How Labor Institutions Create Health Inequality - The Case of Cervical Cancer Screening in Japan*

Yuta Shinzato**

January 30, 2026

Abstract

This paper studies how fiscal institutions shape access to preventive care under universal health insurance in Japan. I show that tax-induced labor supply incentives for married women shift them into employment arrangements that are weakly connected to low-friction screening, despite full coverage for medical treatment.

Using a calibrated life-cycle model of female labor supply and cervical cancer progression, I document that these employment-linked access differences matter even when aggregate screening rates change little. Women with high screening needs but limited institutional access experience systematic delays in detection, leading to worse health outcomes.

I further find that universal information campaigns primarily benefit women who already have access to occupational screening. As a result, policies that raise average awareness can widen health disparities when access to prevention is uneven.

Overall, the results suggest that when preventive care is bundled with labor market status, fiscal policy influences health outcomes mainly by reallocating access to prevention rather than by altering treatment incentives.

JEL Classification: I18, I14, H24, D91

Keywords: health inequality, social insurance, life-cycle model, universal health insurance, preventive care, cancer screening, Japan

*I am deeply grateful to Professor Makoto Nirei for their invaluable guidance and to Professor Hikaru Ogawa, Professor Hitoshi Shigeoka and Professor Yoko Ibuka for their insightful advice. I also thank Professor Masako Ii, Professor Haruko Noguchi, Professor Sayaka Nakamura, Professor Shiko Maruyama, Professor Kaoruko Aita, and my colleagues at the University of Tokyo for their encouragement. All remaining errors are my own.

**Graduate School of Economics, University of Tokyo. Email: shinzato-yuta359@g.ecc.u-tokyo.ac.jp

1 Introduction

A well-established stylized fact in health economics is the positive gradient between socioeconomic status (SES) and health outcomes. In countries without universal health insurance, this disparity is often attributed to inequality in access to medical care - specifically, the ability to pay for treatment. However, a puzzling phenomenon persists: significant health disparities endure even in countries with robust universal health insurance (UHI) systems where financial barriers to treatment are virtually nonexistent. Why do individuals with lower SES continue to face higher mortality risks from preventable diseases, even when the state guarantees their access to curative care?

Recent macroeconomic literature suggests that the driver of this disparity may lie in preventive behavior rather than curative treatment. Ozkan (2025), using U.S. data, argues that means-tested social insurance creates a moral hazard. In the U.S. context, low-income individuals lack the incentive to invest in prevention because their catastrophic treatment costs are covered by safety nets such as Medicaid, whereas high-income individuals must self-insure against future health shocks. In short, the assurance of coverage for expensive treatment reduces the incentive for the poor to invest in prevention. This "treatment-coverage hypothesis" centers on a distortion of prevention incentives. However, this framework fails to explain the context of Japan. In Japan, UHI covers high-cost treatments for all citizens regardless of income through the High-Cost Medical Expense Benefit. Consequently, the moral hazard channel described by Ozkan should apply uniformly across the population, yet a stark SES gradient in preventive screening uptake remains.

This paper proposes a novel mechanism driving health disparities under UHI: the institutional bundling of preventive care with labor market status, which is, in turn, distorted by fiscal policy. I argue that the primary barrier to prevention is not the monetary cost of the service, but the transaction cost of access, which varies asymmetrically across employment types. In sharp contrast to the treatment-coverage hypothesis, which focuses on incentive problems, the mechanism highlights a distortion of structural barriers to prevention access. In Japan, high-quality, low-friction preventive care—specifically, occupational health screening—is institutionally "bundled" with regular employment. In contrast, non-regular employment is "unbundled" from this benefit, leaving workers to rely on high-friction municipal screening programs that require self-booking and separate clinic visits. For the latter group, the prohibitive shadow price of prevention—inclusive of time costs, cognitive load, and opportunity costs—acts as the primary barrier, even if the monetary price is zero.

Selection into these employment types is not random. Japan's tax and social security system—specifically the well-known "1.03 million yen" and "1.30 million yen" income walls—provides strong incentives for secondary earners, primarily women, to limit their labor supply to non-regular employment. I hypothesize that this fiscal structure gen-

erates a severe unintended consequence. By incentivizing women to choose non-regular employment to maximize household disposable income, the tax system inadvertently "unbundles" them from efficient preventive care access, thereby widening the health gap. In this view, fiscal policy is health policy.

To test this hypothesis, I focus on cervical cancer screening in Japan. This setting offers a unique and urgent policy context. Cervical cancer is highly preventable through screening and vaccination. However, due to the suspension of proactive government recommendations for the HPV vaccine from 2013 to 2021, Japan possesses a distinct cohort—the "Vaccine Void" generation—that is almost entirely unprotected by vaccination and thus solely dependent on screening for prevention. This cohort is now entering the age of peak cancer risk, which coincides with the life stage where women face the strongest tax incentives to adjust their labor supply and switch to non-regular employment. This "double bind"—a reliance on screening combined with fiscal pressure to distance oneself from screening-accessible jobs—makes the quantification of this mechanism an urgent task.

The central thesis of this paper rests on a multi-stage causal chain that links fiscal institutions to public health outcomes, specifically through the interaction of labor supply distortions and healthcare access. At the core of this mechanism is the "1.3 million yen wall" within Japan's social insurance system, which creates a significant tax notch for married women. This fiscal boundary incentivizes individuals to strategically limit their labor supply, often resulting in a shift from regular employment—covered by employee insurance (Category-II)—to non-regular roles that maintain their status as dependent spouses (Category-III).

Crucially, this employment transition induces a shift in the agent's health insurance regime, which is institutionally bundled with specific screening arrangements. While regular employment provides high-access, workplace-based screening programs, the dependent status necessitates a reliance on municipal screening. The latter is characterized by higher transaction costs, such as the requirement for individual booking and limited clinical hours, which function as an institutional access cap. From the perspective of rational inattention, these structural barriers reduce the perceived value of screening. When combined with information gaps regarding the asymptomatic nature of early-stage cervical lesions, this reduced access leads to a systematic delay in preventive behavior.

