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Pension reform in Morocco: Multi-pillar approaches and informal sector integration

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Abstract. Demographic shifts, fiscal pressures, and the prevalence of informal employment challenge Morocco's pension system. This study uses a dynamic microsimulation model to assess reform scenarios, including parametric adjustments, non-contributory pensions, multi-pillar systems, and incentives for informal worker participation. Key findings highlight the promise of a multi-pillar system—combining a basic social pension, mandatory contributory schemes, and voluntary savings—in achieving financial sustainability, expanding coverage, and ensuring equity. Targeted non-contributory pensions and strategies to formalize informal sector participation are also crucial. Policy recommendations stress phased implementation, institutional capacity building, and financial literacy promotion to ensure inclusive, effective reforms that secure income for all citizens. This study contributes actionable insights for policymakers navigating complex social protection challenges in developing economies.

Keywords: *Pension reform; Social protection; Multi-pillar pension system; Informal sector; Financial sustainability, Dynamic microsimulation.*

1. Introduction

Morocco's pension system faces mounting pressures due to demographic shifts, economic constraints, and a large informal workforce. Covering only about one-third of workers, the system excludes millions, exacerbating inequality and fiscal stress. Aging populations, declining birth rates, and labor market informality compound these challenges, threatening the system's sustainability. Morocco's pay-as-you-go model—a colonial legacy—relies heavily on today's workers to fund retiree pensions, making it increasingly vulnerable to demographic and economic changes.

This study investigates structural flaws in Morocco's pension framework and explores pathways to reform, guided by three key questions: What are the primary weaknesses of Morocco's current pension system, particularly regarding informal worker inclusion? How can reforms address challenges like aging populations and informal labor to ensure financial sustainability and equity? What lessons can Morocco draw from international examples to inform its approach?

Using a dynamic microsimulation model, this study evaluates reform scenarios such as multi-pillar systems, parametric adjustments, and non-contributory pensions. It emphasizes the need for reforms that balance fiscal responsibility with inclusivity. By aligning Morocco's pension policies with its socio-economic realities, this research offers practical recommendations for creating a resilient, inclusive social protection framework.

2. Literature Review

Pension reform in developing economies is a complex issue. One of the most significant obstacles in Morocco is the informal sector, which employs a sizable portion of the workforce outside of traditional systems. This gap leaves many people without reliable retirement savings, resulting in economic vulnerability that worsens over time. Across the globe, similar challenges have prompted innovative solutions. The OECD notes that pension systems frequently cater primarily to formal employees, ignoring informal workers entirely. This exclusion exacerbates inequality and leaves millions without a safety net as they age. Some countries, however, have started to close the gap. Consider India and South Africa, for example. Both have introduced models that include both contributory and non-contributory elements, demonstrating that a combination of state assistance and individual incentives can help extend pension coverage to informal workers.

Informal workers face long-standing barriers. Income insecurity, a lack of knowledge about pension options, and bureaucratic complexity frequently prevent people from participating. Some countries, such as Kenya, have taken a more innovative approach, utilizing mobile payment systems to facilitate contributions. These systems have brought new participants into the fold by reducing red tape and making the process easier. Demographics add another level of complexity. Morocco, like many other countries, has an aging population. As life expectancy rises and birth rates fall, fewer workers are required to support an increasing number of retirees. The current pay-as-you-go system, which relies on today's workers to fund today's pensions, is under threat. The World Bank has identified this as a critical issue and urged reforms that include multi-pillar systems. These frameworks combine a basic social pension with mandatory contributions and voluntary savings, providing a more balanced approach by distributing risks and resources across multiple sources. Economic conditions only exacerbate the pressure. Low wages and high unemployment make it difficult for many workers to save for retirement, while fiscal constraints limit government funding for public pensions. In this context, Morocco could draw inspiration from Sweden. Sweden's success stems from its adaptability—using flexible retirement ages and innovative contribution models to ensure sustainability while maintaining equity.

What can Morocco learn from these examples? First, while non-contributory pensions can help reduce poverty, they are only one piece of the puzzle. A more comprehensive approach is required, one that promotes formal employment and long-term savings. Morocco can work toward a pension system that is fair, inclusive, and prepared for future challenges by implementing the right reforms.

These global examples highlight that no single solution fits all contexts. In the following sections, we explore how Morocco can adapt these strategies through rigorous analysis using dynamic microsimulation.

a. Pension coverage in the informal sector

In Morocco, a major challenge facing the pension system is the sheer size of the informal labor force (World Bank, 2019). These workers—many of whom are self-employed, seasonal, or casually employed—find themselves outside the safety net of formal pension arrangements. Without access to structured retirement savings, the financial outlook for these individuals in their later years is precarious at best. This isn't a problem unique to Morocco. Across the globe, pension systems often prioritize formal workers while leaving informal workers behind. The OECD has flagged this issue repeatedly, warning that such exclusion only worsens inequalities and deepens poverty among the elderly (OECD, 2023). But solutions do exist. India and South Africa, for example, have rolled out hybrid pension schemes that mix contributory and non-contributory elements, making room for informal workers who might otherwise be left out (Behrendt and Nguyen, 2022).

Morocco's obstacles are clear. Workers in the informal sector often lack stable incomes, making regular contributions difficult. Administrative red tape adds another layer of frustration, while limited awareness about pension benefits keeps many from even considering enrollment. However, there are ways to tackle these barriers. Kenya, for instance, has successfully used mobile payment systems to make pension contributions simple and accessible (Kenya Pension System Report, 2022). Morocco could learn from this model, creating more user-friendly systems that cater to the realities of informal work.

But technology alone isn’t the answer. Trust plays a huge role. Many informal workers hesitate to participate in formal schemes because they don’t see the immediate benefit or fear losing access to their funds (International Labour Organization, 2022). Outreach programs that build trust, coupled with flexible policies that allow for irregular contributions, could help change this mindset. At the end of the day, including the informal sector in Morocco’s pension system isn’t just about numbers—it’s about creating a fairer, more resilient future for all workers (Palacios & Sluchynsky, 2006).

b. Demographic pressures and system sustainability

Morocco’s pension system is walking a tightrope (European Commission, 2023). On one side, you have a population that’s living longer than ever before—a good thing, of course, but one that comes with financial challenges. On the other side, there’s a steady decline in birth rates, which means fewer workers are contributing to the system over time. Together, these trends are stretching the current pension framework to its limits. The pay-as-you-go (PAYG) model, which Morocco relies on, is particularly vulnerable to this kind of demographic shift. The concept is simple: today’s workers fund today’s retirees (World Bank, 2008). But as the number of retirees grows and the workforce shrinks, the math starts to fall apart. The World Bank has pointed to this imbalance as a major threat to the system’s sustainability (World Bank, 2019).

To tackle this, many countries have turned to multi-pillar models. These systems combine basic social pensions with mandatory contributions and voluntary private savings, creating a more diversified structure (Holzmann & Hinz , 2005). By spreading out the risk, they’re better equipped to handle the pressures of an aging population. Economic conditions complicate things even further. High unemployment and stagnant wages make it tough for many workers to contribute to pension funds. At the same time, government budgets are already under strain. Morocco might find some inspiration in Sweden’s approach. There, flexible retirement ages and innovative contribution models have helped maintain a balance between fairness and sustainability (Rocha et al. 2011).

