summing to one. For non-SS Effect constructs, LLM-specific weights β_{kl} are similarly drawn and multiplied by α_k to yield goal-LLM weights y_{gl}, which

are summed over LLMs to produce final goal weights w_g. The SS Effect construct uses $\alpha_{\text{SS Effect}}$ directly since LLMs do not evaluate this criterion.

The penalty parameter $\lambda \sim U(0.2, 0.7)$, where U is a continuous uniform, reflects plausible variability in stakeholder tolerance for goal underperformance, with bounds ensuring penalties are neither negligible nor excessively punitive. Because the penalty structure mirrors the weight allocation defined in (7)–(12), only non–SS Effect components are subject to penalization, preserving the decomposition established in the combined weight formulation. Portfolio size $N_{\max} \sim \text{Unif}\{1, 2, \ldots, 6\}$, where Unif is a discrete uniform, reflects practical policy constraints on the number of courses of action considered.

Four constraint types govern feasibility: goal satisfaction (equation 15), privatization exclusivity (equation 16), selection cardinality (equation 17), and actuarial solvency (equation 18). The objective function (equation 19) maximizes weighted goal contributions minus penalized shortfalls. Since solvency is a hard constraint and overachievement is unrestricted, only negative deviations enter the penalty term.

4.2. Simulation and Replication

We conducted 100 independent optimization runs with newly sampled weights and parameters in each iteration. Congruence analysis based on Jaccard similarity confirmed solution stability: perfect consistency for $N_{\max} \in \{1, 2, 3, 4\}$ and high stability (mean congruence 0.85) for $N_{\max} \in \{5, 6\}$, validating the adequacy of 100 runs.

Each simulation was solved using the `lpsolve` package in R [33, 34]. Outputs were aggregated to assess selection frequencies, portfolio stability, and construct satisfaction patterns. Co-selection patterns and latent trade-offs were identified using correlation matrices and heatmaps. LLM marginal contributions to total weights across constructs revealed differential model influence. Weighted Cohen's κ coefficients were computed across LLM pairs within each construct to quantify inter-rater reliability beyond chance agreement.

5. Results

5.1. Descriptive Statistics

Table 1 presents summary statistics for evaluation criteria across LLM assessments and SS Effect. Evaluation scores span the full -5 to +5 range,

with medians clustering near -1 or 0, indicating predominantly moderate to slightly negative assessments.

Table 1: Summary Statistics for Evaluation Scores

Variable	Min	Median	Mean (SD)	Max	IQR
ICB1	-5	-2	-0.90 (1.98)	4.00	2.75
ICB2	-5	-1	-0.82 (2.29)	3.00	4.75
ICB3	-5	-1	-0.75 (1.37)	2.00	2.00
ICB4	-5	0	-0.40 (2.08)	3.00	4.00
T1	-4	-1	-0.94 (1.84)	5.00	2.00
T2	-5	-1	-0.54 (2.02)	3.00	3.00
T3	-5	0	-0.81 (1.39)	2.00	2.00
T4	-5	-2	-0.77 (2.45)	4.00	4.75
E1	-4	0	-0.02 (2.18)	5.00	4.00
E2	-4	2	0.82 (2.24)	4.00	4.00
E3	-4	0	0.46 (1.28)	3.00	1.00
E4	-4	-2	-0.58 (1.97)	3.00	3.00
S1	-3	2	1.22 (2.12)	4.00	3.00
S2	-5	2	1.58 (2.33)	5.00	5.00
S3	-5	2	1.23 (1.52)	4.00	2.00
S4	-2	3	2.42 (1.81)	5.00	2.00
AF1	-3	2	1.87 (1.57)	5.00	2.00
AF2	-3	3	2.63 (1.01)	5.00	1.00
AF3	-4	0	0.49 (1.10)	2.00	1.00
AF4	-4	2.5	1.60 (2.28)	5.00	3.00
PV1	-5	-1	-0.80 (2.26)	5.00	4.00
PV2	-5	-2	-1.01 (2.42)	3.00	5.00
PV3	-5	-1	-0.89 (1.26)	2.00	2.00
PV4	-5	-1	-0.34 (2.59)	4.00	6.00
SS Effect	-1.48	0.37	0.64 (0.96)	4.13	1.07

ICB = Individual Cost Burden, T = Trust, E = Equity, S = Sustainability, AF = Administrative Feasibility, PV = Political Viability.
1 = ChatGPT, 2 = Claude, 3 = Gemini, 4 = Copilot.

Mean scores reveal construct-level patterns. ICB and T evaluations skewed negative (means -0.90 to -0.40 for ICB; -0.94 to -0.54 for T), with high variability (SDs 2). E assessments were mixed, with positive means for E2

(0.82) and E3 (0.46) but negative for E1 and E4. S and AF constructs showed strongly positive evaluations, particularly S4 (mean 2.42) and AF2 (mean 2.63), indicating most COAs are viewed as technically sustainable and administratively feasible. In contrast, PV evaluations were predominantly negative across all LLMs, suggesting political infeasibility despite technical soundness—reflecting Social Security's status as the "third rail" of US politics.

SS Effect (actuarial balance impact) averaged 0.64 (SD 0.96), ranging from -1.48 to 4.13, with IQR of 1.07 indicating most reforms produce modest positive impacts. Combined with positive S and AF scores, this confirms that technical reform feasibility exceeds political viability. Boxplots (Figure 3) illustrate this tension between technical merit and political acceptance.

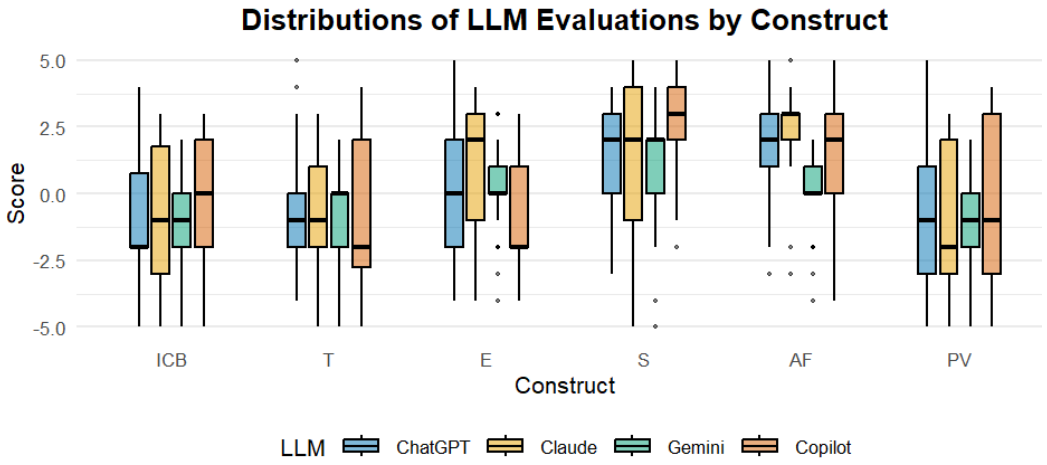


Figure 3: Boxplots of evaluation scores across six policy constructs (ICB, T, E, S, AF, PV) as rated independently by the LLMs.

5.2. Inter-Rater Reliability

To assess inter-rater reliability, we computed both Spearman's rank correlation coefficients (ρ) for directional co-trending and weighted Cohen's κ for absolute agreement accounting for ordinal distance.

Consensus Patterns. LLMs exhibited varying agreement across constructs (Figure 4). S showed strongest consensus, with narrow score distributions and high correlations ($\rho = 0.60$–0.91), indicating objective assessability of fiscal solvency. ICB and T also demonstrated high pairwise correlations

($\rho > 0.70$), reflecting robust alignment on cost burden and trustworthiness dimensions.

Conversely, PV and T displayed wider score distributions and differing medians across models, indicating interpretive ambiguity in political feasibility and public trust assessments. E exhibited moderate correlations (0.39–0.72), suggesting variability in equity interpretations. AF revealed weakest alignment (ρ as low as 0.20), likely reflecting divergent conceptions of operational feasibility. Notably, Gemini and Copilot assigned more favorable ICB and E ratings than ChatGPT and Claude. For AF, Copilot and ChatGPT produced consistently higher scores, while Gemini exhibited compressed ranges and lower medians.

These patterns mirror broader expert divisions [17, 35]: technical reforms generate consensus, while political and distributional dimensions remain contested.

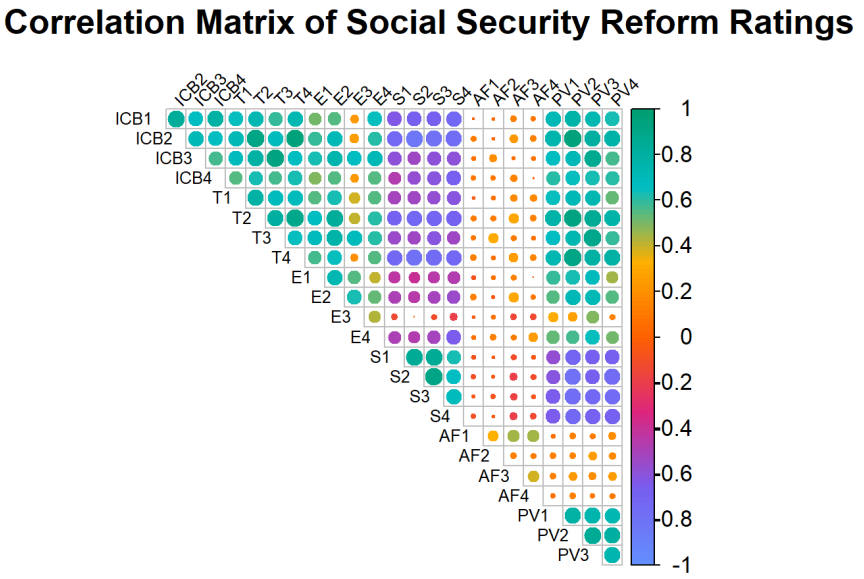


Figure 4: Patterns of inter-model consensus and divergence across evaluation constructs. High alignment on S contrasts with divergence in PV and T, reflecting differing model perspectives on political and trust dimensions of Social Security reform.