Consequently, the distortion in labor supply choices—originally driven by fiscal incentives—results in what we term a health penalty. This penalty is manifested in the late-stage detection of cervical cancer and elevated elevated risks of late-stage detection and adverse health outcomes.

I construct a life-cycle model of female labor supply and health capital accumulation. Departing from standard health production models that treat health behaviors as purely individual preferences, I model screening access as a state-dependent institutional probability determined by employment choice. Agents optimize their labor supply

in response to the non-linear tax schedule, which endogenously determines their access regime. My quantitative analysis asks: How much of the cervical cancer screening gap can be explained by tax-induced distortions in the labor market? I demonstrate that fiscal reform can play an important role in shaping access to preventive care and health equity. The findings suggest that structural barriers imposed by institutional design may be more significant drivers of the gradient than individual behavioral biases, highlighting that removing tax barriers to regular employment could be a cost-effective strategy to reduce cancer mortality. The contribution of this research is threefold. First, I propose an access-based mechanism for preventive care under universal health insurance, in which screening access is institutionally bundled with employment status. Second, I link this access regime to fiscal distortions in female labor supply, providing a structural economic interpretation of the employment gradient documented in public health studies. Third, I assess the health implications of counterfactual fiscal reforms in a life-cycle model calibrated to Japan.

2 Background

This section provides the medical and institutional background necessary to interpret screening behavior in Japan. I first summarize the medical characteristics of cervical cancer that make timely screening particularly valuable. I then describe the institutional features of Japan's cervical cancer prevention system that generate substantial access frictions. Finally, I explain how labor market dualism, reinforced by fiscal policy, endogenously sorts women into differential screening-access regimes.

2.1 Medical Characteristics of Cervical Cancer

Cervical cancer exhibits several medical characteristics that distinguish it from other major malignancies and make it especially relevant for the economic analysis of preventive care. In particular, the disease is infectious in etiology, highly preventable, and associated with sharply stage-dependent treatment outcomes. This subsection summarizes these features, drawing primarily on Cohen et al. (2019).

Cervical cancer is the fourth most common cancer among women worldwide. Unlike malignancies driven primarily by genetic predisposition or lifestyle-related risk factors, cervical cancer is almost exclusively caused by persistent infection with high-risk subtypes of the human papillomavirus (HPV). Consequently, individual risk is largely determined by exposure to the virus and immune response, rather than hereditary factors.

Despite its infectious nature, cervical cancer is largely preventable. Primary prevention is achieved through HPV vaccination, which has demonstrated efficacy exceeding 90 percent against HPV types 16 and 18, the strains responsible for the majority of high-grade precancerous lesions. Secondary prevention relies on screening technologies such

as cytology and HPV testing, which enable the detection and treatment of precancerous lesions prior to progression to invasive disease. In high-income countries, the introduction of organized screening programs has reduced cervical cancer incidence and mortality by more than half over the past three decades.

Crucially, treatment choice and prognosis depend sharply on the stage at diagnosis. Early-stage disease can often be treated with minimally invasive, fertility-preserving surgical procedures such as conization or radical trachelectomy, which are typically curative. In contrast, locally advanced disease requires concurrent chemoradiotherapy, and metastatic or recurrent cancer remains associated with poor survival outcomes despite advances in targeted therapies. This steep gradient—from low-burden curative treatment to high-mortality palliative care—implies that timely screening generates exceptionally large health returns. From an economic perspective, cervical cancer therefore represents a setting in which barriers to preventive access are likely to have first-order welfare consequences.

2.2 Institutional Features of Cervical Cancer Prevention in Japan

Japan's cervical cancer prevention system reflects a unique combination of historical policy decisions and persistent institutional inefficiencies. Together, these features create an environment in which reliance on secondary prevention is unusually strong, while access to screening remains highly uneven.

Suspension of Proactive HPV Vaccination

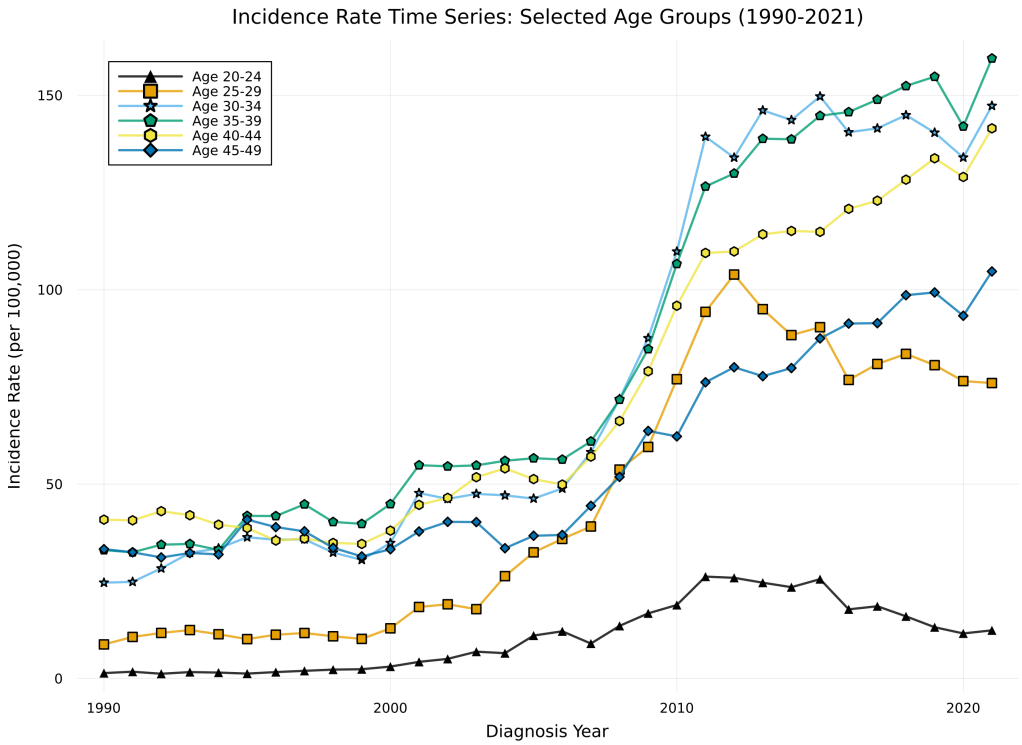
The importance of screening in Japan is amplified by a prolonged interruption in primary prevention. Although the HPV vaccine was introduced in the early 2010s, the Ministry of Health, Labour and Welfare suspended its proactive recommendation from 2013 to 2021 following reports of potential adverse events that were later found to lack scientific support. As a result, vaccination coverage among eligible cohorts declined sharply, falling to below one percent.