Morocco's path forward won’t be easy, but it’s not impossible either. Reforms need to be bold yet inclusive, ensuring that everyone—whether they work in the formal or informal sector—can look forward to a secure retirement. It’s not just about fixing the numbers; it’s about building a system that reflects the realities of today’s workforce while preparing for the challenges of tomorrow (Behrendt & Nguyen, 2022).

c. Recent developments in Morocco's pension reform

In recent years, Morocco has made notable moves to address the growing instability of its pension system. Policymakers, faced with mounting fiscal pressures and widening coverage gaps, have begun charting a path toward comprehensive reform. A 2024 report from national financial regulators outlines a bold vision: the creation of a dual public-private pension system aimed at balancing liabilities while ensuring long-term sustainability (International Labour Organization, 2022).

The idea behind this dual system is simple but ambitious. By distributing responsibility between public and private institutions, the government hopes to ease the financial strain on its current schemes. Key proposals include stabilizing at-risk pension funds and introducing targeted measures to expand coverage to informal workers—a group that has historically been left out of the conversation (Palacios & Sluchynsky, 2006). For example, temporary freezes on pension re-evaluations and procedural adjustments are being explored to stabilize existing funds.

But reforms don’t stop there. Morocco is also looking to incentivize informal workers to join pension schemes. Subsidies, flexible contribution schedules, and even micro-pension products tailored to low-income workers are part of the strategy (Kenya Pension System Report, 2022). Collaborations with private financial institutions are underway to design programs that meet the unique needs of these groups. These steps, while promising, highlight a significant shift in how Morocco views inclusivity in its pension reforms.

Still, challenges remain. The success of these measures will depend heavily on their implementation. Transparency in fund management, strong governance structures, and public trust are non-negotiable for these reforms to succeed. Lessons from Mexico’s struggles in transitioning to a mixed pension system show how mismanagement and mistrust can derail even the best-laid plans. Morocco’s efforts will need to stay focused on avoiding similar pitfalls.

Overall, while the road ahead is long, these recent developments signal a new era in Morocco’s pension reform journey. By addressing both financial stability and social inclusivity, the country is taking meaningful steps toward a more resilient future (European Commission, 2023).

d. International perspectives on pension reform

When it comes to pension reform, there’s a lot of Morocco can learn by looking beyond its borders. Different countries have faced similar challenges, and their successes—and failures—offer valuable insights for shaping effective strategies.

Take Chile, for instance. Once seen as a model for privatized pensions, Chile’s system is under intense scrutiny Behrendt & Nguyen, 2022). While the country achieved fiscal sustainability early on, many retirees found themselves struggling to make ends meet, especially those with irregular work histories. The system’s focus on privatization inadvertently created gaps in coverage, leaving a significant portion of the population behind. For Morocco, this serves as a cautionary tale: reforms that prioritize fiscal goals at the expense of social adequacy often fall short in the long run.

On the other hand, there are success stories like New Zealand’s universal basic pension (Palacios & Sluchynsky, 2006). Funded entirely through general taxation, this system guarantees a baseline level of income for all elderly citizens, regardless of their employment history. Then there’s Brazil, which has taken a different approach by introducing targeted social pensions for informal and rural workers (International Labour Organization, 2022). These examples show that different models can work well, depending on a country's specific needs and context.

One recurring theme is the importance of inclusivity. Morocco's informal sector, much like Brazil's, represents a significant challenge to achieving universal coverage (World Bank, 2019). By learning from Brazil's targeted approaches and New Zealand's emphasis on simplicity and universality, Morocco can design a system that addresses the diverse realities of its workforce.

Of course, context matters. While international models inspire, any reforms in Morocco will need to account for its unique demographic, economic, and institutional landscape (Holzmann and Hinz, 2005). By drawing on global lessons and tailoring them to local needs, Morocco has the opportunity to build a pension system that balances fiscal responsibility with social fairness.

e. Gaps in the literature

When it comes to Morocco's pension system, a lot has been said, but some crucial areas remain underexplored. One of the biggest unanswered questions is how to bring informal workers into the fold (World Bank, 2019). We know the informal sector makes up a huge portion of the workforce, yet detailed insights into the day-to-day realities of these workers—and what keeps them from participating in pension schemes—are surprisingly scarce. Are the barriers primarily financial, or are they tied to trust and awareness? That's a question that deserves more attention.

Another area that feels a bit neglected is the adequacy of existing pensions. Sure, there's been plenty of focus on sustainability—making sure the system doesn't run out of money—but what about the people who rely on it? Can they live on their benefits? For women, low-income workers, and others with patchy contribution histories, the answer often seems to be "no." Yet, this side of the conversation doesn't get nearly the attention it should (International Labour Organization, 2022).

Then there's the international angle. Countries like Brazil and New Zealand have tackled similar challenges in creative ways. Brazil has succeeded with targeted programs for informal workers, while New Zealand's universal approach ensures everyone gets a baseline income (Behrendt & Nguyen, 2022). But here's the catch: Morocco's situation is different, and we can't just copy-paste what worked elsewhere. How do you adapt these ideas to fit Morocco's unique mix of demographics and economic realities? That's another question worth digging into.

Finally, let's talk about technology. Kenya, for example, has used mobile money platforms to bring pensions to people who might otherwise be excluded (Kenya Pension System Report, 2022). Could Morocco do something similar? The potential is there, but the specifics—how to implement it and how to build trust in the system—haven't been studied enough (Holzmann and Hinz, 2005).

This study takes a step toward filling these gaps. By using dynamic microsimulation, it doesn't just crunch numbers; it explores how different reforms might play out for real people in real situations. Hopefully, this approach will spark new ideas and push the conversation forward.

3. Methodology

To tackle the complexities of Morocco's pension reform, this study uses a dynamic microsimulation model—a tool specifically designed to analyze how policies impact individuals over time. Think of it to predict the ripple effects of reforms on real people's lives rather than just looking at abstract numbers. This approach is particularly useful in understanding how demographic shifts, labor market changes, and policy tweaks interact.

The model itself is an adaptation of the INSEE's Destinie framework, originally developed in France. But Morocco isn't France, so the model had to be reworked to reflect the country's unique labor market and demographic profile. For example, it includes data on informal employment patterns, something that's much more pronounced in Morocco than in many other countries.

Three key data sources form the backbone of this analysis. First, there's the Moroccan Household Survey from 2014, which provides detailed information about household income and employment (World Bank, 2019). Then, labor force surveys conducted by the High Commission for Planning (HCP) give insights into workforce dynamics. Finally, administrative records from the Caisse Nationale de Sécurité Sociale (CNSS) and the Caisse Marocaine des Retraites (CMR) offer a clear picture of current pension coverage and contributions. Together, these datasets create a robust foundation for the microsimulation.

The model has three components:

1. **Demographic Module**: Projects population changes using fertility, mortality, and migration data.
2. **Labor Market Module**: Simulates employment transitions, including shifts between informal and formal sectors.
3. **Pension Module**: Calculates pension benefits based on contribution histories under different reform scenarios.

Four reform scenarios are analyzed:

1. **Parametric Reforms**: These include adjustments like raising the retirement age or tweaking contribution rates. Essentially, they're technical fixes aimed at shoring up the system's finances.
2. **Non-Contributory Pensions**: This involves creating a safety net for those who've never contributed formally, ensuring that no one is left without support in old age.
3. **Multi-pillar systems**: These combine basic pensions, mandatory contributions, and voluntary savings to spread risks and provide more balanced income sources for retirees.
4. **Incentives for Informal Workers**: These are measures like subsidized contributions or simpler registration processes to encourage participation from the informal sector.

The model limitations:

1. **Informal Sector Diversity**: Income variability complicates accurate modeling.
2. **Data Gaps**: Limited longitudinal data restricts projections for informal worker participation.
3. **Economic Shocks**: Assumes economic stability, omitting potential disruptions.