Agreement Analysis. Weighted κ values (Table 2) were substantially higher than unweighted counterparts, appropriately accounting for ordinal

scale properties. ICB (0.601–0.828), T (0.566–0.871), and S (0.493–0.861) showed substantial to near-perfect agreement, reflecting their more technical foundations. PV demonstrated reasonably strong consensus (0.546–0.821), suggesting shared understanding of political realism despite interpretive judgment.

In contrast, E displayed weaker agreement (0.334–0.670), with several pairwise comparisons below 0.5, signaling divergent equity thresholds across models. AF showed similarly modest agreement (0.087–0.363), reflecting context-sensitive administrative feasibility judgments.

Table 2: Weighted Cohen's κ (two comparisons per row) across LLM pairs by construct.

Pair	**Weighted κ**	**Pair**	**Weighted κ**
ICB1–ICB2	0.828	ICB1–ICB3	0.601
ICB1–ICB4	0.762	ICB2–ICB3	0.634
ICB2–ICB4	0.684	ICB3–ICB4	0.507
T1–T2	0.772	T1–T3	0.640
T1–T4	0.670	T2–T3	0.763
T2–T4	0.871	T3–T4	0.566
E1–E2	0.670	E1–E3	0.449
E1–E4	0.371	E2–E3	0.537
E2–E4	0.417	E3–E4	0.334
S1–S2	0.861	S1–S3	0.782
S1–S4	0.502	S2–S3	0.822
S2–S4	0.610	S3–S4	0.493
AF1–AF2	0.361	AF1–AF3	0.336
AF1–AF4	0.363	AF2–AF3	0.087
AF2–AF4	0.123	AF3–AF4	0.278
PV1–PV2	0.789	PV1–PV3	0.642
PV1–PV4	0.717	PV2–PV3	0.695
PV2–PV4	0.821	PV3–PV4	0.546

These results validate the hierarchical weighting approach: constructs with high inter-rater reliability (ICB, T, S) provide stable evaluation signals, while those with lower agreement (E, AF) benefit from multi-model aggregation to capture interpretive diversity. The moderate-to-high PV coherence suggests model assessments of political viability are pragmatically reliable.

5.3. Optimization Performance and COA Selection Patterns

The optimization algorithm consistently identified feasible solutions across 100 runs with varying weights and constraints (Table 3). Objective values ranged from −71.89 to 7.37 (mean −16.65, SD 19.94), reflecting diverse preference structures. The number of selected COAs averaged 3.28 and always equaled the allowed maximum $N_{\max}$, indicating full utilization of selection capacity. The penalty parameter λ averaged 0.45 (range 0.23–0.69).

Table 3: Summary Statistics of Optimization Runs

Metric	**Objective Value**	**Max COAs**	**λ (Penalty)**
Mean (SD)	−16.65 (19.94)	3.28 (1.57)	0.45 (0.14)
Minimum, Maximum	−71.89, 7.37	1.00, 6.00	0.23, 0.69

Most Frequently Selected COAs. Table 4 presents the most frequently selected COAs. COA 32 (reconfigure special minimum benefit) appeared in 86% of runs, comprising 26.22% of all selections despite its modest negative SS effect (−0.13%), indicating strong alignment with redistributive goals. COA 85 (increase payroll tax to 15.9% then 19.4%) was selected in 73% of runs with the highest SS effect (+4.13%), reflecting preference for broad-based revenue enhancement under solvency pressure. COA 31 (Primary Insurance Amount adjustments) ranked third (63% selection) with neutral SS effect, serving as a middle-ground reform supporting benefit adequacy without undermining solvency.

Family-oriented COAs 78 (alternative surviving spouse benefit) and 83 (prorated death-month payouts) appeared in 41% and 8% of runs, respectively, with small negative SS effects (−0.10%, −0.03%). Tax-based COAs 91, 90, and 92 (eliminating taxable maximum with varying benefit credits) were selected in 27%, 15%, and 12% of runs, carrying substantial SS effects (+1.86% to +2.55%). Benefit-type COAs 29, 36, and 44 each appeared in only 1% of runs, lacking sufficient fiscal impact or cross-cutting appeal. Notably, major reforms from 1983 and 1993 can be described as combinations of COAs 85, 90, and 91, demonstrating persistence in politically feasible Social Security reform.

LLM Evaluator Influence. Despite randomized weight sampling, average LLM contributions converged closely to the theoretical Dirichlet(1,1,1,1) expectation of 0.25: Gemini (0.260), Copilot (0.255), ChatGPT (0.245), and

Table 4: Most Frequently Selected Courses of Action Across Simulations

COA	Description (Simplified)	Type	Rel. Freq. (%)	% Selected (100 Runs)	SS Effect
32	Reconfigure special minimum benefit	Benefits	26.22	86.00	−0.13
85	Increase payroll tax to 15.9% and then 19.4%	Tax	22.26	73.00	4.13
31	Primary Insurance Amount changes	Benefits	19.21	63.00	0.00
78	Alternative benefit for surviving spouse	Family	12.50	41.00	−0.10
91	Eliminate the taxable maximum	Tax	8.23	27.00	1.86
90	Eliminate taxable max and benefit credit above 2025 max	Tax	4.57	15.00	2.55
92	Eliminate taxable maximum change payout	Tax	3.66	12.00	2.37
83	Prorate payout for month of death	Family	2.44	8.00	−0.03
29	Improve years-worked math for those with children < 6 yrs	Benefits	0.30	1.00	−0.06
36	Improve special minimum benefit	Benefits	0.30	1.00	−0.07
44	Increase benefits for 85+	Benefits	0.30	1.00	−0.16

Claude (0.241) (Table 5). This convergence confirms the aggregation mechanism did not systematically privilege any single model, supporting both fairness and functional reliability of the ensemble structure.

Table 5: Average LLM Contributions to Optimization Decisions

Evaluator	Importance
ChatGPT	0.245
Claude	0.241
Gemini	0.260
Copilot	0.255

Impact of Lambda Parameter. Portfolio composition shifted systematically with λ (Table 6). At low λ (0.2), portfolios were diverse, with most combining benefits, family, and tax reforms. As λ increased (0.3–0.5), tax-only solutions increased from 1 to 6, indicating higher penalties encouraged concentrated, high-impact fiscal strategies. At $\lambda = 0.6$, benefit-tax portfolios became nearly as frequent as comprehensive portfolios. At extreme penalty ($\lambda = 0.7$), solution feasibility declined with no tax-only portfolios, suggesting reduced flexibility. These patterns align with Mulligan [36], who

noted reform strategies become more fiscally aggressive as solvency pressure increases, with λ serving as a proxy for political or fiscal urgency.

Table 6: Distribution of solutions by penalty parameter value

Lambda	**Benefits, Family, Tax**	**Benefits, Tax**	**Tax**	**Totals**
0.2	5	3	1	9
0.3	8	9	2	19
0.4	8	7	3	18
0.5	9	12	6	27
0.6	9	11	2	22
0.7	2	3	0	5
Totals	41	45	14	100

Goal Achievement. The optimization consistently achieved high performance on S and AF goals across all simulations. However, persistent trade-offs emerged between ICB and E goals, suggesting these objectives remain in tension regardless of parameter settings, consistent with theoretical expectations where distributional equity often increases financial burden on certain groups [36]. The framework successfully identified reform combinations balancing these competing objectives, with consistent selection of certain COAs across diverse parameters suggesting robustness in their multi-goal contributions.

6. Discussion

This study provides a reproducible framework for evaluating Social Security reform under stakeholder diversity, policy complexity, and fiscal constraint. The hierarchical multi-voting MIGP model produced consistent, interpretable results across 100 simulations, yielding insights into optimal reform portfolios and model behavior under varying decision priorities.

6.1. COA Selection Patterns

Eleven COAs were selected at least once, with three dominating: COA 32 (reconfigure special minimum benefit, 86% of runs), COA 85 (increase payroll tax to 15.9% then 19.4%, 73%), and COA 31 (Primary Insurance Amount changes, 63%). This combination reflects strategic preference for policies improving long-term solvency while maintaining equity and political viability.

COA 85 offered the strongest solvency impact (SS Effect = 4.13), while COAs 32 and 31 provided moderate benefit adjustments without undermining trust or fairness. Family-oriented COAs 78 and 83 played complementary roles, suggesting the dominant strategy blends fiscal strength with social adequacy.

Radical reforms including privatization and investment-based restructuring were never selected, likely due to actuarial constraints and consistently lower scores on Trust, Administrative Feasibility, and Political Viability. Coverage expansion proposals (COAs 126-127) were also excluded, reflecting administrative complexity concerns. LLM training on historical data may perpetuate past solutions, yielding low scores for novel approaches—a limitation shared with human decision-makers subject to "this is how it's always been done" bias.