This policy reversal created a distinct cohort of women—those currently in their 20s and early 30s—who are almost entirely unprotected by vaccination. For this group, secondary screening is not complementary to primary prevention but instead constitutes the sole effective means of reducing cervical cancer mortality.

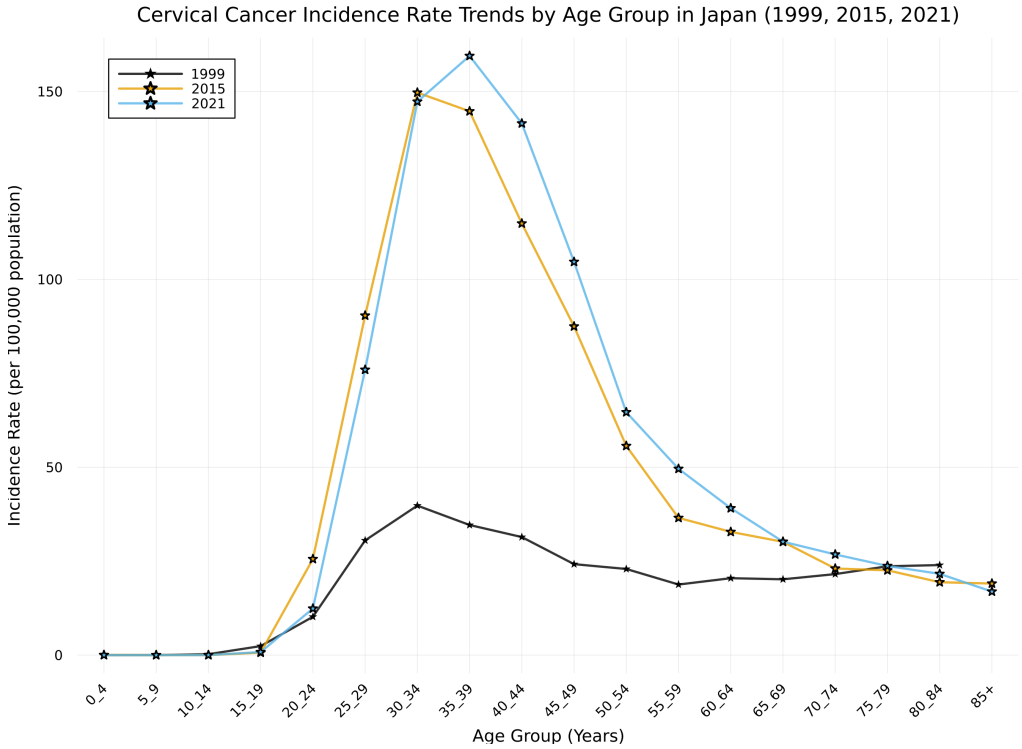
Escalating Crisis and the Shift in Age Profiles

The importance of secondary prevention in Japan is not merely a theoretical concern but a response to an escalating public health crisis. Unlike many other high-income countries where cervical cancer incidence is declining, Japan has experienced a paradoxical surge.

Figure 1(a) illustrates the incidence rate time series from 1990 to 2021. For women in their 30s and 40s, the incidence rate has nearly tripled over the last three decades.



(a) Incidence Rate Time Series



(b) Age-Specific Trends (1999 vs 2021)

Figure 1: The Evolving Landscape of Cervical Cancer in Japan. Panel (a) shows the rapid increase in incidence rates among young and middle-aged women since 1990. Panel (b) highlights the shift of the disease's peak toward the late 30s, which is the critical period for labor supply and insurance status decisions.

This alarming upward trend is observed even before the "Vaccine Void" generation—the cohort currently in their 20s and early 30s who lack primary protection—reaches the peak risk age. As this cohort matures into the high-incidence age brackets, the disease burden is expected to intensify further, leaving them entirely dependent on secondary screening.

This escalating crisis is compounded by a significant shift in the disease's age profile. Figure 1(b) compares the age-specific incidence rates of 1999 with 2021; while the 1999 profile showed a modest peak in older ages, the 2021 profile exhibits a sharp, elevated peak in the late 30s. Crucially, this biological peak now aligns perfectly with the life stage where married women face the strongest fiscal incentives to limit their labor supply and exit regular employment. This collision between the peak of cancer risk and institutional barriers to screening access justifies the focus on the interaction between tax policy and health outcomes.

Fragmentation of Screening Infrastructure and Follow-up

In Japan, the current national guidelines recommend biennial cervical cytology for women aged 20 to 69. Despite this established protocol, aggregate screening participation remains at 43.6 percent. This rate is not only below the OECD average but also falls short of the World Health Organization's targets for cervical cancer elimination. This participation gap is particularly concerning given that the "Vaccine Void" cohort relies exclusively on such screening for cancer prevention. As discussed below, this low coverage is driven less by the clinical guidelines themselves and more by the institutional frictions that hinder access for specific employment groups.