Validation and sensitivity analyses are a crucial part of this process (International Labour Organization, 2022). After all, no model is perfect. To ensure reliability, historical data were used to test the model's accuracy, comparing its outputs with actual trends. Sensitivity analysis, meanwhile, explored how changes in key variables—like economic growth or fertility rates—could impact the results. These steps aren't just about double-checking; they're about building confidence in the findings.

At its core, this methodology isn't just about crunching numbers—it's about making sense of how policies will play out in the real world. By capturing the nuances of Morocco's labor market and demographics, the model aims to provide insights that are both practical and actionable.

a. Data sources

The primary data sources for this analysis include the Moroccan Household Survey (2014), labor force surveys conducted by the High Commission for Planning (HCP), and administrative data from the Caisse Nationale de Sécurité Sociale (CNSS) and the Caisse Marocaine des Retraites (CMR). These datasets provide a comprehensive depiction of demographic characteristics, employment structures, income distribution, and current pension coverage levels in Morocco. Additionally, macroeconomic data from the World Bank and the International Monetary Fund (IMF) are incorporated to contextualize the broader economic environment in which pension reforms are being evaluated.

To enhance the empirical robustness of the microsimulation model, this study also incorporates longitudinal survey data and administrative records from other countries that have implemented similar pension reforms. This comparative perspective is essential for validating the model, ensuring that the assumptions and scenarios reflect a broad range of real-world experiences. Integrating cross-country data adds rigor to the model's projections, enabling a more nuanced analysis of the potential effects of the proposed reforms. The inclusion of such data allows for benchmarking against international best practices, providing insights into how different reform strategies have fared in comparable contexts.

b. Model structure

The dynamic microsimulation model is composed of several interlinked modules that simulate demographic, labor market, and pension system dynamics. The demographic module projects population changes based on fertility, mortality, and migration rates, while the labor market module simulates employment transitions, including shifts between formal and informal sectors, as well as wage progression over time. The pension module calculates accrued pension rights and benefits based on individual earnings histories and the specific rules of the Moroccan pension system.

The demographic module uses age-specific fertility and mortality rates to project population growth and changes in the age structure. These projections are critical for assessing the future dependency ratio, which directly influences the sustainability of pay-as-you-go (PAYG) pension systems. The labor market module relies on transition probabilities derived from labor force survey data to simulate employment trajectories, including labor force entries and exits, as well as transitions between formal and informal employment. This component is particularly important given the significant prevalence of informal work in Morocco, which poses challenges for pension coverage. The detailed modeling of transitions between formal and informal sectors provides insights into the dynamics of informality and its implications for pension reform, highlighting potential pathways for increasing formalization.

The pension module, as the core component of the model, calculates pension entitlements based on individual earnings histories and contribution records. It incorporates key parameters of the Moroccan pension system, including contribution rates, accrual rates, and retirement ages. The model allows for the simulation of various policy scenarios, such as changes in contribution rates, adjustments to retirement ages, or the introduction of non-contributory social pensions aimed at expanding coverage to informal sector workers. This flexibility in modeling allows for an exploration of different policy levers, providing a comprehensive understanding of how specific interventions may impact both individual outcomes and overall system sustainability.

c. Policy scenarios

The analysis evaluates several reform scenarios to determine their potential impact on pension coverage and system sustainability. These scenarios include:

1. **Parametric reforms**: Adjustments to existing parameters, such as increasing the retirement age, modifying contribution rates, or altering benefit formulas. These reforms are intended to enhance the financial sustainability of the pension system by adjusting key variables that influence the balance between contributions and payouts. Parametric reforms are often seen as a first step towards addressing fiscal imbalances, and their effects on different population cohorts are analyzed to understand the distributional impacts of such changes.
2. **Non-contributory pensions**: Introduction of a basic social pension for individuals who have not accrued sufficient pension rights through formal employment. This scenario aims to close the coverage gap for informal sector workers and provide a minimum level of income security for the elderly population. Non-contributory pensions are particularly relevant in the context of Morocco's large informal sector, as they offer a safety net for those who are otherwise excluded from contributory schemes. The model assesses the fiscal implications of introducing such a scheme and its potential to alleviate poverty among the elderly.
3. **Multi-pillar system**: Transitioning to a multi-pillar pension system that combines a basic social pension, a mandatory contributory scheme, and voluntary private savings. This approach aims to diversify income sources for retirees, reduce dependence on a single system, and improve resilience to demographic and economic shocks. The multi-pillar approach is modeled to evaluate how different combinations of public and private provisions can enhance system resilience, particularly in the face of demographic aging and economic volatility. The analysis also considers the potential role of financial markets in supporting voluntary savings and the regulatory framework needed to ensure the security of private pension assets.
4. **Incentives for informal workers**: Implementation of targeted incentives to encourage informal sector workers to participate in the pension system. These incentives may include subsidized contributions, tax benefits, or simplified registration processes to lower barriers to participation for informal workers. The effectiveness of these incentives is assessed by modeling their impact on participation rates, with particular attention to the heterogeneity within the informal sector. The analysis explores how different incentive structures may affect workers with varying income levels and employment stability, providing insights into the design of effective policies to broaden coverage.

d. Validation and sensitivity analysis

To ensure the reliability and robustness of the model's projections, this study conducts a series of validation exercises and sensitivity analyses (OECD, 2023). The model's outputs are compared with historical data on pension expenditures, coverage rates, and demographic trends to validate its accuracy. Sensitivity analysis is employed to assess the influence of key assumptions, such as variations in fertility rates, economic growth trajectories, or labor market participation, on the projected outcomes of the reform scenarios (International Labour Organization, 2022). This approach helps identify the most critical factors affecting the sustainability and inclusiveness of the pension system (Barr and Diamond, 2008). The sensitivity analysis also provides insights into the range of possible outcomes under different economic and demographic conditions, highlighting the risks and uncertainties associated with each reform scenario.

While the dynamic microsimulation model provides valuable insights into the potential effects of pension reforms, several limitations must be acknowledged. The model relies on a set of assumptions regarding demographic and economic trends, which may not fully account for future uncertainties. For instance, unexpected economic shocks or changes in migration patterns could significantly alter the projected outcomes (OECD, 2023). Furthermore, the heterogeneity of the informal sector presents challenges in accurately modeling the behavior of informal workers, whose income patterns and employment trajectories can vary significantly (World Bank, 2019). The model also assumes a degree of policy stability that may not reflect the political and economic volatility that can influence pension reforms. Despite these limitations, the model remains a powerful tool for exploring the potential impacts of different policy interventions and providing evidence-based recommendations for pension reform in Morocco (Palacios & Sluchynsky, 2006). By explicitly acknowledging these limitations, the study aims to provide a balanced view of the potential and constraints of microsimulation in pension policy analysis.

By employing a rigorous, data-driven approach, this study aims to contribute meaningfully to the policy debate on pension reform in Morocco, offering insights into how various reform options can improve coverage, ensure sustainability, and provide adequate income security for all segments of the population. The findings of this study are intended to inform policymakers, stakeholders, and researchers, providing a foundation for future discussions on the design of a resilient and inclusive pension system that addresses the needs of both formal and informal workers. In doing so, the study not only adds to the academic literature but also offers practical recommendations for achieving a more equitable and sustainable social protection framework in Morocco.