6.2. Construct Tradeoffs

Despite randomized construct and rater weights, optimization consistently revealed tradeoffs between Individual Cost Burden and Equity. Tax-based reforms, frequently selected for strong Sustainability performance, scored lower on ICB due to perceived contributor burdens, but were outweighed by strong Trust, Political Viability, and Administrative Feasibility ratings. This reflects classical public finance tensions between equity and efficiency [36, 37].

The penalty parameter λ shaped portfolio composition rather than size. At lower λ (0.2–0.3), portfolios frequently combined benefit, family, and tax reforms. As λ increased, portfolios increasingly prioritized reforms with clearer actuarial benefits, reflecting greater aversion to goal shortfalls. While λ did not limit COA count (constrained by $N_{\max}$), it influenced reform strategy composition consistent with goal-aligned prioritization under uncertainty.

6.3. Political Viability and Model Realism

Technical optimal COAs (maximizing Sustainability, Trust, Equity) often performed poorly on Political Viability, reflecting long-standing policy tensions: best reforms aren't always most politically palatable. LLM disagreement on PV—particularly between Gemini (conservative) and Copilot/ChatGPT (progressive)—reinforces interpretive variability in real-world governance. The model's strength lies in embedding rather than masking disagreement through transparent, Dirichlet-based weight sampling, offering a pathway for participatory policy modeling and AI-assisted governance design.

LLM contributions to final weights were well-balanced (0.241–0.260), indicating no single model dominated results and supporting aggregated rankings' validity. This underscores the utility of blending LLMs in high-stakes evaluations: rating variation adds epistemic richness without compromising stability.

6.4. Comparison to Prior Literature

The preference for incremental reforms parallels Diamond's [17] recommendations for modest tax increases and targeted benefit reductions. Similarly, Brookings Institute [18] and the Center for Retirement Research [15] favor hybrid packages avoiding fundamental restructuring. Our AI-based evaluation framework independently confirms these expert recommendations but suggests that some policy enhancements should occur as well. The optimization outperformed traditional single-rater or criteria-dominant frameworks by allowing multiple constructs to inform decisions simultaneously—a significant advancement for policy contexts requiring simultaneous legal, fiscal, and sociopolitical constraint satisfaction.

7. Conclusions

7.1. Policy Recommendations

This study identifies a robust set of Social Security reforms that consistently emerge across diverse stakeholder priorities and decision criteria. Three reforms form the core of optimal policy portfolios: increasing payroll taxes progressively (COA 85), reconfiguring the special minimum benefit (COA 32), and adjusting the Primary Insurance Amount formula (COA 31). These reforms appeared in 73%, 86%, and 63% of simulations, respectively, demonstrating resilience across varying political and fiscal constraints.

For policymakers, this suggests:

- **Revenue enhancement over benefit cuts:** Progressive payroll tax increases consistently outperform benefit reductions in achieving solvency while maintaining public trust and political viability. COA 85, raising payroll taxes to 15.9% then 19.4%, delivers the strongest actuarial impact (+4.13% of payroll) while scoring well on equity and administrative feasibility.

- **Targeted benefit restructuring:** Rather than across-the-board cuts, selective adjustments like reconfiguring the special minimum benefit (COA 32) and modifying PIA calculations (COA 31) achieve fiscal goals while protecting vulnerable populations. These reforms balance redistribution with solvency despite modest negative actuarial effects.

- **Complementary family provisions:** Survivor benefit reforms (COAs 78, 83) strengthen household-level equity without major fiscal disruption, appearing in 41% and 8% of optimal portfolios. These measures enhance political acceptability of tax-focused packages.

- **Avoid radical restructuring:** Privatization and investment-based reforms were never selected, consistently scoring poorly on trust, administrative feasibility, and political viability. Coverage expansion proposals similarly failed to emerge, suggesting administrative complexity outweighs potential benefits under current constraints.

Historical validation: The major Social Security reforms of 1983 and 1993 can be characterized as combinations of COAs 85, 90, and 91—precisely the tax-based revenue enhancements our model identifies as optimal. This convergence between historical legislative outcomes and simulation results suggests our framework captures enduring political-economic constraints that limit feasible reform space. While this validates the model's realism, it also highlights a challenge: both human decision-makers and AI-trained systems may perpetuate incremental approaches, potentially overlooking transformative solutions.

7.2. Methodological Contributions and Future Applications

This work demonstrates the feasibility of multi-agent, construct-weighted optimization under real policy constraints. The hierarchical Dirichlet weighting structure successfully balanced diverse evaluative perspectives without privileging any single model (LLM contributions ranged 0.241–0.260), while stochastic parameter sampling revealed robust reform patterns across 100 scenarios.

The framework is generalizable to other complex policy domains:

- **Healthcare reform:** Balancing cost containment, access expansion, and quality improvement under budget constraints

- **Tax policy:** Optimizing revenue generation, economic efficiency, and distributional equity

- **Climate adaptation:** Coordinating mitigation costs, resilience benefits, and intergenerational fairness

Extensions could incorporate stakeholder surveys, legislative scoring, or expert elicitation alongside LLM evaluations, creating hybrid human-AI decision support systems. The penalty parameter λ could be calibrated to reflect actual political urgency or fiscal crisis severity, enabling scenario planning under varying constraint tightness.

7.3. Toward Transparent, Pluralistic Policy Design

This approach exemplifies AI-augmented policy modeling where algorithms facilitate rather than dictate democratic choices. By embedding evaluative disagreement through probabilistic weighting rather than forcing consensus, the framework acknowledges that in contested policy domains, diversity of perspective is informative, not problematic. The model's transparency—with full mathematical specification, explicit tradeoffs, and traceable LLM contributions—supports democratic accountability.

The convergence between our simulation results and historical reform patterns validates the model while highlighting a critical challenge: AI systems trained on past data may reinforce incremental thinking. Future work should explicitly test novel reform combinations excluded from training data, potentially through constrained optimization runs that force inclusion of historically overlooked options, to determine whether truly innovative solutions exist beyond the "tried and tested" policy space.

Ultimately, this framework moves policy analysis toward transparent, accountable, and pluralistic decision-making in the age of intelligent systems—one where diverse stakeholder values are formally incorporated, tradeoffs are explicitly quantified, and optimal solutions emerge from structured deliberation rather than partisan bargaining alone.

8. Supplementary Information

All data, code, and analysis are available online.

9. Generative AI Disclosure

During the preparation of this work, the author used ChatGPT (OpenAI), Claude (Anthropic), Gemini (Google), and Copilot (Microsoft) to assist with drafting, editing, formatting, and evaluating proposed Courses of Action (COAs) as part of a structured multi-model review process. These tools were employed to refine language, improve clarity, and systematically assess each COA using predefined criteria. After using these tools, the author reviewed and edited all content as needed and takes full responsibility for the study's design, analysis, interpretations, and conclusions. No generative AI tools were used for conceptualization or ideation.

10. Declarations

Funding. No funding was obtained for this research. Institutional Review Board approval was not required as the research does not involve humans.

Conflict of Interest/Competing Interests. Authors declare no financial or non-financial interests.

Ethics Approval and Consent to Participate. Institutional Review Board approval was not required as the research does not involve human subjects.

Data Availability. Data are available at `https://github.com/dustoff06/SocialSecurity`.

Materials Availability. Not applicable.

Code Availability. Code developed to execute this study are available at `https://github.com/dustoff06/SocialSecurity`

Author Contribution. (omitted for anonymity)

Appendix A. Appendix A Courses of Action List

Appendix A.1. Cost of LIving Adjustments

1. Starting December 2025, reduce the annual COLA by 1 percentage point.
2. Starting December 2025, reduce the annual COLA by 0.5 percentage point.

3. Starting December 2025, compute the COLA using a chained version of the consumer price index for wage and salary workers (CPI-W). We estimate this new computation will reduce the annual COLA by about 0.3 percentage point, on average.
4. Starting December 2027, compute the COLA using a chained version of the consumer price index for wage and salary workers (CPI-W). We estimate this new computation will reduce the annual COLA by about 0.3 percentage point, on average. The new COLA will not apply to DI benefits. It will apply to OASI benefits, except for those of formerly disabled-workers who converted to retired-worker status.
5. Starting December 2025, add 1 percentage point to the annual COLA for beneficiaries who have lived past a "specified age". The "specified age" is the sum of: (1) 65 and (2) the unisex cohort life expectancy at age 65.
6. Starting December 2026, compute the COLA using the Consumer Price Index for the Elderly (CPI-E). We estimate this new computation will increase the annual COLA by about 0.2 percentage point, on average.
7. Starting December 2025, reduce the annual COLA by 1 percentage point, but not to less than zero. In cases where the unreduced COLA is less than 1 percentage point, do not carry over the unused reduction into future years.
8. Starting December 2025, for OASI beneficiaries only (DI beneficiaries would only be affected when their benefit converts to OASI at NRA), the annual COLA would be based on the chain-weighted version of the CPI-U.
9. For single/head-of-household/married-filing-separate taxpayers with modified adjusted gross income (MAGI) below $110,800 and for joint filers with MAGI below $221,500 for December 2026 ($85,000 and $170,000 multiplied by estimated CPI-U for 2018–2026), use the chain-weighted version of the Consumer Price Index for All Urban Consumers (C-CPI-U) to calculate the cost-of-living adjustment (COLA), beginning with the December 2026 COLA. For those beneficiaries whose MAGI is above these thresholds, provide no COLA. Use prior tax year income data for this determination. Use the chain-weighted CPI for the COLA for years prior to benefit receipt. Index the eligibility income threshold amounts to the CPI-U after December 2026.