Even conditional on participation, Japan's screening system exhibits substantial inefficiencies in risk management and follow-up care. A prominent example concerns women who test negative on cytology but positive for high-risk HPV. Whereas international guidelines typically recommend immediate colposcopy for high-risk genotypes, Japanese practice generally adopts a conservative approach that delays follow-up testing for up to 12 months (Umezaki et al., 2025).

In addition, Japan lacks a centralized national cervical cancer screening registry comparable to those in the United Kingdom or other European countries. Screening records are instead managed at the municipal level, often through fragmented or paper-based systems. This institutional fragmentation disproportionately affects municipal screening programs, which primarily serve individuals without access to occupational health services, thereby increasing access frictions and reducing continuity of care.

2.3 Labor Market Dualism and Fiscal Incentives

The segmentation of screening access described above would be less consequential if individuals were randomly allocated across employment types. However, Japan's labor market is characterized by a pronounced dual structure consisting of regular and non-regular

employment. As documented by Kitao and Mikoshiba (2022), this dualism, reinforced by fiscal policy, systematically sorts married women into employment arrangements associated with inferior access to preventive care.

Employment trajectories diverge sharply over the life cycle. While many women enter the labor market as regular employees by their early 20s, a substantial share exit regular employment following marriage or childbirth. Upon re-entry, the majority return as non-regular workers, such as part-time or fixed-term employees. Unlike regular employment, which features seniority-based wage growth and returns to experience, non-regular jobs typically offer flat wage profiles and limited opportunities for human capital accumulation.

This selection into non-regular employment is strongly shaped by Japan's tax and social insurance system, which imposes discontinuous income thresholds on secondary earners. The spousal tax deduction creates a kink in the household budget constraint when spousal earnings exceed approximately 1.03 million yen. More importantly, the social insurance premium exemption—commonly referred to as the 1.30 million yen threshold—classifies dependent spouses below this level as Category-III insured persons, exempting them from pension and health insurance contributions while preserving full benefit eligibility.

Exceeding this threshold triggers a sudden obligation to pay independent social insurance premiums, amounting to roughly 15 percent of earnings. In the presence of fixed costs of labor market participation, such as commuting, childcare, and psychological costs (Bessho and Hayashi, 2014), these discontinuities generate strong incentives for households to limit female labor supply. Counterfactual simulations by Kitao and Mikoshiba (2022) demonstrate that removing these fiscal barriers would induce substantial transitions from non-regular to regular employment.

In the current equilibrium, fiscal incentives effectively lock many married women into non-regular employment in order to maximize short-run household disposable income. Because access to low-friction occupational screening is institutionally bundled with regular employment, this sorting mechanism unintentionally unbundles a large segment of women from efficient preventive care. As a result, inequality in screening uptake arises not from individual preferences or financial constraints, but as a structural outcome of fiscal design interacting with labor market institutions.

3 Literature Review

This paper contributes to three strands of literature: the macroeconomic analysis of health disparities under universal health insurance, the determinants of preventive health behavior—particularly cancer screening—and the structural analysis of female labor supply under fiscal distortions. This section situates this paper's contribution within each strand.

3.1 Socioeconomic Status and Health Disparities

A large body of research documents a robust gradient between socioeconomic status (SES) and health outcomes. In settings without universal health insurance, this gradient is often attributed to financial barriers to care. For example, Fang and Krueger (2022) study the effects of the Affordable Care Act in the United States and emphasize the role of insurance expansion in improving access to medical care and reducing inequality. This line of work views the removal of financial constraints as the primary policy instrument for addressing health disparities.

However, a persistent puzzle remains: substantial health disparities are observed even in countries with comprehensive universal health insurance (UHI) systems. Recent macroeconomic research seeks to explain this phenomenon by shifting attention from financial barriers to behavioral mechanisms. Using a structural life-cycle model calibrated to Germany, Mahler and Yum (2024) argue that wealth-health gradients arise endogenously from differential lifestyle choices, with wealthier individuals exerting greater effort to maintain health. Similarly, Ozkan (2025) proposes a moral hazard mechanism in which means-tested safety nets reduce preventive investment among low-income individuals by insuring catastrophic treatment costs.

This paper departs from these behavioral explanations in the context of Japan. I argue that the observed SES gradient is driven neither by the absence of insurance coverage (Fang and Krueger, 2022) nor solely by heterogeneous health preferences (Mahler and Yum, 2024), but by institutional frictions that systematically vary across employment types. In particular, for non-regular workers in Japan, the time and transaction costs associated with accessing screening services act as a prohibitive shadow price. This mechanism generates a structural barrier to prevention that is distinct from the incentive-based channels emphasized in existing macroeconomic models.

Methodologically, I build on the structural literature linking health and labor market dynamics. While Capatina (2015) quantify how health shocks propagate into earnings inequality through labor supply responses, this analysis highlights the reverse channel: how tax-induced labor supply choices shape health capital accumulation by determining access to preventive care.

3.2 Determinants of Cancer Screening and Employment-Based Access

A parallel literature in public health and epidemiology examines the determinants of cervical cancer screening and consistently documents a pronounced socioeconomic gradient. Global reviews such as Brotherton et al. (2025) show that women of lower socioeconomic status face significantly higher risks of late-stage diagnosis and mortality. Similar patterns are documented in high-income settings, including the United Kingdom (Hiatt et al., 2025), as well as in middle-income countries such as Brazil (Galindo et al., 2023).

Importantly, these studies emphasize that disparities are driven primarily by structural barriers—such as access frictions, health literacy, and organizational features of screening systems—rather than biological differences.