4. Results and discussion

The results derived from the dynamic microsimulation model offer critical insights into the potential impacts of various pension reform scenarios on the Moroccan pension system. These findings elucidate the effects of different reform measures on pension coverage, fiscal sustainability, and distributional outcomes across distinct population segments. This section presents the results of each policy scenario and provides a detailed discussion of their broader implications, focusing on coverage expansion, financial viability, and equity. This extended discussion aims to provide a nuanced understanding of the potential trade-offs and long-term consequences associated with each reform scenario while emphasizing key policy considerations for Moroccan decision-makers.

Scenario 1: Parametric reforms

The parametric reform scenario, which includes measures such as increasing the retirement age and adjusting contribution rates, demonstrates a notable improvement in the financial sustainability of the pension system. Raising the retirement age lowers the dependency ratio, thereby reducing the pressure on pension expenditures. The model projects that an increase in the retirement age by two years could extend the solvency of the pension system by an additional decade, assuming stable economic conditions. Furthermore, increasing contribution rates results in a more favorable balance between contributions and payouts, thereby strengthening the fiscal position of pension funds.

However, the distributional analysis reveals that the burden of parametric reforms is disproportionately borne by younger workers, who are expected to contribute more while retiring later. Although these reforms enhance the financial stability of the pension system, they may exacerbate intergenerational inequities, with younger cohorts absorbing a larger share of the adjustment costs. This raises concerns about the political feasibility of such reforms and highlights the need for compensatory measures to mitigate the adverse effects on specific population groups. Introducing incentives for younger workers, such as enhanced future retirement benefits or phased increases in contribution rates, may help address these concerns and improve the acceptability of the reforms.

Moreover, the broader implications of raising the retirement age for labor market dynamics should be considered. Extending the working life of individuals may affect youth employment opportunities, as older workers remain in the labor force for longer periods. This could result in increased competition for jobs, especially in sectors with limited employment growth. To mitigate these potential negative impacts on labor market entry, policymakers should explore complementary measures such as retraining programs for older workers and incentives for employers to hire younger individuals.

Scenario 2: Non-contributory pensions

The introduction of a non-contributory pension scheme for individuals lacking sufficient contribution histories has a profound impact on coverage expansion, particularly among informal sector workers. The findings indicate that implementing a basic social pension significantly reduces old-age poverty by providing a minimum level of income security to those previously excluded from formal pension arrangements. The model demonstrates that the introduction of a non-contributory pension covering all elderly individuals without formal pension entitlements could increase coverage rates by up to 25%, thereby enhancing social protection for vulnerable populations.

Nonetheless, the fiscal implications of this scenario are substantial. The costs associated with a universal non-contributory pension are projected to be significant, potentially imposing a strain on public finances if not carefully managed. To ensure fiscal sustainability, the analysis suggests that non-contributory pensions should be accompanied by targeted funding mechanisms, such as reallocating subsidies or introducing specific taxes earmarked for financing the scheme. Additionally, implementing eligibility criteria based on income or assets could help contain costs while ensuring that benefits are directed to those most in need.

Another crucial consideration is the potential effect of non-contributory pensions on labor market incentives. The availability of a basic social pension may diminish the motivation for informal workers to transition to formal employment, as they may perceive the non-contributory benefit as sufficient for their retirement needs. To counteract this potential disincentive, policymakers could integrate non-contributory pensions with contributory schemes, offering incentives for individuals to voluntarily contribute to enhance their retirement benefits. This approach would help maintain the attractiveness of formal employment while providing a basic level of income security for all elderly individuals.

Scenario 3: Multi-pillar system

The transition to a multi-pillar pension system, which combines a basic social pension, a mandatory contributory scheme, and voluntary private savings, yields promising results in terms of sustainability and resilience. The model projects that a multi-pillar system would diversify income sources for retirees, thereby reducing dependence on any single pillar and enhancing the overall robustness of the pension system. By incorporating a basic social pension, this scenario addresses the coverage gap for informal workers, while the mandatory contributory scheme provides a stable funding source for the pension system.

Voluntary private savings play a critical role in this scenario, allowing individuals to supplement their retirement income beyond what is provided by the mandatory schemes. The findings indicate that incentivizing private savings through measures such as tax deductions or matching contributions could substantially increase retirement incomes for middle- and high-income workers. However, the effectiveness of this approach hinges on the development of financial literacy programs and the availability of secure, accessible financial products that encourage long-term savings.

The success of a multi-pillar system also depends on the regulatory framework governing private pension funds. Ensuring the safety and reliability of private savings is crucial for maintaining public trust in the system. Regulatory measures, such as the establishment of a pension guarantee fund and stringent oversight of private pension providers, are necessary to safeguard individuals' savings and mitigate risks related to market volatility. Moreover, the promotion of financial literacy is essential for empowering individuals to make informed decisions regarding their retirement savings, particularly in a context where private savings play a significant role in retirement income security.

Scenario 4: Incentives for informal workers

The scenario involving targeted incentives to encourage informal sector workers to participate in the pension system yields mixed results. On the positive side, subsidized contributions and simplified registration processes lead to a significant increase in participation rates among informal workers, particularly those with more stable income streams. The model suggests that participation rates among informal workers could increase by 15-20% if appropriate incentives are provided, thereby improving overall coverage levels.

However, the analysis also underscores the challenges associated with this approach. The heterogeneity of the informal sector means that a one-size-fits-all incentive structure may not be effective for all workers. For example, individuals with irregular income patterns may still find it challenging to commit to regular pension contributions, even with subsidies. The discussion highlights the need for tailored approaches that account for the diverse nature of the informal sector, including flexible contribution schedules and mechanisms that accommodate varying income stability.

To address these challenges, policymakers could explore innovative mechanisms such as mobile-based savings platforms, which have proven successful in other developing countries in facilitating pension contributions among informal workers. Leveraging technology to provide flexible and accessible means of contributing to pension schemes could help overcome some of the barriers faced by informal workers. Additionally, partnerships with community-based organizations and cooperatives could enhance outreach efforts and foster trust among informal workers, thereby encouraging greater participation in the pension system.

5. Broader implications and policy recommendations

The findings of this study underscore the complexity of pension reform in Morocco, particularly in light of demographic pressures, labor market informality, and fiscal constraints. The results suggest that a combination of reforms—rather than relying on a single approach—will likely yield the most effective outcomes. Specifically, the introduction of a multi-pillar system, complemented by targeted non-contributory pensions and incentives for informal workers, appears to offer a balanced solution that enhances coverage, ensures sustainability, and addresses equity concerns.

Policymakers must consider the trade-offs inherent in each reform scenario. While parametric reforms can stabilize the pension system financially, they risk imposing disproportionate burdens on younger cohorts. Non-contributory pensions provide substantial social protection benefits but require careful design to ensure fiscal sustainability. A multi-pillar system offers resilience but depends on the successful implementation of private savings mechanisms, which in turn necessitate adequate financial infrastructure and literacy.

To move forward, this study recommends a phased approach to reform, beginning with the introduction of non-contributory pensions for the most vulnerable, followed by gradual parametric adjustments and the establishment of the institutional framework needed to support a multi-pillar system. Additionally, targeted incentives for informal workers should be designed with flexibility, ensuring that contributions are affordable and aligned with the income realities of these workers. Developing financial literacy programs and public awareness campaigns will also be crucial for fostering a culture of savings and enhancing the long-term effectiveness of the proposed reforms.

Furthermore, the study emphasizes the importance of continuous monitoring and evaluation of the reform process. Policymakers should establish mechanisms for regularly assessing the impact of implemented reforms, allowing for adjustments as necessary to address emerging challenges and ensure that the pension system remains adaptive to evolving economic and demographic conditions. Engaging stakeholders, including representatives from the informal sector, employers, and civil society, will be vital to ensuring that the reforms are inclusive and reflect the needs of all population groups.