Appendix A.2. Benefits Solutions

10. Price indexing of PIA factors beginning with those newly eligible for OASDI benefits in 2031: Reduce factors so that initial benefits grow by inflation rather than by the SSA average wage index.
11. Progressive price indexing (30th percentile) of PIA factors beginning with individuals newly eligible for OASDI benefits in 2031: Create a new bend point at the 30th percentile of the AIME distribution of newly retired workers. Maintain current-law benefits for earners at the 30th percentile and below. Reduce the 32 and 15 percent factors above the 30th percentile such that the initial benefit for a worker with AIME equal to the taxable maximum grows by inflation rather than the growth in the SSA average wage index.
12. Progressive price indexing (40th percentile) of PIA factors beginning with individuals newly eligible for OASDI benefits in 2031: Create a new bend point at the 40th percentile of the AIME distribution of newly retired workers. Maintain current-law benefits for earners at the 40th percentile and below. Reduce the 32 and 15 percent factors above the 40th percentile such that the initial benefit for a worker with AIME equal to the taxable maximum grows by inflation rather than the growth in the SSA average wage index.
13. Progressive price indexing (50th percentile) of PIA factors beginning with individuals newly eligible for OASDI benefits in 2031: Create a new bend point at the 50th percentile of the AIME distribution of newly retired workers. Maintain current-law benefits for earners at the 50th percentile and below. Reduce the 32 and 15 percent factors above the 50th percentile such that the initial benefit for a worker with AIME equal to the taxable maximum grows by inflation rather than the growth in the SSA average wage index.
14. Progressive price indexing (60th percentile) of PIA factors beginning with individuals newly eligible for OASDI benefits in 2031: Create a new bend point at the 60th percentile of the AIME distribution of newly retired workers. Maintain current-law benefits for earners at the 60th percentile and below. Reduce the 32 and 15 percent factors above the 60th percentile such that the initial benefit for a worker with AIME equal to the taxable maximum grows by inflation rather than the growth in the SSA average wage index.
15. Beginning with those newly eligible for OASI benefits in 2034, multiply the PIA factors by the ratio of life expectancy at 67 for 2029 to the

life expectancy at age 67 for the 4th year prior to the year of benefit eligibility. Unisex life expectancies, based on period life tables as computed by SSA's Office of the Chief Actuary, are used to determine the ratio. Disabled workers are: (a) not affected prior to normal retirement age; and (b) subject to a proportional reduction in benefits, based on the worker's years of disability, upon conversion to retired-worker beneficiary status.

16. Beginning with those newly eligible for OASDI benefits in 2031, create a new bend point at the 50th percentile of the AIME distribution of newly retired workers and gradually reduce all PIA factors except for the 90 percent factor. By 2064: a) the 32 percent PIA factor below the new bend point reduces to 30 percent; b) the 32 percent PIA factor above the new bend point reduces to 10 percent; and c) the 15 percent PIA factor reduces to 5 percent.
17. Beginning with those newly eligible for OASDI benefits in 2037, gradually reduce the 15 percent PIA factor in each year so that it reaches 10 percent for those newly eligible in 2066 and later.
18. Beginning with those newly eligible for OASDI benefits in 2031, gradually increase the first PIA bend point in each year so that it is 15 percent higher for those newly eligible in 2045 and later.
19. Increase the first PIA factor from 90 percent to 93 percent for all beneficiaries eligible as of January 2026 and for those newly eligible for benefits after 2025.
20. Use an annualized "mini-PIA" formula beginning with retired workers newly eligible in 2031. For each indexed earnings year, compute an individual AIME and an individual PIA. Sum these individual PIAs for the 40 highest years of indexed earnings and divide that total amount by 37 to get the PIA for this provision. Phase-in over five years, meaning that in 2031, 80 percent of the benefit would be based on the old 35-year average PIA formula and 20 percent on the new mini-PIA formula, shifting by 20 percentage points each year until 100 percent is based on the new mini-PIA formula for those attaining age 62 in 2035. Disabled worker benefits are unchanged under this provision.
21. For retired worker beneficiaries newly eligible in 2031 (excluding disabled workers), add a new bend point at the wage-indexed equivalent of the 50th percentile of the AIME distribution minus $100 (for 2015 eligibility) and change the PIA factors to 95/32/15/5. Also move the current-law first bend point from the wage-indexed equivalent of $1,174

in 2023 to $1,493 in 2024. Phase this provision in over 10 years (2031–2040). The phase-in would work on a weighted-average basis: 90% of CL formula + 10% of proposal formula for 2031, 80% of CL formula + 20% of proposal formula for 2032, and so on.

22. Beginning with those newly eligible for OASDI benefits in 2026, reduce the 15 percent PIA factor by 2 percentage points per year so that it reaches 5 percent for those newly eligible in 2030 and later.
23. Increase the 90 percent PIA formula factor to 91 percent for beneficiaries newly eligible in 2029, 92 percent for those newly eligible in 2030, ..., reaching 95 percent for those newly eligible in 2033 and later.
24. For retired worker and disabled worker beneficiaries becoming initially eligible in January 2031 or later, phase in a new benefit formula (from 2031 to 2040). Replace the existing two primary insurance amount (PIA) bend points with three new bend points as follows: (1) 25% AWI/12 from 2 years prior to initial eligibility; (2) 100% AWI/12 from 2 years prior to initial eligibility; and (3) 125% AWI/12 from 2 years prior to initial eligibility. The new PIA factors are 95%, 27.5%, 5% and 2%. During the phase in, those becoming newly eligible for benefits will receive an increasing portion of their benefits based on the new formula, reaching 100% of the new formula in 2040.
25. Increase the current-law first bend point by 22 percent and increase the 90 percent PIA factor to 95 percent for all beneficiaries eligible for benefits as of January 2025 and for those newly eligible for benefits after 2024. This provision will result in an approximate $230 increase in PIA for most workers newly eligible for retirement or disability benefits in 2025.
26. Increase the number of years used to calculate benefits for retirees and survivors (but not for disabled workers) from 35 to 38, phased in over the years 2025–2029.
27. Increase the number of years used to calculate benefits for retirees and survivors (but not for disabled workers) from 35 to 40, phased in over the years 2025–2033.
28. For the OASI and DI computation of the PIA, gradually reduce the maximum number of drop-out years from 5 to 0, phased in over the years 2026–2034.
29. Reduce the number of computation years (increase dropout years) for parents having a child in care under the age of 6. The parent must have

no earnings (covered or non-covered) for the year to be eligible for the credit. Only one parent can claim the childcare added dropout year for a given earnings year. Each parent can earn at most 2 dropout years per child, and a maximum of 5 dropout years in total. The years designated as childcare years do not have to be the years that could otherwise be included in the computation of the average indexed monthly earnings (AIME). The provision would be effective for all benefits payable for entitlement in January 2026 and later (without regard for when the beneficiary became initially eligible).

30. For retired and disabled workers, reduce the maximum number of dropout years to 4 for workers newly eligible in 2026, to 3 for workers newly eligible in 2027, and to 2 for workers newly eligible in 2028 and later.
31. Increase the PIA to a level such that a worker with 30 years of earnings at the minimum wage level receives an adjusted PIA equal to 120 percent of the Federal poverty level for an aged individual. This provision takes full effect for all newly eligible OASDI workers in 2042, and is phased in for new eligibles in 2033 through 2041. The percentage increase in PIA is lowered proportionately for those with fewer than 30 years of earnings, down to no enhancement for workers with 20 or fewer years of earnings. (Year-of-work requirements are "scaled" for disabled workers based on their years of potential work from age 22 to benefit eligibility). The benefit enhancement percentage is reduced proportionately for workers with higher average indexed monthly earnings (AIME), down to no enhancement for those with AIME at least twice that of a 35-year steady minimum wage earner.
32. Beginning for those newly eligible in 2025, reconfigure the special minimum benefit: (a) A year of coverage is defined as a year in which 4 quarters of coverage are earned. (b) At implementation, set the PIA for 30 years of coverage equal to 125 percent of the monthly poverty level (about $1,519 in 2023). For those with under 30 years of coverage, the PIA per year of coverage over 10 years is $1,519/20 = $75.95. (c) Index the initial PIA per year of coverage by wage growth for successive cohorts.
33. Beginning for those newly eligible in 2025, reconfigure the special minimum benefit: (a) A year of coverage is defined to be either a year in which 4 quarters of coverage are earned or a child is in care. Childcare years are granted to parents who have a child under 5, with a limit of

8 such years. (b) At implementation, set the PIA for 30 years of coverage equal to 125 percent of the monthly poverty level (about $1,519 in 2023). For those with under 30 years of coverage, the PIA per year of coverage over 10 years is $1,519/20 = $75.95. (c) Index the initial PIA per year of coverage by wage growth for successive cohorts.