In Japan, the policy relevance of these barriers is amplified by the prolonged suspension of proactive HPV vaccination. As documented by Yagi et al. (2022), this suspension created a cohort of young women who are almost entirely unprotected by vaccination and therefore rely exclusively on screening for prevention. Within this context, employment status has emerged as a critical predictor of screening uptake. Using survey data on young unmarried women, Kaneko (2018) show that full-time employment is strongly associated with screening participation, attributing lower uptake among non-regular workers to the absence of organized, employer-provided screening opportunities. While this literature establishes a robust correlation between employment status and screening behavior, employment type is typically treated as an exogenous characteristic. Explanations for low screening uptake among non-regular workers are often framed in terms of individual knowledge, logistical barriers, or the lack of reminders (Kaneko, 2018; Brotherton et al., 2025). By contrast, my contribution is to reinterpret the observed screening gap as an endogenous outcome of labor market choices. By explicitly modeling the institutional bundling of occupational screening with regular employment, I link the employment gradient documented in the public health literature to fiscal incentives that shape labor supply decisions.

3.3 Fiscal Policy, Female Labor Supply, and Health Access

My analysis is closely related to the structural labor economics literature examining the effects of Japan's tax and social security system on female labor supply. A large body of evidence shows that spousal tax deductions and social insurance rules create substantial distortions in labor market participation. Bessho and Hayashi (2014) document significant extensive-margin responses to spousal tax incentives, while Kitao and Mikoshiba (2022) develop a life-cycle model demonstrating that the social insurance premium exemption at the 1.30 million yen threshold generates particularly strong disincentives for full-time employment among married women. In this framework, dependent spouses earning below the threshold receive full health and pension benefits without paying premiums, while exceeding the threshold triggers a discrete increase in mandatory contributions. Kitao and Mikoshiba (2022) show that this discontinuity rationally induces households to suppress female labor supply and select into non-regular employment with flat wage profiles. By linking these fiscal distortions to preventive health access, this paper also contributes to the broader literature on health insurance and labor markets. In the United States, classic studies such as Madrian (1994) describe "job lock," whereby workers remain in suboptimal jobs to retain employer-sponsored health insurance. Under Japan's universal health insurance system, coverage itself is not at risk. Instead, the

relevant distortion operates through incentives to maintain dependent status, giving rise to what can be described as a form of labor supply suppression rather than job lock. The central contribution is to show that this fiscal optimization entails a hidden health cost. While limiting labor supply allows households to avoid insurance premiums, it simultaneously unbundles women from the low-friction occupational screening associated with regular employment. By integrating a health accumulation process into a life-cycle labor supply model, I demonstrate that the welfare costs of fiscal distortions extend beyond foregone earnings to include the long-run depreciation of health capital due to delayed cancer detection.

4 Data

I document two empirical regularities that motivate the structure of the model. First, screening uptake differs sharply by employment type, even conditional on income. Second, female labor supply responds strongly to discontinuous fiscal thresholds, shaping the distribution of employment arrangements over the life cycle.

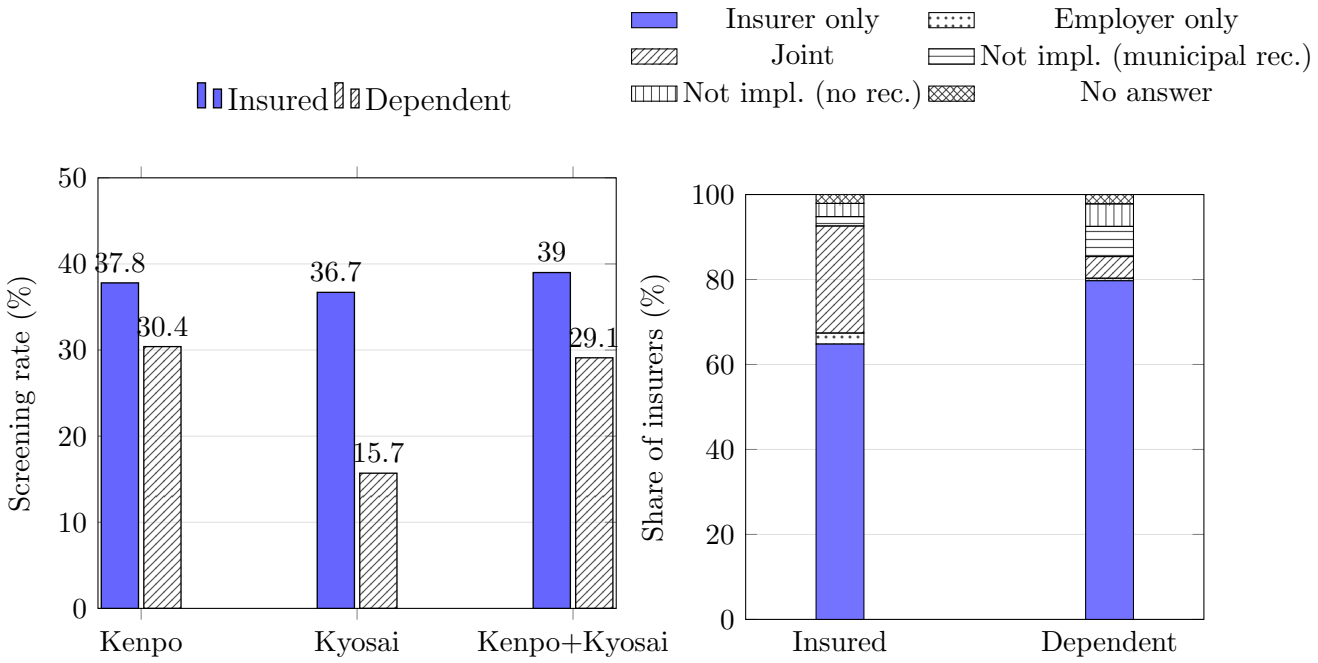
4.1 Data Sources

This analysis integrates several nationally representative datasets to bridge the gap between labor market behavior and health outcomes. The primary source for individual-level attributes is the *Comprehensive Survey of Living Conditions* (CSCLC), which provides detailed information on household demographics, income, and health behaviors, including cancer screening participation. To characterize the broader labor market environment, I incorporate the *Labor Force Survey*, which offers precise data on employment types, working hours, and the prevalence of non-regular employment among married women.