By providing a comprehensive analysis of various reform scenarios, this study aims to contribute to the ongoing policy dialogue on pension reform in Morocco, offering evidence-based insights that can inform the design of an inclusive and sustainable social protection system. The results underscore the importance of a holistic approach that integrates multiple policy tools to address the diverse challenges facing the pension system, ultimately ensuring that all individuals, regardless of their employment status, have access to adequate income security in old age.

This study bridges gaps in the literature on informal sector inclusion and demographic pressures in pension systems. It provides policymakers with actionable strategies, including phased implementation, technology-driven outreach, and non-contributory pensions, tailored to Morocco's socio-economic landscape.

a. Reinforcing reform strategies through sensitivity analyses and global comparisons

i. Overview of findings

The refined projections and sensitivity analyses provide crucial insights into the financial and demographic challenges facing Morocco's pension system. These insights highlight the urgency of reform and offer evidence-based recommendations tailored to Morocco's specific demographic and economic conditions.

ii. Lessons from international comparisons

Countries like Kenya, Brazil, and Sweden offer valuable lessons in pension reform:

- Kenya demonstrates the effectiveness of a zero-pillar universal pension funded through taxation, which could be an ideal solution for Morocco's vulnerable populations.
- Brazil highlights how integrating pensions with broader social programs, such as Bolsa Familia, can alleviate old-age poverty and encourage compliance.
- India shows the feasibility of micro-pensions and mobile contributions to bridge the gap for informal workers.
- Sweden exemplifies the success of a multi-pillar approach, integrating universal basic pensions, contributory schemes, and voluntary savings for fiscal sustainability.

Morocco's reforms can draw on these experiences while addressing local challenges, such as high informal employment and fiscal constraints.

iii. Sensitivity analyses: Key results and implications

Sensitivity analyses revealed critical factors impacting the sustainability of pension reforms:

- **Retirement age increase**: Raising the retirement age to 65 significantly delays fund depletion and reduces deficits. However, implementation must consider political resistance and workforce adaptation.
- **Contribution rate adjustments**: Incremental increases (e.g., 2%) in contribution rates improve fund solvency without overburdening contributors. Policy incentives could help ensure compliance, particularly among informal sector participants.
- **Economic growth impact**: Higher GDP growth rates (4.5% vs. 2.5%) substantially enhance the financial health of pension systems. Policies promoting economic growth are thus vital to complement pension reforms.
- **Informal worker inclusion**: Expanding coverage to informal workers reduces deficits and improves long-term stability. This requires targeted outreach, simplified registration processes, and affordable contribution schemes.

iv. Proposed reform scenarios

Scenario 1: Parametric adjustments (Short-term sustainability)

- Gradual retirement age increases to 65.
- Incremental contribution rate increases.

- Administrative improvements to reduce evasion and improve compliance.

Benefits:

- Delays fund depletion by 10-15 years.
- Improves contributor-to-beneficiary ratios.

Scenario 2: Systemic multi-pillar reform (Long-term equity and stability)

- **Pillar 1:** Universal basic pension funded through taxation, ensuring a safety net for all.
- **Pillar 2:** Mandatory contributory schemes for formal and informal workers.
- **Pillar 3:** Voluntary private savings plans for supplementary income.

Benefits:

- Ensures universal coverage, addressing old-age poverty.
- Achieves fiscal sustainability by diversifying funding sources.

v. Strategic integration and implementation

To achieve these reforms:

- **Policy alignment**: Integrate pension reforms with broader social protection initiatives, such as health insurance and poverty alleviation programs.
- **Technological solutions**: Leverage mobile platforms for contributions and benefit delivery, as seen in India.
- **Stakeholder engagement**: Engage workers, employers, and policymakers to build consensus and address resistance.
- **Monitoring and evaluation**: Establish a robust system for ongoing monitoring to adjust policies as needed.

6. Recommendations

The findings from this study underscore the complex and multifaceted challenges confronting the Moroccan pension system, particularly concerning coverage gaps, demographic pressures, and fiscal sustainability. Utilizing a dynamic microsimulation model, this analysis has illuminated the differential impacts of a variety of pension reform scenarios, including parametric adjustments, non-contributory pensions, a multi-pillar system, and targeted incentives for informal workers. The results indicate that a holistic and multi-faceted approach is imperative to effectively address these challenges, emphasizing the need for financial sustainability, social protection adequacy, and equitable outcomes for different segments of the population.

The Moroccan pension system is at a critical juncture, requiring strategic and decisive action to address structural deficiencies and ensure long-term resilience. Demographic shifts—characterized by an increasing elderly population and declining fertility rates—have exerted considerable pressure on the sustainability of the current system. Additionally, the high prevalence of informal employment remains a significant impediment to expanding pension coverage, as a substantial proportion of the workforce lacks access to formal retirement savings mechanisms. Addressing these challenges will necessitate not only technical adjustments to the pension system but also a broader strategy that fosters inclusion and resilience across the entire social protection framework.

a. Summary of key findings

Parametric Reforms

Raising the retirement age and increasing contribution rates improve financial sustainability but place a heavier burden on younger workers. This could exacerbate intergenerational inequity. Policymakers should consider phased increases and incentives for younger contributors to balance these effects. These reforms, while effective in stabilizing pension funds, must be complemented by measures addressing broader labor market dynamics.

Non-Contributory Pensions

Introducing a universal or targeted non-contributory pension significantly reduces old-age poverty and expands coverage, particularly for informal workers. However, these reforms carry substantial fiscal costs, requiring careful funding strategies, such as reallocating subsidies or implementing targeted taxes. Combining non-contributory pensions with incentives for voluntary contributions could maintain labor market incentives while ensuring a safety net for vulnerable groups.

Multi-Pillar System

The multi-pillar system—integrating basic pensions, mandatory schemes, and voluntary savings—proves most effective in balancing sustainability, equity, and coverage. Incentivizing voluntary savings through tax benefits and financial literacy campaigns enhances its effectiveness. Robust regulatory frameworks are essential to ensure public trust and the security of private pension assets.

Incentives for Informal Workers

Subsidized contributions, flexible payment options, and mobile-based savings platforms effectively increase informal worker participation. Tailored approaches are critical, as income volatility and low trust in formal systems remain significant barriers. Outreach programs and partnerships with community organizations can build trust and address these challenges.

b. Policy recommendations

Based on the findings of this study, several policy recommendations are proposed to guide the reform of Morocco's pension system:

1. **Adopt a multi-pillar approach**: Policymakers should prioritize the adoption of a multi-pillar pension system that combines a basic social pension, a contributory scheme, and voluntary savings. This diversified approach will help enhance the resilience of the pension system while expanding coverage to those currently excluded, particularly informal sector workers. A multi-pillar system provides a balanced framework for managing demographic risks, ensuring that retirees have access to a combination of public, private, and voluntary sources of income. Such an approach reduces dependency on any one pillar and helps to safeguard against systemic vulnerabilities.

2. **Introduce non-contributory pensions for vulnerable populations**: To address the coverage gaps faced by informal workers and other vulnerable groups, a non-contributory pension scheme should be introduced. This scheme should be accompanied by targeted funding mechanisms to ensure fiscal sustainability, such as reallocating existing subsidies

or introducing specific levies dedicated to financing the program. Moreover, eligibility criteria should be carefully designed to ensure that the benefits reach those most in need while avoiding unintended labor market distortions. Targeting mechanisms should be regularly reviewed to ensure their effectiveness and to adapt to changing socio-economic conditions.