34. Beginning for those newly eligible in 2031, reconfigure the special minimum benefit: (a) A year of coverage is defined as a year in which 4 quarters of coverage are earned. (b) At implementation, set the PIA for 30 years of coverage equal to 125 percent of the monthly poverty level (about $1,519 in 2023). For those with under 30 years of coverage, the PIA per year of coverage over 10 years is $1,519/20 = $75.95. (c) From 2023 to the year of implementation, 2031, index the PIA per year of coverage using the chain-CPI index. Then, for later years, index the PIA per year of coverage by wage growth for successive cohorts. (d) Scale work requirements for disabled workers, based on the number of years of non-disabled potential work.
35. Beginning for those newly eligible in 2026, reconfigure the special minimum benefit: (a) A year of coverage is defined as a year in which either 20 percent of the "old law maximum" is earned or a child is in care. Childcare years are granted to parents who have a child under 6, with a limit of 8 such years. (b) At implementation, set the PIA for 30 years of coverage equal to 133 percent of the Census monthly poverty level (about $1,620 in 2023). For those with under 30 years of coverage, the PIA per year of coverage over 19 years is $1,620/11 = $147.20. (c) Index the initial PIA per year of coverage by wage growth for successive cohorts. (d) Scale work requirements for disabled workers, based on the number of years of non-disabled potential work.
36. Beginning for those newly eligible in 2025, reconfigure the special minimum benefit: (a) A year of coverage is defined to be either a year in which 4 quarters of coverage are earned or a child is in care. Childcare years are granted to parents who have a child under 6, with a limit of 5 such years. (b) At implementation, set the PIA for 30 years of coverage equal to 100 percent of the monthly poverty level (about $1,255 in 2024). For those with under 30 years of coverage, the PIA per year of coverage over 10 years is $1,255/20 = $62.75. (c) From 2024 to the year of implementation, 2025, index the PIA per year of coverage using the CPI index. Then, for later years, index the PIA per year of coverage by wage growth for successive cohorts. (d) Scale

work requirements for disabled workers, based on the number of years of non-disabled potential work.

37. Beginning for those newly eligible in 2027, reconfigure the special minimum benefit: (a) The number of years of work (YOWs) is determined as total quarters of coverage divided by 4, ignoring any fraction. Child-care years are granted to parents who have a child under 6, with a limit of 5 such years. (b) At implementation, set the PIA for 30+ YOWs equal to 100 percent of the monthly HHS poverty level for the year prior to eligibility. For workers between 11 and 29 YOWs, reduce the special minimum by 3 1/3 percentage points per YOW so that at 29 YOWs the minimum would be 96 2/3% of poverty, ..., down to 11 YOWs at 36 2/3% of poverty. No minimum for 10 or fewer YOWs.
38. Beginning in 2029, create a Basic Minimum Benefit (BMB) within Social Security (i.e., the cost of the BMB would be charged as a cost to the OASI Trust Fund), with the following specifications: (1) Eligibility for the BMB would be limited to OASI beneficiaries who have attained normal retirement age (NRA) or above. OASI beneficiaries under NRA would not be eligible for the BMB. (2) The BMB would be calculated on a household basis and split equally between members of the household. In the case of a married couple, both spouses would need to claim any Social Security benefits for which they are eligible before they could receive the BMB. If both spouses have claimed and one is NRA or above and the other has not yet attained NRA, only the half of the BMB for the spouse over NRA would be payable. (3) The BMB amount for single beneficiaries would be equal to either: 1) the BMB base ($604 in 2015) - 0.70 * current monthly OASI benefit (not including any BMB), if positive; or 2) zero. (4) The BMB amount for married beneficiaries would be equal to either: 1) the BMB base ($906 in 2015) - 0.70 * total household monthly OASI benefits (not including any BMB), if positive; or 2) zero. (5) The BMB bases for singles and couples would be updated annually for changes in the average wage index (AWI). (6) Single filers with Adjusted Gross Income (AGI) over $30,000 and joint filers with AGI (including taxable SS benefits) over $45,000 would be subject to clawback of the BMB through the income tax system. Any BMB would be reduced by one dollar for every dollar of income above the thresholds. (Thresholds, in 2015 dollars, would be indexed to chained CPI-U.) Clawbacks would be credited back to the OASI Trust Fund.

39. Beginning for those newly eligible in 2026, reconfigure the special minimum benefit: (a) A year of coverage is defined as a year in which 4 quarters of coverage are earned. (b) At implementation, set the PIA for 40 years of coverage equal to 125 percent of the monthly Aged Federal poverty level (about $1,522 in 2023). For those with 20 or fewer years of coverage, phase up linearly from 0 percent of the poverty level for 10 years of coverage to 100 percent of the poverty level. For those having between 20 and 40 years of coverage, phase up linearly from 100 percent of the poverty level at 20 years of coverage to 125% of the poverty level for 40 or more years of coverage. (c) For newly eligible workers in 2026 and 2027, index the applicable poverty level using the CPI index, to the year prior to eligibility. Then, for newly eligible workers in 2028 and later, index the PIA per year of coverage by wage growth for successive cohorts. (d) Disabled workers have a somewhat similar minimum benefit, with work requirements scaled based on the number of years of non-disabled potential work.
40. Reconfigure the special minimum benefit, phased in for retired and disabled workers newly eligible from 2031 through 2040: (a) A year of work (YOW) coverage is equal to earnings at or above $10,875 in 2024 (reflecting a full-time worker earning the federal minimum wage), adjusted thereafter for wage growth. (b) At implementation, set the minimum PIA at zero percent of AWI for those with 10 or fewer YOWs to 15 percent of AWI for those with 15 YOWs, increasing linearly so that it reaches 19 percent for 19 YOWs. Then the minimum PIA would jump up to 25 percent of AWI for those with 20 YOWs, increasing linearly so that it equals 35 percent of AWI for those with 35 or more YOWs. (c) Use the AWI for two years prior to the year of initial eligibility in the minimum PIA calculation with COLA increase after the year of initial eligibility. (d) Scale the YOW requirements for disabled workers, based on the number of years of non-disabled potential work.
41. Beginning for those newly eligible in 2025, reconfigure the special minimum benefit: (a) The number of years of work (YOWs) is determined as total quarters of coverage divided by 4, ignoring any fraction. Childcare years are granted to parents who have a child under 6, with a limit of 5 such years. (b) For beneficiaries becoming newly eligible in 2025, set the initial special minimum benefit for 30+ YOWs equal to 100 percent of the monthly HHS poverty level for 2024. For beneficiaries becoming newly eligible after 2025, the initial special minimum benefit

is indexed by the AWI. For workers between 11 and 29 YOWs, reduce the special minimum by 3 1/3 percentage points per YOW so that at 29 YOWs the minimum would be 96 2/3% of poverty, ..., down to 11 YOWs at 36 2/3% of poverty. No minimum for 10 or fewer YOWs.

42. Provide a 5 percent increase to the monthly benefit amount (MBA) of any beneficiary who is 85 or older at the beginning of 2025 or who reaches their 85th birthday after the beginning of 2025.
43. Provide the same dollar amount increase to the monthly benefit amount (MBA) of any beneficiary who is 85 or older at the beginning of 2025 or who reaches their 85th birthday after the beginning of 2025. The dollar amount of increase equals 5 percent of the average retired-worker MBA in the prior year.
44. Provide an increase in the benefit level of any beneficiary who is 85 or older at the beginning of 2026 or who reaches their 85th birthday after the beginning of 2026. Increase the beneficiary's PIA based on an amount equal to the average retired-worker PIA at the end of 2025, or at the end of the year age 80 if later. Increase the beneficiary's PIA by 5 percent of this amount for those older than 85 at the beginning of 2026 and by 5 percent of this amount at age 85 for others, phased in at 1 percent per year for ages 81–85.
45. Starting in 2025, provide a 5 percent uniform benefit increase 24 years after initial benefit eligibility. Phase in the benefit increase at 1 percent per year from the 20th through 24th years after eligibility. For disabled workers, the eligibility age is the initial entitlement year to the benefit. The benefit increase is equal to 5 percent of the PIA of a worker assumed to have career-average earnings equal to SSA's average wage index. Auxiliary beneficiaries receive benefit enhancement based on the PIA of the governing worker.
46. Starting in 2027, provide a 5 percent uniform PIA increase 20 years after benefit eligibility. Phase in the PIA increase at 1 percent per year from the 16th through 20th years after eligibility. The full PIA increase is equal to 5 percent of the PIA of a worker assumed to have career-average earnings equal to the SSA average wage index. Auxiliary beneficiaries receive benefit enhancement based on the PIA of the governing worker.
47. Starting in 2031, provide a uniform PIA increase in the 24th year of benefit eligibility. Phase in the PIA increase at 0.5 percent per year from the 15th through the 24th years of eligibility. The full PIA increase

is equal to 5 percent of the average retired worker PIA in December of the 14th year of benefit eligibility. A similar additional PIA increase applies in the 43rd year of benefit eligibility (age 104), phased in from the 34th through the 43rd years of eligibility. For those past the 15th year of eligibility in 2030 (over age 76 for retirees), phase in the PIA enhancement over 10 years starting in 2031. Auxiliary beneficiaries receive benefit enhancement based on the PIA of the governing worker.