To supplement these sources, particularly regarding age-specific wage growth and returns to experience, I utilize the *Basic Survey on Wage Structure*. Finally, medical parameters regarding cervical cancer progression are calibrated based on the epidemiological literature summarized in the Background section. I focus on women aged 25 to 60 to align with the starting age of my life-cycle model and the primary working-age population.

4.2 The Employment–Screening Gradient

A central challenge in studying cervical cancer screening in Japan is the absence of a comprehensive administrative dataset that directly links individual screening participation to eligibility for occupational versus municipal screening. In practice, access to preventive care is institutionally determined by employment and insurance status.



(a) Cervical cancer screening rates among employment-based insurers: insured vs dependent.

(b) Implementation status for cervical cancer screening among employment-based insurers: insured vs dependent.

Figure 2: Institutional bundling of preventive screening in employment-based insurance.

Occupational screening is bundled with regular employment through employment-based insurers, while non-regular workers and dependents are typically directed to municipal screening programs, which require individual initiation. As a result, employment status serves as a reliable proxy for screening access regimes.

Figure 2a documents this institutional bundling using insurer-level evidence. Within employment-based insurance schemes, screening participation rates are substantially higher among insured workers than among dependents. Figure 2b further shows that, when screening is not provided to dependents, insurers frequently recommend municipal screening, effectively shifting them into a higher-friction access regime.

Taken together, these figures demonstrate that differences in screening uptake by employment type reflect structural differences in access rather than differences in monetary costs. This institutional segmentation motivates my modeling approach, in which labor supply choices endogenously determine access to preventive care.

4.3 Fiscal Walls and Labor Supply Adjustment

A second empirical regularity is that married women's labor supply in Japan responds sharply to discontinuous fiscal thresholds. While the administrative microdata required to reconstruct fine income histograms are not publicly accessible, existing studies using municipal tax records and large-scale payroll datasets consistently document pronounced bunching around the 1.03 million yen and 1.30 million yen thresholds. Table 1 summarizes

this evidence and the institutional interpretation of the thresholds.

These findings motivate my modeling of labor supply as a discrete choice over employment arrangements in the presence of non-linear budget constraints. Crucially, in my framework employment status also determines the screening access regime, linking fiscal incentives to preventive health behavior. (For completeness, Appendix Figure A.1 reports screening participation rates by employment type in the CSCLC.)

Table 1: Empirical evidence on income thresholds and labor supply adjustment among married women in Japan

Source (Data Type)	Key empirical finding
Kondo and Fukai (2023) Municipal tax records (Administrative data)	Clear spikes in the annual income distribution of married women at 1.03 million yen and 1.30 million yen. The discontinuity at 1.30 million yen is particularly large, reflecting the loss of dependent status in social insurance. Bunching is absent for married men and much weaker for unmarried women.
Cabinet Office (2025) Payroll service big data (Monthly panel)	Among female hourly workers aged 25–60, a pronounced asymmetry in the income distribution is observed at 1.03 million yen, despite the fact that this threshold does not represent a large statutory tax notch. No comparable bunching is observed among male workers.
Institutional Background Statutory tax and social insurance rules	Crossing the 1.03 million yen threshold triggers income tax liability and loss of tax-dependent status. Crossing 1.30 million yen induces mandatory payment of pension and health insurance premiums, implying an annual burden increase of approximately 300,000 yen.

Notes: This table summarizes stylized facts documented in existing administrative and large-scale private datasets. Raw microdata are not publicly accessible, and thus the evidence is presented descriptively. Sources: Kondo and Fukai (2023); Cabinet Office (2025).

Publicly available tabulations from the Employment Status Survey further support the relevance of discontinuous fiscal incentives for married women's labor supply, even though individual-level administrative microdata are not accessible. Table 2 reports the share of married women who report adjusting their working hours or days by annual earnings categories.

Two patterns stand out. First, the incidence of work-hour adjustment is disproportionately high in earnings ranges that bracket the main fiscal thresholds faced by secondary earners. Among married women earning between 0.5 and 0.99 million yen and between 1.0 and 1.49 million yen, more than 55 percent report actively adjusting their labor supply. Second, this behavior drops sharply once earnings exceed these ranges:

the adjustment rate falls to 7 percent in the 1.5–1.99 million yen category and below 5 percent at higher income levels.

Although the coarse income bins in public statistics preclude a direct visualization of fine bunching at the 1.03 million and 1.30 million yen thresholds, these patterns are consistent with intensive-margin labor supply responses to non-linear budget constraints documented in administrative and payroll data. Importantly, because employment type determines access to low-friction occupational screening, these fiscal-induced labor supply adjustments have direct implications for preventive health access. In my model, the observed concentration of work-hour adjustment in threshold-adjacent earnings ranges motivates treating employment status—and hence screening access—as an endogenous outcome of tax policy.

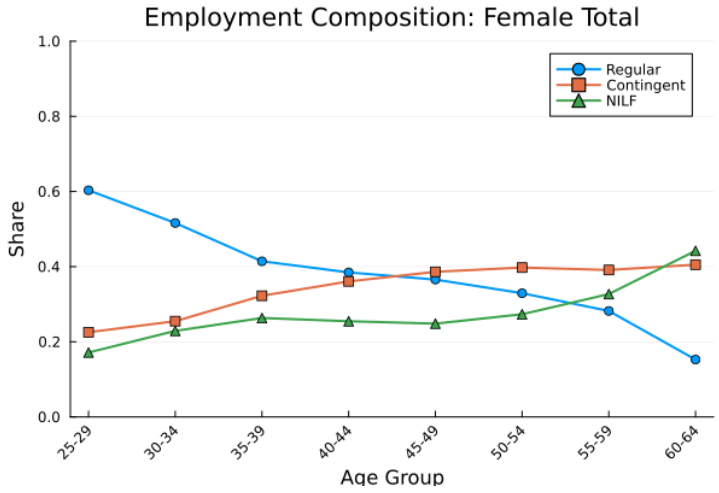
Table 2: Work-hour adjustment by annual earnings among married women (Employment Status Survey)