3. **Implement targeted incentives for informal sector participation**: Policymakers should develop targeted incentives to encourage informal sector workers to participate in the pension system. These incentives may include subsidized contributions, simplified registration processes, and mobile-based savings platforms that facilitate pension contributions. Flexibility in contribution schedules will also be crucial to accommodating the diverse income patterns of informal workers. Additionally, partnerships with community organizations and local cooperatives could be leveraged to build trust and facilitate outreach efforts, making it easier for informal workers to engage with the pension system. Building social trust is key, and these partnerships can also act as intermediaries that help informal workers understand and navigate the pension system.
4. **Promote financial literacy and awareness**: The success of a multi-pillar system and voluntary savings schemes will depend on individuals' understanding of the importance of retirement savings and the available options. Public awareness campaigns and financial literacy programs should be implemented to empower individuals to make informed decisions about their retirement savings. These programs should target different segments of the population, including young workers, informal sector employees, and women, who may face unique challenges in accessing financial services and planning for retirement. Financial literacy programs should also be integrated into school curricula to build a culture of savings from an early age.
5. **Phased implementation and continuous evaluation**: Given the complexity of the proposed reforms, a phased approach to implementation is recommended. This approach should be coupled with continuous monitoring and evaluation to assess the impact of reforms, identify challenges, and make necessary adjustments. Engaging key stakeholders, including representatives from the informal sector, employers, and civil society, will be crucial in ensuring that the reforms are inclusive and responsive to the needs of all population groups. Continuous evaluation will also help policymakers identify emerging risks and adapt the reform strategy, accordingly, ensuring that the pension system remains resilient in the face of changing economic and demographic conditions. Establishing performance indicators and benchmarks will be vital for tracking progress and ensuring accountability throughout the implementation process.
6. **Strengthen institutional capacity**: Effective implementation of pension reforms will require robust institutional capacity. Policymakers should invest in strengthening the administrative and regulatory framework of the pension system to ensure efficient service delivery and effective oversight. This includes enhancing the capacity of pension fund administrators, improving data collection and management systems, and ensuring transparency and accountability in the management of pension assets. Strengthening institutional capacity will also help in building public trust, which is essential for the success of pension reforms. Moreover, investing in technology and data analytics will be

key to improving service delivery, monitoring compliance, and making data-driven decisions.

c. Future research directions

While this study provides a comprehensive analysis of various pension reform scenarios, several areas warrant further research. Future studies should explore the long-term economic impacts of pension reforms on labor market dynamics, including potential effects on employment patterns, labor supply, and productivity. Additionally, there is a need for more granular data on the informal sector to better understand the specific barriers faced by different groups within this sector and to design more targeted interventions. Research into the gender dimensions of pension coverage is also needed, as women are often disproportionately represented in informal employment and may face unique challenges in accessing adequate retirement benefits (International Labour Organization, 2022). Cross-country comparative studies could also provide valuable insights into best practices and innovative solutions for addressing similar challenges in pension systems across developing economies.

Further research should also consider the impact of technological innovations on pension coverage and delivery. The use of digital platforms for pension contributions and benefits disbursement could play a significant role in extending coverage to informal workers and reducing administrative costs. Exploring the potential of technology-driven solutions, such as mobile money and blockchain, could provide new avenues for enhancing the efficiency and inclusiveness of the pension system (Kenya Pension System Report, 2022). Future research should also focus on developing data-driven (OECD, 2023) approaches to predict demographic trends and economic shocks, allowing for more proactive pension policy planning.

- **Exploring Informal Sector Dynamics**:
  - "Future research should investigate how income volatility and trust influence informal worker participation in pension schemes."
- **Gendered Impacts**:
  - "Studies should analyze gender disparities in pension access, especially for women in informal employment."

7. Conclusion

The Moroccan pension system requires bold yet inclusive reforms to address demographic shifts, informal employment, and fiscal constraints. A phased, multi-pillar approach—integrating basic social pensions, contributory schemes, and voluntary savings—offers the most promising path forward. By fostering financial literacy, strengthening institutions, and targeting informal worker inclusion, Morocco can build a resilient, equitable pension system that ensures income security for all citizens.

Policymakers must prioritize adaptive strategies, stakeholder engagement, and rigorous evaluation to align reforms with Morocco’s socio-economic realities. These measures will ensure that the pension system not only addresses current challenges but remains robust against future uncertainties.

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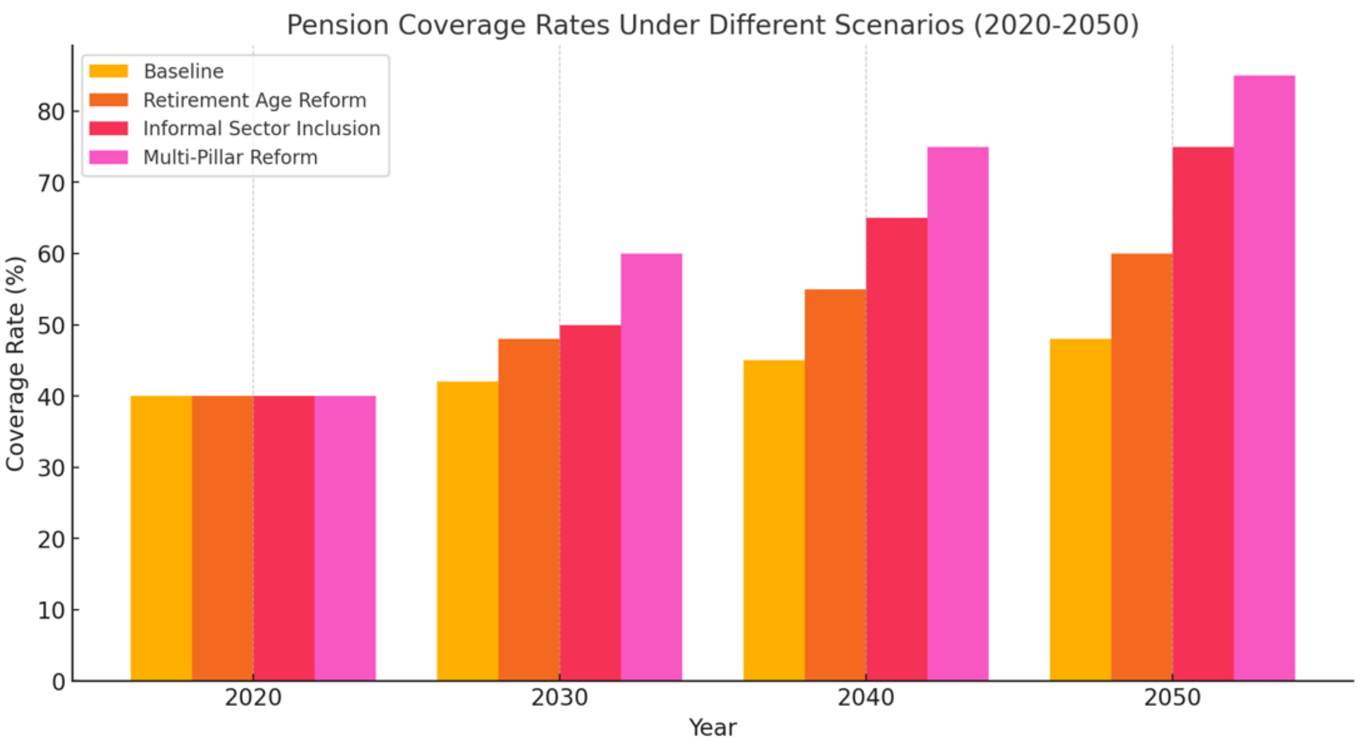
Appendix: Figures and Data Sources