48. Starting in January 2031, provide an addition to monthly benefits for all beneficiaries who have been eligible for at least 20 years, with the following specifications: (1) Augment benefits (not the PIA) for those of qualifying age and eligibility duration with a MAGI below about $30,000 if single and $60,000 if married. MAGI is set to equal the IRMAA definition (AGI plus tax-exempt interest income). Index these thresholds after 2031 by the increase in the C-CPI-U; (2) The full additional amount is applicable for those born 1964 and later, once 24 years elapse from initial eligibility. The basic additional amount is calculated as 5 percent of the PIA for a hypothetical worker with earnings equal to the AWI each year; (3) For those born prior to 1964, the full additional amount is multiplied by the number of years they have been affected by the C-CPI-U, divided by 24; (4) Beneficiaries will receive 20 percent of their additional amount in their 20th year after initial eligibility, 40 percent in their 21st year after initial eligibility,..., and 100 percent of their additional amount in their 24th and later years after benefit eligibility; (5) Retired and disabled worker beneficiaries, dually entitled spouse beneficiaries, and all survivor beneficiaries received their addition as described above. Spousal beneficiaries (aged or with child in care) and child beneficiaries of a living retired or disabled worker receive 50 percent of the additional amount described above. Other beneficiary types (such as parents of deceased workers) will receive the percentage of the flat benefit that equals the percentage of the insured worker's PIA that they receive; (6) The AWI used is for the second year prior to the beneficiary's initial eligibility year, with applicable COLAs applied up to the age when the addition is received; and (7) The additional amount is added to the monthly benefit after reductions for early claiming or increases for delayed claiming have been applied.

49. Starting in 2026, provide an additional monthly benefit equal to 1/12th of 2 percent of the AWI for the second prior year. This additional benefit would be available to those meeting any of the following four

requirements: (a) Social Security beneficiaries who have attained age 82; (b) Social Security beneficiaries who have attained NRA and have both AIME at or below the first PIA bend point ($1,174 for 2024 initial eligibility) and at least 11 "years of coverage" as used for Windfall Elimination Provision purposes (earnings above $31,275 for 2024); (c) Individuals who have received Social Security benefits and/or SSI payments for at least 240 distinct months after attaining age 19; or (d) SSI recipients who have attained the Social Security NRA. This additional benefit would be paid out of the applicable Social Security OASI or DI Trust Fund for any month in which the individual is in receipt of a Social Security benefit; it would be paid out of the General Fund of the Treasury for any month in which the individual is in receipt of an SSI monthly payment but not a Social Security monthly benefit.

50. Reduce benefits by 5 percent for those newly eligible for benefits in 2025 and later.
51. Give credit to parents with a child under 6 for earnings for up to five years. The earnings credited for a childcare year equal one half of the SSA average wage index (about $34,396 in 2024). The credits are available for all past years to newly eligible retired-worker and disabled-worker beneficiaries starting in 2025. The 5 years are chosen to yield the largest increase in AIME.
52. Increase benefits by 5 percent for all beneficiaries as of the beginning of 2025 and for those newly eligible for benefits after the beginning of 2025.
53. Reduce individual Social Security benefits if modified adjusted gross income, or MAGI (AGI less taxable Social Security benefits plus nontaxable interest income) is above $60,000 for single taxpayers or $120,000 for taxpayers filing jointly. This provision is effective for individuals newly eligible for benefits in 2029 or later. The percentage reduction increases linearly up to 50 percent for single/joint filers with MAGI of $180,000/$360,000 or above. Index the MAGI thresholds for years after 2029, based on changes in the SSA average wage index.
54. Replace the Windfall Elimination Provision (WEP) and Government Pension Offset (GPO) with a revised reduction for most OASI benefits based on all earnings, beginning with beneficiaries newly eligible in 2031.
55. Beginning for newly eligible retired workers and spouses in 2031, all claimants who are married would receive a specified joint-and-survivor

annuity benefit (i.e., surviving spouses would receive 75 percent of the decedents' benefits, in addition to their own) that would be payable if both were still alive. Initial benefits would be actuarially adjusted to keep the expected value of benefits equivalent to what would otherwise be current law.

56. Replace the current-law WEP with a new calculation for most OASI and DI benefits based on covered and non-covered earnings, phased in for beneficiaries becoming newly eligible in 2031 through 2040. For this new approach, compute a PIA based on all past earnings (covered and non-covered), and multiply by the "non-covered earnings ratio." This ratio is equal to the current-law concept of the average indexed monthly earnings computed without non-covered earnings divided by a modified average indexed monthly earnings that includes both covered and non-covered earnings in agency records.
57. Beginning in January 2027, eliminate the retirement earnings test for all beneficiaries under normal retirement age, including retired workers, aged spouses, aged widow(er)s, young spouses with a child in care, young surviving spouses with a child in care, and children.
58. Provide an option to split the 8-percent delayed retirement credit (DRC) to offer a lump sum benefit at initial entitlement equal to 2 percent of the 8 percent DRC earned, and a 6 percent DRC on subsequent monthly benefits, effective for workers newly entitled to retired worker benefits in 2027 and later. Widows are held harmless from the lump-sum decision.
59. Eliminate the DI 5-month waiting period for disabled workers and disabled surviving spouses, and eliminate the 24-month Medicare (HI) waiting period for individuals who have become entitled to Social Security disability benefits. Effective with 2025 applications.
60. Eliminate completely the Windfall Elimination Provision (WEP) and Government Pension Offset (GPO), effective 2025.

Appendix A.3. Age-Based Solutions

61. Starting with those age 62 in 2025, increase the normal retirement age (NRA) 1 month every 2 years until the NRA reaches 68.
62. Increase the normal retirement age (NRA) 2 months per year for those age 62 starting in 2025 and ending in 2030 (NRA reaches 68 for those age 62 in 2030).

63. Starting for those age 62 in 2025, index the normal retirement age (NRA) to maintain a constant ratio of expected retirement years (life expectancy at NRA) to potential work years (NRA minus 20). We assume the NRA will increase 1 month every 2 years.
64. Increase the normal retirement age (NRA) 2 months per year for those age 62 starting in 2025 and ending in 2036 (NRA reaches 69 for those age 62 in 2036). Thereafter, increase the NRA 1 month every 2 years.
65. Starting with those age 62 in 2025, increase the normal retirement age (NRA) 1 month every 2 years until the NRA reaches 69. Also increase the age up to which the delayed retirement credit may be earned at the same rate (from 70 to 72). No change to earliest eligibility age.
66. Increase the normal retirement age (NRA) 3 months per year for those age 62 starting in 2025 and ending in 2032 (NRA reaches 69 for those age 62 in 2032). Increase the age up to which delayed retirement credits may be earned from 70 to 72 on the same schedule. Increase the widow(er) NRA in the same manner. The earliest eligibility age (EEA) for worker's and widow(er)'s benefit is unchanged.
67. Increase the earliest eligibility age (EEA) by 2 months per year for those age 62 starting in 2026 and ending in 2043 (EEA reaches 65 for those age 62 in 2043).
68. Starting for those age 62 in 2025, index the normal retirement age (NRA) to maintain a constant ratio of expected retirement years (life expectancy at NRA) to potential work years (NRA minus 20). We assume the NRA will increase 1 month every 2 years. Also, raise the earliest eligibility age (EEA) for retired-workers, aged widow(er)s, and disabled widow(er)s by the same amount as the NRA starting for those attaining 62 in 2025.
69. Starting for those age 62 in 2025, index the normal retirement age (NRA) to maintain a constant ratio of expected retirement years (life expectancy at NRA) to potential work years (NRA minus 20). We assume the NRA will increase 1 month every 2 years. Also, increase the earliest eligibility age (EEA) by the same amount as the NRA starting for those age 62 in 2025 so as to maintain a 5-year difference between the two ages. Include a "hardship exemption" with no EEA/NRA change for a worker with 25 years of earnings (with 4 quarters of coverage each), and average indexed monthly earnings (AIME) less than 250 percent of the poverty level (wage-indexed from 2013). The hardship

exemption is phased out for those with AIME above 400 percent of the poverty level.

70. Starting for those age 62 in 2025, increase both the normal retirement age (NRA) and the earliest eligibility age (EEA) by 36/47 of a month per year until the NRA and EEA reach 70 and 65, respectively. For each year, the computed NRA and EEA round down to the next lower full month.
71. Increase the normal retirement age (NRA) 3 months per year for those age 62 starting in 2025 and ending in 2036 (NRA reaches 70 for those age 62 in 2036). Thereafter, index the NRA to maintain a constant ratio of expected retirement years (life expectancy at NRA) to potential work years (NRA minus 20). We assume the NRA will increase 1 month every 2 years. Also, increase the earliest eligibility age (EEA) from 62 to 64 at the same time the NRA increases from 67 to 69; that is, for those attaining age 62 in 2025 through 2032. Keep EEA at 64 thereafter.
72. Increase the normal retirement age (NRA) and the earliest eligibility age (EEA) for those age 62 in 2025–2026 to 68 and 63, respectively, and then by 3 months per year in 2027–2030 to 69 and 64, respectively.
73. Increase the normal retirement age (NRA) and the earliest eligibility age (EEA) for those age 62 starting in 2025 by 3 months per year until EEA reaches 64 in 2032 and NRA reaches 69 in 2032.
74. Starting in 2027, convert all disabled-worker beneficiaries to retired-worker status upon attainment of their earliest eligibility age (EEA) rather than their normal retirement age (NRA). After conversion, apply the early retirement reduction for retirement at EEA (currently 30 percent for those age 62 in 2027) phased in over 40 years.