Annual earnings (million yen)	Married	Adjusting	Not adjusting	Adjusting rate (%)
All income groups	9,217,900	3,602,700	5,028,700	39.1
⩽0.5	752,300	188,100	517,900	25.0
0.5–0.99	3,183,500	1,774,700	1,226,700	55.8
1.0–1.49	2,679,300	1,496,500	1,034,900	55.9
1.5–1.99	938,100	66,800	819,900	7.1
2.0–2.49	875,500	35,500	793,300	4.1
2.5–2.99	331,400	11,500	302,400	3.5
3.0–3.99	231,900	5,400	208,800	2.3
4.0–4.99	51,700	1,000	46,200	1.9
5.0+	45,300	200	40,700	0.4

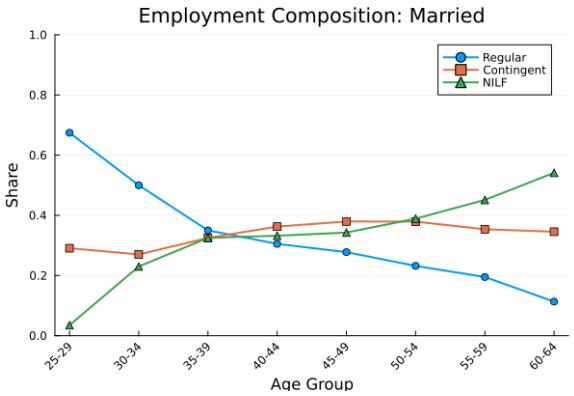
Notes: "Adjusting" indicates respondents report adjusting working hours/days. Sample: women; married subsample ("Of which married"). Source: Employment Status Survey tabulation shown in the excerpted table.

Finally, Figure documents the resulting life-cycle employment patterns for Japanese women, categorized by marital status. For the total female population (Panel A), we observe the well-known decline in regular employment during the late 20s and 30s. However, when disaggregated by marital status, a stark contrast emerges. While unmarried women (Panel C) maintain relatively high rates of regular employment throughout their prime working years, married women (Panel B) exhibit a dramatic shift from regular to non-regular (contingent) employment and non-participation (NILF) starting in their early 30s. This empirical distribution provides the foundation for this structural model, where the fiscal-induced selection into non-regular work endogenously "unbundles" married women from efficient preventive care.

Taken together, these stylized facts suggest that screening behavior in Japan cannot be understood independently of labor market choices and fiscal incentives. n the next



(a) Female Total



(b) Married



(c) Single

Figure 3: Life-cycle Employment Composition by Marital Status (2024). Data Source: Labour Force Survey.

section, I formalize this interaction in a life-cycle model. Crucially, unlike standard models where health is an exogenous shock or a function of medical spending, the model features 'access regimes' as a choice variable bundled with employment. This allows us to quantify the trade-off between disposable income (maximized by non-regular work) and health capital accumulation (maximized by regular work).

5 Model

This section develops a quantitative life-cycle model of female labor supply, savings, and health under the Japanese tax and health insurance system. Following Kitao and Mikoshiba (2022), the economy is populated by finitely lived individuals. This is a partial equilibrium model, where agents take as given the paths of factor prices and policies.

5.1 Demographics and Types

In this model, all agents are female; males agents exist just to bring their exogenous income to their spouses. Female individuals enters this economy at $t = 1$. Time is discrete and indexed by age $t = 1, 2, \ldots, T$, and one period corresponds to one year. Agents retire at an exogenous retirement age $R < T$: for $t \geq R$ women do not supply labor and receive pension income.

Each individual is characterized by gender $g \in \{m, f\}$ and skill (or education) $s \in \{s^L, s^H\}$. Women can be single or married. Let $q_t \in \{S, M\}$ denote marital status at age t, where S stands for single and M for married. At $t = 1$, each woman starts life as either single or married according to an exogenous distribution that depends on s and age. Marital status then evolves exogenously as follows. A single woman with skill s at age t becomes married in the next period with probability $\xi_{t,s}$:

$$\Pr(q_{t+1} = M \mid q_t = S, s) = \xi_{t,s}, \quad \Pr(q_{t+1} = S \mid q_t = S, s) = 1 - \xi_{t,s}.$$

Once married, women remain married; I abstract from divorce and remarriage.

When a woman marries, she is matched with a husband whose skill is $s' \in \{s^L, s^H\}$ with some probability. The husband's labor income profile $y_t^m(s')$ is entirely exogenous and enters only through the household budget constraint when $q_t = M$.

5.2 Employment, Earnings, and Taxes

Employment states and female earnings

Before retirement ($t < R$) a woman chooses her employment status

$$e_t \in \{R, C, N\},$$

where R denotes regular full-time employment, C denotes contingent employment (part-time, temporary, or non-regular work), and N denotes non-participation (NILF).

Female labor earnings are given by

$$y_t^f(e_t, s) = \gamma_{e_t} w_t^f(s), \tag{1}$$

where $w_t^f(s)$ is a skill-specific age-wage profile, and γ_{e_t} is an employment-type specific earnings factor. I assume $\gamma_R = 1$, $\gamma_C < 1$, and $\gamma_N = 0$. Male earnings $y_t^m(s')$ are exogenous and depend only on the husband's skill.

Taxes and social insurance

The government levies labor income taxes and social insurance contributions. I focus on labor income taxation and social insurance premia and abstract from consumption and

capital income taxation.

Let $T_{q_t}(y_t^f)$ denote the combined burden of labor income tax and social insurance contributions that the woman pays in period t, which depends on her marital status q_t and her own labor income y_t^f.