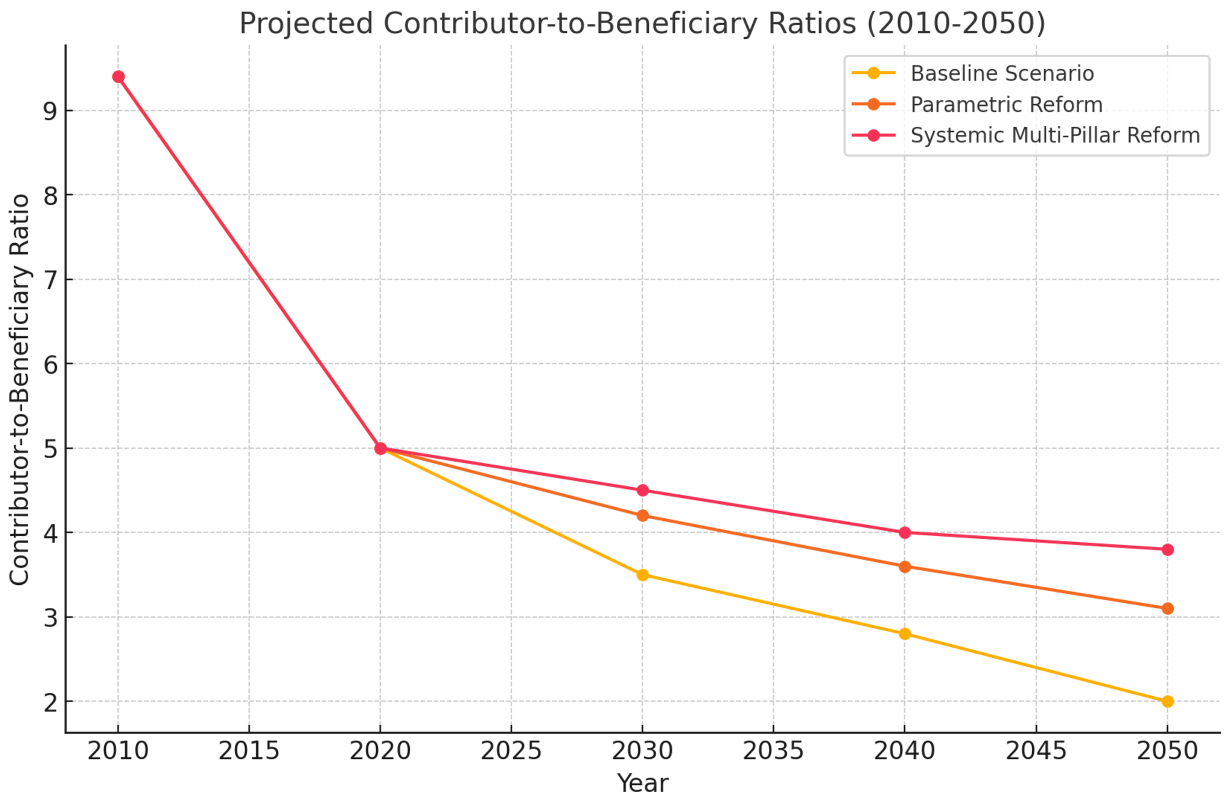
Figure 1: **Pension coverage rates under different scenarios (2020–2050)**



Interpretation:

- The multi-pillar reform will achieve the highest coverage rates by 2050, approaching 85%, demonstrating its transformative impact.
- Informal sector inclusion significantly improves coverage rates, especially between 2030 and 2050.
- The baseline scenario shows minimal improvement, underscoring the urgency for reform.
- **Policy implication**: Expanding coverage through informal sector inclusion and a multi-pillar system should be prioritized for broader social equity.

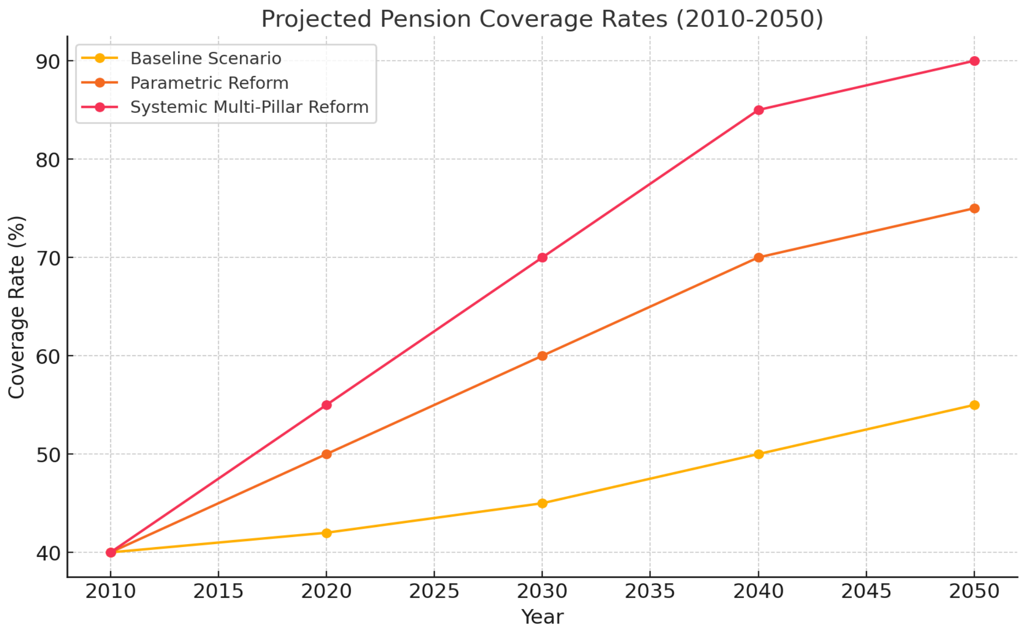
Figure 2: Projected contributor-to-beneficiary ratios (2010–2050)



Interpretation:

- Without reforms, the contributor-to-beneficiary ratio will fall below three by 2050, reflecting the burden on contributors.
- Parametric reform moderately improves the ratio, but systemic reforms provide greater stability over time.
- **Policy implication**: Addressing demographic challenges requires systemic changes to stabilize the ratio and prevent excessive burdens on contributors.