Appendix A.4. Family Benefits Solutions

75. Beginning in 2025, continue benefits for children of disabled or deceased workers until age 22 if the child is in high school, college, or vocational school.
76. The current spouse benefit is based on 50 percent of the PIA of the other spouse. Reduce this percent each year by 1 percentage point beginning with newly eligible spouses in 2025, until the percent reaches 33 in 2041.
77. Allow divorced aged spouses and divorced surviving spouses married 5 to 9 years to get benefits based on the former spouse's account. Divorced aged and surviving spouses would receive 50% of the applicable

current-law PIA percentage if married 5 years, 60% if married 6 years, ..., 90% if married 9 years. This benefit would be available to divorced spouses on the rolls at the beginning of 2026 and those becoming eligible after 2025.

78. Establish an alternative benefit for a surviving spouse. For the surviving spouse, the alternative benefit would equal 75 percent of the sum of the survivor's own worker benefit and the deceased worker's PIA (including any actuarial reductions or delayed retirement credits). If the deceased worker died before becoming entitled, use the age 62 actuarial reduction if deceased before age 62, or the applicable actuarial reduction/DRC for entitlement at the age of death if deceased after 62. The alternative benefit would not exceed the PIA of a hypothetical earner who earns the SSA average wage index (AWI) every year, and who becomes eligible for retired-worker benefits in the same year in which the deceased worker became entitled to worker benefits or died (if before entitlement). The alternative benefit would be paid only if more than the current-law benefit. This benefit would be available to surviving spouses on the rolls at the beginning of 2026 and those becoming eligible after 2025.
79. Limit the spousal benefit to that received by the spouse of the 75th percentile career-average worker, beginning with retired workers newly eligible in 2031. For future cohorts, this limit would be indexed for inflation annually using chain-weighted CPI-U. The provision affects divorced spouses and young spouses (retired workers) but not spouses of disabled workers.
80. For spouses and children of retired and disabled workers becoming newly eligible beginning in 2031 and phased in for 2031 through 2040, limit their auxiliary benefit to one-half of the PIA for a hypothetical worker with earnings equal to the national average wage index (AWI) each year.
81. Beginning in January 2027, require full-time school enrollment as a condition of eligibility for child benefits at age 15 up to 18.
82. Beginning in 2025, continue benefits for children of disabled, retired, or deceased workers until age 26 if the child is in high school, college, or vocational school.
83. Provide for pro-rata benefit payment for the month of death of a beneficiary, rather than no payment for the month of death. For situations where an auxiliary beneficiary is changed from one type of benefit to

another upon the death of the worker, benefits for the month of the worker's death would be determined on a pro-rata basis. This provision would apply for deaths in 2025 or later.

Appendix A.5. Tax Solutions

84. Increase the payroll tax rate (currently 12.4 percent) to 16.0 percent in 2025 and later.
85. Increase the payroll tax rate (currently 12.4 percent) to 15.9 percent in 2035–2064, and to 19.4 percent in years 2065 and later.
86. Increase the payroll tax rate (currently 12.4 percent) by 0.1 percentage point each year from 2030–2049, until the rate reaches 14.4 percent in 2049 and later.
87. Increase the payroll tax rate (currently 12.4 percent) by 0.1 percentage point each year from 2027–2032, until the rate reaches 13.0 percent for 2032 and later.
88. Increase the payroll tax rate (currently 12.4 percent) by 0.1 percentage point each year from 2028–2051, until the rate reaches 14.8 percent in 2051 and later.
89. Increase the payroll tax rate by 0.1 percentage point per year for 2026 through 2035 so that it equals 13.4 percent for 2035 and later. The increase would be split evenly between the employer and employee share and allocated between OASI and DI in proportion to currently scheduled payroll tax rates.
90. Eliminate the taxable maximum in years 2025 and later, and apply the full 12.4 percent payroll tax rate to all earnings. Do not provide benefit credit for earnings above the current-law taxable maximum.
91. Eliminate the taxable maximum in years 2025 and later, and apply the full 12.4 percent payroll tax rate to all earnings. Provide benefit credit for earnings above the current-law taxable maximum.
92. Eliminate the taxable maximum for years 2031 and later (phased in 2025–2031), and apply the full 12.4 percent payroll tax rate to all earnings. Provide benefit credit for earnings above the current-law taxable maximum using a secondary PIA formula with a new bend point and formula factors of 3 and 0.25 percent below and above the bend point, respectively.
93. Apply the 12.4 percent payroll tax rate on earnings above $250,000 starting in 2025, and tax all earnings once the current-law taxable max-

imum exceeds $250,000. Do not provide benefit credit for additional earnings taxed.

94. Eliminate the taxable maximum in years 2030 and later. Phase in elimination by taxing all earnings above the current-law taxable maximum at increasing rates until reaching 12.4 percent in 2030. Provide benefit credit using a secondary PIA formula with a 5 percent formula factor above the maximum.
95. Eliminate the taxable maximum in years 2036 and later. Phase in elimination by taxing all earnings above the current-law taxable maximum at increasing rates from 2027–2036. Provide benefit credit for earnings above the maximum with a 3 percent formula factor above the new bend point.
96. Apply OASDI 12.4 percent payroll tax on earnings above $400,000 starting in 2026, and tax all earnings once the current-law taxable maximum exceeds $400,000. Provide benefit credit using a secondary PIA formula with a 2 percent formula factor on excess earnings.
97. Apply OASDI 12.4 percent payroll tax on earnings above $250,000 starting in 2026, and tax all earnings once the taxable maximum exceeds $250,000. Provide benefit credit with a 2 percent formula factor on excess earnings.
98. Apply OASDI 12.4 percent payroll tax on earnings above $300,000 starting in 2026, and tax all earnings once the taxable maximum exceeds $300,000. Provide benefit credit with a 3 percent formula factor on excess earnings.
99. Apply OASDI 12.4 percent payroll tax on earnings above $250,000 starting in 2025, and tax all earnings once the taxable maximum exceeds $250,000. Increase the SSA average wage index after 2024 by 0.7–0.9 percent and provide benefit credit with a 2 percent formula factor on excess earnings.
100. Apply 12.4 percent payroll tax on earnings above $400,000 starting in 2025 and tax all earnings once the taxable maximum exceeds $400,000. Do not provide benefit credit for additional earnings taxed.
101. Apply the combined OASDI payroll tax on covered earnings above $400,000 starting in 2026, increasing AWI by 0.5–0.9 percent and crediting additional earnings for benefits using a 1 percent formula factor on a secondary AIME.
102. Increase the taxable maximum so that 90 percent of earnings are subject to the payroll tax (phased in 2025–2034). Provide benefit credit

up to the revised taxable maximum.

103. Increase the taxable maximum so that 90 percent of earnings are subject to the payroll tax (phased in 2025–2034). Do not provide benefit credit for additional earnings taxed.
104. Increase the taxable maximum by an additional 2 percent each year beginning in 2025 until taxable earnings equal 90 percent of covered earnings. Provide benefit credit up to the revised taxable maximum.
105. Increase the taxable maximum by an additional 2 percent each year beginning in 2027 until taxable earnings equal 90 percent of covered earnings. Do not provide benefit credit for additional earnings taxed.
106. Increase the taxable maximum by an additional 2 percent per year beginning in 2026 until taxable earnings equal 90 percent of covered earnings. Provide benefit credit up to the revised taxable maximum and create a new bend point at the maximum with a 5 percent formula factor above it.
107. Beginning in 2032, apply a 2 percent payroll tax on earnings over the wage-indexed equivalent of $200,000 in 2017 (about $366,000 in 2032), with proportional benefit credit for additional earnings taxed.
108. Beginning in 2032, apply a 2 percent payroll tax on earnings over the wage-indexed equivalent of $200,000 in 2017. Do not provide benefit credit for additional earnings taxed.
109. Beginning in 2032, apply a 2 percent payroll tax on earnings over the wage-indexed equivalent of $300,000 in 2017 (about $549,000 in 2032), with proportional benefit credit.
110. Beginning in 2032, apply a 2 percent payroll tax on earnings over the wage-indexed equivalent of $300,000 in 2017. Do not provide benefit credit.
111. Beginning in 2032, apply a 2 percent payroll tax on earnings over the wage-indexed equivalent of $400,000 in 2017 (about $732,000 in 2032), with proportional benefit credit.
112. Beginning in 2032, apply a 2 percent payroll tax on earnings over the wage-indexed equivalent of $400,000 in 2017. Do not provide benefit credit.
113. Eliminate the taxable maximum for the employer payroll tax (6.2 percent) beginning in 2025. For the employee payroll tax (6.2 percent), increase the taxable maximum by an additional 2 percent annually until taxable earnings equal 90 percent of covered earnings.

114. Increase the taxable maximum so that 90 percent of earnings are subject to the payroll tax (phased in 2025–2034). Apply an additional 6.2 percent tax above the revised taxable maximum. Provide benefit credit up to the revised maximum.
115. Beginning in 2026, apply a 4 percent payroll tax on earnings above the wage-indexed equivalent of $400,000 in 2015 (about $612,900 in 2026). Provide benefit credit using a secondary PIA formula with a 2 percent formula factor on excess earnings between $400,000 and $500,000.
116. Beginning in 2026, increase the taxable maximum by twice the AWI growth rate (minimum 3 percent). Provide benefit credit up to the revised taxable maximum.
117. Increase the taxable maximum linearly over 4 years to $291,000 for 2029. After 2029, index to AWI plus 0.5 percentage point. Provide benefit credit on additional earnings taxed.
118. Increase the taxable maximum so that 90 percent of earnings are subject to the payroll tax (phased in linearly from 2026–2031). Provide benefit credit using a secondary PIA formula with a 2.5 percent formula factor on excess earnings.

Appendix A.6. Coverage and Revenue Source Solutions

119. Starting in 2025, cover newly hired State and local government employees.
120. Starting in 2025, exempt individuals with more than 180 quarters of coverage from the OASDI payroll tax. Earnings exempted from OASDI payroll tax would not be used in computing benefits.
121. Expand covered earnings to include employer and employee premiums for employer-sponsored group health insurance (ESI). Starting in 2028, phase out the OASDI payroll tax exclusion for ESI premiums. Set an exclusion level at the 75th percentile of premium distribution in 2028, with amounts above that subject to the payroll tax. Reduce the exclusion level each year by 10 percent of the 2028 exclusion level until fully eliminated in 2038.
122. Expand covered earnings to include contributions to voluntary salary reduction plans (such as Cafeteria 125 plans and Flexible Spending Accounts). Starting in 2025, subject these contributions to the OASDI payroll tax, making their treatment equivalent to 401(k) contributions.

123. Apply a separate 6.2 percent tax on investment income as defined in the Affordable Care Act (ACA), with unindexed thresholds as in the ACA ($200,000 for single filers, $250,000 for married filing jointly), starting in 2026. Proceeds go to the OASI and DI Trust Funds.
124. For the estate tax, gift tax, and generation-skipping transfer (GST) tax, return exemption thresholds and tax rates to 2009 levels ($3.5 million threshold for estate tax with a top 45% tax rate) for deaths after 2024 and gifts made after 2024, with no future indexing. All proceeds would go to the OASI and DI Trust Funds.
125. For active S-corporation officers and limited partners, apply a 16.2 percent tax on investment income as defined in the ACA, with unindexed thresholds ($200,000 single, $250,000 joint), starting in 2025. Proceeds go to the OASDI Trust Funds for tax attributable to 12.4 percent of the total 16.2 percent tax rate.
126. Apply a separate 12.4 percent tax on investment income as defined in the ACA, with unindexed thresholds ($200,000 single, $250,000 joint), starting in 2026. Proceeds go to the OASDI Trust Funds.
127. Expand the tax on net investment income (NII) as defined in the ACA to cover earnings from active S-corporation holders and active limited partners. Apply a 12.4 percent tax on this expanded definition of NII, payable to the OASI and DI Trust Funds with unindexed thresholds of $400,000 for single filers and $500,000 for joint filers, starting in 2025.
128. Apply a separate 12.4 percent tax on NII, as defined in the ACA, payable to the OASI and DI Trust Funds with an unindexed threshold of $400,000, effective 2026 and later. The NII tax would apply to the lesser of NII and the excess of modified adjusted gross income (MAGI) above the threshold, regardless of filing status.

Appendix A.7. Equity Investment Solutions

129. Invest 40 percent of the OASI and DI Trust Fund reserves in equities (phased in 2025–2039), assuming an ultimate 5.8 percent annual real rate of return on equities.
130. Invest 40 percent of the OASI and DI Trust Fund reserves in equities (phased in 2025–2039), assuming an ultimate 4.8 percent annual real rate of return on equities.
131. Invest 40 percent of the OASI and DI Trust Fund reserves in equities (phased in 2025–2039), assuming an ultimate 2.3 percent annual real

rate of return on equities (equal to the assumed return on Trust Fund bonds).

132. Invest 15 percent of the OASI and DI Trust Fund reserves in equities (phased in 2025–2034), assuming an ultimate 5.8 percent annual real rate of return.
133. Invest 15 percent of the OASI and DI Trust Fund reserves in equities (phased in 2025–2034), assuming an ultimate 2.3 percent annual real rate of return (same as Trust Fund bonds).
134. Invest 25 percent of the OASI and DI Trust Fund reserves in equities (phased in 2027–2036), assuming an ultimate 5.8 percent annual real rate of return.
135. Invest 25 percent of the OASI and DI Trust Fund reserves in equities (phased in 2027–2036), assuming an ultimate 2.3 percent annual real rate of return (same as Trust Fund bonds).

Appendix A.8. Taxation of Benefits Solutions

136. Starting in 2025, tax Social Security benefits in a manner similar to private pension income. Phase out the lower-income thresholds during 2025–2044.
137. Increase the threshold for taxation of OASDI benefits to $50,000 for single filers and $100,000 for joint filers starting in 2026. Taxation of benefits revenues transferred to the HI Trust Fund would remain at current-law levels.
138. Beginning in 2031, for single/head-of-household/married-filing-separate taxpayers with MAGI of $250,000 or more and joint filers with MAGI of $500,000 or more, include up to the remaining 15 percent of Social Security benefits in taxable income (raising the current 85 percent cap). Thresholds indexed to AWI thereafter. Revenue would be credited to the Social Security trust funds.
139. Eliminate federal income taxation of OASDI benefits credited to the OASI and DI Trust Funds for 2054 and later. Phase out OASDI taxation of benefits by increasing relevant income thresholds gradually from 2045–2053. HI Trust Fund taxation remains unchanged.
140. Replace current-law thresholds with fixed thresholds at $50,000 for single filers and $100,000 for joint filers for taxing up to 85 percent of OASDI benefits, effective 2026. Reallocate revenue so that the HI Trust Fund remains at current-law levels, with the net amount credited to the combined Social Security Trust Fund.

Appendix A.9. Privatization Solutions

141. Full Privatization: Divert all payroll taxes to private 401(k)-like accounts over 30 years, with a 0% crowd-out of other savings and loss of trust fund assets and interest. Transition occurs at 3.3% of payroll per year. Funds are diversified through existing market instruments such as mutual funds.
142. TSP-Style Privatization: Divert 3.33% of payroll taxes annually into low-fee, government-managed accounts, increasing by 3.33% per year. The SSA winds down by year 30. Funds are already diversified through mutual fund structures.

Appendix B. LLM Evaluation Primary Prompts and Protocols

This appendix describes the evaluation protocol used to assess Social Security reform Courses of Action (COAs) across six policy constructs. Each COA is scored using a standardized Likert scale and brief justifications to ensure consistency and transparency in scoring.

Appendix B.1. Evaluation Overview

Each COA is evaluated on a scale from -5 to $+5$ for the following constructs: **Individual Cost Burden (ICB)**, **Trust (T)**, **Equity (E)**, **Sustainability (S)**, **Administrative Feasibility (AF)**, and **Political Viability (PV)**. Every score is supported by a one-sentence justification. Evaluators are expected to use the entire scale across the full COA set.

Appendix B.2. Construct Definitions

Table B.7 shows the working definitions for each construct used in the evaluation.

Appendix B.3. Likert Scale Legend

The Likert scale used to evaluate each construct is shown in Table B.8. Negative scores indicate negative effects, while positive scores indicate positive effects.

Appendix B.4. Round 1: Initial Evaluation (18 COA)

In the initial round, raters assign scores to each COA with concise justifications. The format used for recording results is shown in Table B.9.

Table B.7: Construct Definitions for COA Evaluation

Construct	Definition
Individual Cost Burden (ICB)	Assesses the direct economic burden imposed on individuals (e.g., taxpayers, retirees, workers), including changes to taxes, thresholds, or benefits.
Trust (T)	Measures whether the reform supports or undermines public confidence in Social Security as a reliable and earned entitlement.
Equity (E)	Evaluates fairness across income groups, occupations, and generations, especially in terms of progressivity and distributional justice.
Sustainability (S)	Indicates the reform's contribution to long-term financial solvency and its likelihood of avoiding future crisis interventions.
Administrative Feasibility (AF)	Considers legal, technical, and bureaucratic challenges associated with implementation.
Political Viability (PV)	Reflects the likelihood of legislative and public support, based on precedent and contemporary political climate.

Table B.8: Likert Scale Legend

Score	Interpretation
+5	Very significant positive impact
+4	Significant positive impact
+3	Positive impact
+2	Small positive impact
+1	Very small positive impact
0	No measurable impact
−1	Very small negative impact
−2	Small negative impact
−3	Negative impact
−4	Significant negative impact
−5	Very significant negative impact

Appendix B.5. Round 2: Revision and Justification Review (18 COA)

In the second round, evaluators review their scores alongside the anonymized scores and justifications of three other raters. Revisions are made only if an-

Table B.9: Round 1: Initial Evaluation Table (Transposed Format)

Construct	Score	Justification
COA # 2		
ICB		
T		
E		
S		
AF		
PV		
COA # 8		
ICB		
T		
E		
S		
AF		
PV		
COA # ⋮		
ICB		
T		
E		
S		
AF		
PV		

other justification is persuasive. The table format is shown in Table B.10.

Appendix B.6. Final Evaluation: Full COA Set (142 COA)

The final round involves scoring all 142 COAs without justifications. Evaluators apply lessons from previous rounds and maintain consistency across similar policy types. Table B.11 provides the format.

Appendix B.7. Final Notes

Evaluators should remain evidence-based and decisive in assigning scores, maintaining internal consistency for comparable COAs. This evaluation supports a broader research agenda on AI-assisted, value-sensitive policy design.

Table B.10: Round 2: Revision and Justification Review Table (Transposed Format)

Construct	Old Score	New Score	COA #	Reason for Change
ICB			2	
T			2	
E			2	
S			2	
AF			2	
PV			2	
ICB			8	
T			8	
E			8	
S			8	
AF			8	
PV			8	
⋮			⋮	

Table B.11: Final Evaluation: Full COA Set (142 COA)

COA #	ICB	T	E	S	AF	PV
1						
2						
⋮						
142						

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