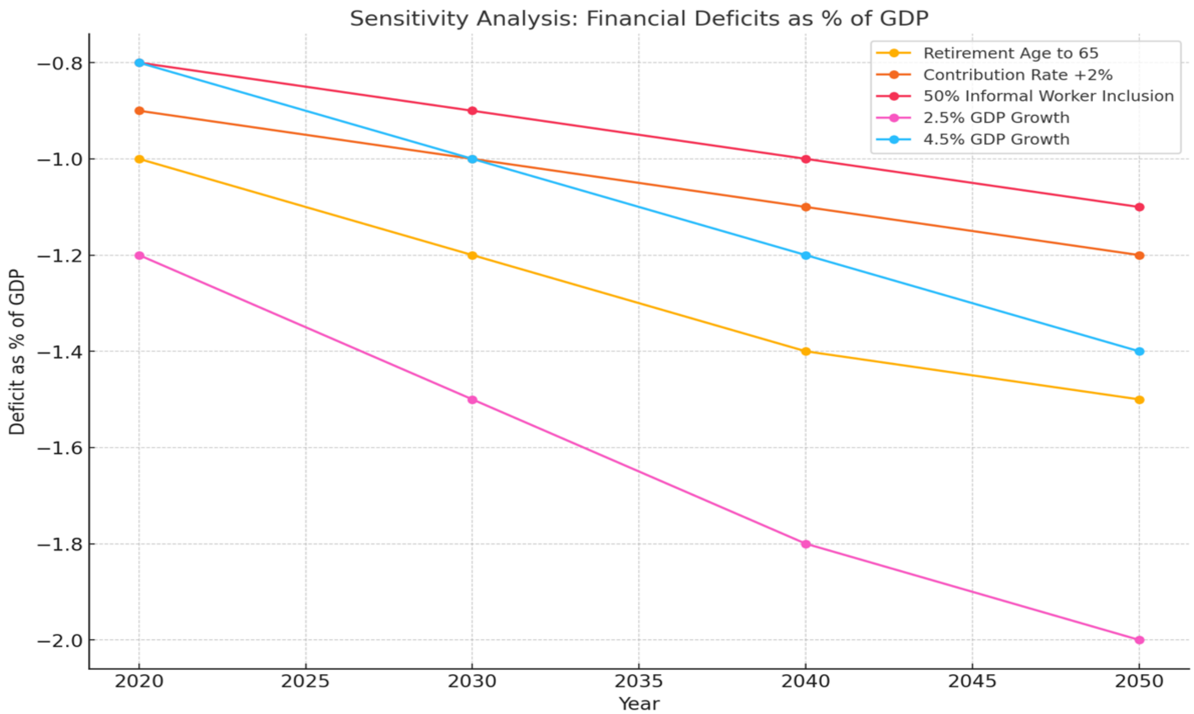
Figure 3: Projected pension coverage rates (2010–2050)



Interpretation:

- Baseline reforms lead to stagnant growth in coverage rates, indicating their ineffectiveness in addressing systemic issues.
- Parametric reforms (e.g., retirement age increases) and systemic reforms show consistent growth, with the latter achieving coverage rates exceeding 80% by 2050.
- **Policy implication**: Comprehensive, systemic reforms are crucial to achieving long-term coverage goals.

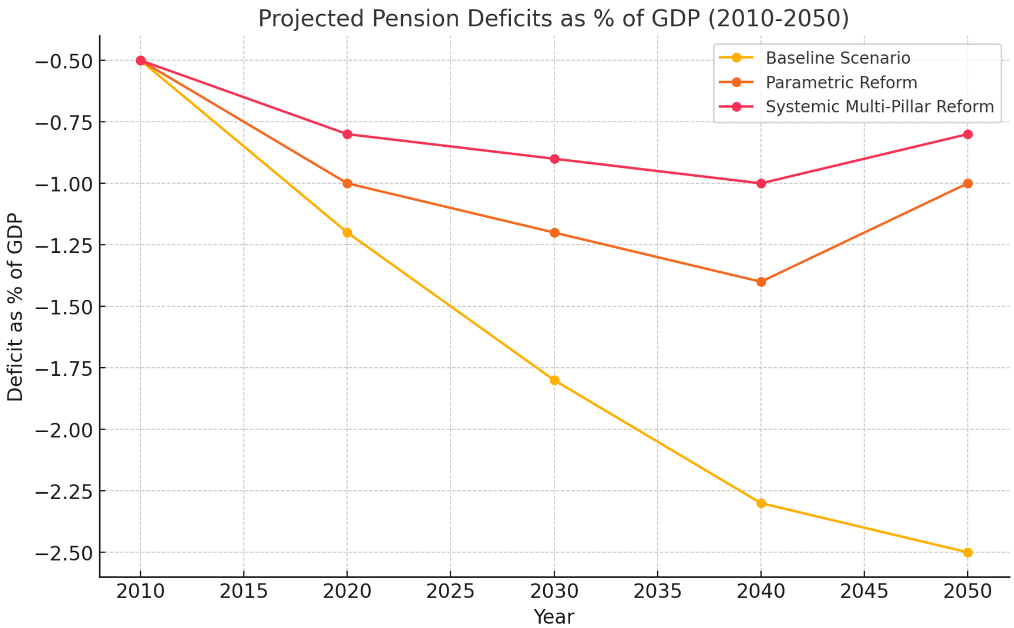
Figure 4: Sensitivity analysis: Financial deficits as % of GDP (2020–2050)



Interpretation:

- Scenarios such as multi-pillar reform and 4.5% GDP growth significantly reduce financial deficits over time.
- Informal worker inclusion offers moderate improvement, but its impact is limited compared to multi-pillar reforms.
- **Policy implication**: Reforms must combine strategies to improve coverage and fiscal sustainability simultaneously.

Figure 5: Projected pension deficits as % of GDP (2010–2050)



Interpretation:

- Baseline reforms lead to an increasing deficit, highlighting the financial unsustainability of the current system.
- Parametric reforms reduce deficits modestly, while systemic reforms demonstrate significant long-term improvements.
- **Policy implication**: Only comprehensive systemic reforms can effectively control financial deficits while addressing demographic and coverage challenges.

Data sources used in the methodology.

1. **Demographic data**
    - **Source**: Moroccan National Statistics Office (Haut-Commissariat au Plan) and United Nations Population Division.
    - **Variables**:
        - Population size and growth rates (2010–2050).
        - Age structure (working-age population vs. retirees).
        - Fertility and mortality rates.
2. **Economic data**
    - **Source**: Moroccan Ministry of Economy and Finance, World Bank, and IMF.
    - **Variables**:
        - GDP growth rates (baseline: 2.5%, optimistic: 4.5%).
        - Wage distribution across formal and informal sectors.
        - Contribution rates and taxable income levels.

3. **Labor market data**
    - **Source**: Moroccan Labor Force Survey (ENMT, Haut-Commissariat au Plan).
    - **Variables**:
        - Employment rates by sector (formal vs. informal).
        - Gender-based employment disparities.
        - Participation rates in social security schemes.
4. **Pension system data**
    - **Source**: Moroccan National Pension Fund (CMR), Social Security Fund (CNSS), and World Bank reports.
    - **Variables**:
        - Contributor and beneficiary numbers.
        - Replacement rates and benefit payouts.
        - Fund solvency metrics (assets vs. liabilities).
5. **Household survey data**
    - **Source**: Moroccan Household Survey (2014) and similar sources.
    - **Variables**:
        - Income distribution across households.
        - Savings behavior.
        - Informal sector participation rates.
6. **Assumptions for projections**
    - **Model**: Dynamic microsimulation model (e.g., adapted from France's Destinie model).
    - **Variables**:
        - Retirement age scenarios (current: 60, proposed: 65).
        - Contribution rate adjustments (e.g., baseline +2%).
        - Informal sector inclusion (coverage expansion scenarios: 25%, 50%, 75%).

Specific modeling inputs

1. **Demographic Projections**:
    - Population aging trends (e.g., old-age dependency ratio increasing from 12% in 2020 to 24% by 2050).
    - Median retirement durations (e.g., retirees living 20 years post-retirement).
2. **Economic growth scenarios**:
    - Baseline (2.5% annual GDP growth).
    - Optimistic growth scenario (4.5%).
3. **Coverage expansion assumptions**:
    - Incremental increases in informal worker participation rates (25% by 2030, 50% by 2040, and 75% by 2050).
4. **Baseline pension metrics**:
    - Current coverage rates (formal sector: ~42%, informal sector: ~10%).
    - Pension fund deficits (as % of GDP): ~1.2% (2020).