For single women I assume a simple proportional schedule,

$$T_S(y) = \tau^S_{\text{labor}}\, y + \tau^S_{SH}\, y, \tag{2}$$

where τ^S_{labor} is the labor income tax rate and τ^S_{SH} the social insurance contribution rate for singles.

For married women, I incorporate the "1.3 million JPY wall" associated with spousal social insurance coverage in a stylized way. Let $\bar{y}$ denote the income threshold corresponding to 1.3 million JPY (appropriately scaled to model units). I specify

$$T_M(y) = \tau^M_{\text{labor}}\, y + \mathbb{1}_{\{y>\bar{y}\}}\, \tau^M_{SH}\, y, \tag{3}$$

where τ^M_{labor} is the labor income tax rate for married women and τ^M_{SH} is the social insurance contribution rate applied only when the woman's own earnings exceed the threshold $\bar{y}$. This piecewise-linear schedule captures the key non-linearity in the effective marginal tax rate faced by married women.

Budget constraint and assets

Let a_t denote the woman's net financial wealth at the beginning of period t, and r the real interest rate. The asset accumulation equation for $t < R$ is

$$\begin{aligned} c_t + a_{t+1} = (1+r)a_t + y_t^f(e_t, s) + y_t^m(s')\, \mathbb{1}_{\{q_t=M\}} \\ - T_{q_t}\big(y_t^f(e_t, s)\big), \end{aligned} \tag{4}$$

where c_t is household consumption.

After retirement ($t \geq R$), women no longer work ($e_t = N$ and $y_t^f = 0$) and receive pension benefits as part of $y_t^m(s')$. The budget constraint retains the same form.

Assets are constrained to be non-negative, $a_{t+1} \geq 0$.

5.3 Health, Screening, and Information

True health

Each woman faces a stochastic health process for cervical cancer. Let

$$h_t^{\text{true}} \in \{\text{Healthy}, \text{CIN}, \text{Cancer_early}, \text{Cancer_late}, \text{Death}\}$$

denote her true health state in period t. The process is Markovian and depends on whether screening is performed:

$$h_{t+1}^{\text{true}} \sim \pi\big(\cdot \mid h_t^{\text{true}}, \text{screen}_t\big), \tag{5}$$

where $\text{screen}_t \in \{0, 1\}$ indicates whether the woman undergoes screening in period t. Screening can detect pre-cancerous lesions (CIN) and early-stage cancer and, conditional on detection, is assumed to lead to appropriate follow-up diagnosis and treatment.

I allow transition probabilities to depend on age implicitly through t. In particular, screening reduces the probability of progression from CIN to cancer and from early to late cancer, and may increase the probability of recovery from CIN to Healthy.

Subjective health and information

Agents do not directly observe h_t^{true} in most states. Instead, they hold a subjective health belief b_t taking values in:

$$b_t \in \{\text{Healthy}, \text{CIN}, \text{Cancer_early}, \text{Cancer_late}\}.$$

The belief b_t summarizes the agent's information about her own health based on past screening results and physical symptoms.

We assume that beliefs are updated through two channels: clinical screening and the onset of severe symptoms. While early stages (CIN and early cancer) are typically asymptomatic and only detectable via screening, we assume that the late-stage cancer ($h_t^{\text{true}} = \text{Cancer_late}$) entails noticeable symptoms that lead to clinical diagnosis regardless of screening participation.

Formally, the law of motion for beliefs is given by:

$$b_{t+1} = \begin{cases} h_{t+1}^{\text{true}} & \text{if } \text{screen}_t = 1 \text{ or } h_{t+1}^{\text{true}} = \text{Cancer_late}, \\ b_t & \text{otherwise.} \end{cases} \tag{6}$$

Thus, the agent learns her true health whenever she is screened or when the disease progresses to the late stage. In the absence of both screening and severe symptoms, the subjective health belief persists, potentially leading to a wedge between the true and perceived health states.

5.4 Preferences

Households derive utility from consumption and leisure, which is scaled by their subjective health beliefs.

Subjective health beliefs enter utility through a multiplicative scaling function. Let

the belief state be

$$b_t \in \{\text{Healthy}, \text{CIN}, \text{Cancer_early}, \text{Cancer_late}\}.$$

Because b_t is a categorical state, I introduce a scalar utility shifter $B(b_t)$ that maps each belief state into a utility scaling factor:

$$B(b_t) \in (0, 1].$$

In the quantitative implementation, I set

$$B(b_t) = (1.0,\ 0.95,\ 0.6,\ 0.3),$$

corresponding respectively to $\{\text{Healthy}, \text{CIN}, \text{Cancer_early}, \text{Cancer_late}\}$. This specification captures the idea that worsening perceived health reduces the effective utility derived from both consumption and leisure, while keeping preferences homothetic within each belief state.

Let c_t be household consumption and L total available time (normalized to one). Female leisure in period t is given by:

$$l_t^f = L - \phi_{q_t,e_t} - \chi_{e_{t-1},e_t} - \nu, \tag{7}$$

where ϕ_{q_t,e_t} captures the time cost associated with employment type and marital status, χ_{e_{t-1},e_t} is the switching cost of changing employment status, and ν represents time allocated to childcare. Retired women enjoy a fixed leisure $\bar{l}^R$.

A key feature of my model is that health beliefs enter the utility function multiplicatively. Following Viscusi (2019), I assume that severe health shocks, such as cancer, not only impose financial burdens but also fundamentally alter the utility structure by reducing the marginal utility of consumption and leisure. By multiplying the entire period utility by a health-dependent scaling factor $B(b_t)$, the model captures the empirical finding that the "joy of consumption" diminishes as health state deteriorates.

For singles ($q_t = S$), following Kitao and Mikoshiba (2022), the per-period utility is:

$$u^S(c_t, l_t^f, b_t) = B(b_t) \left\{ \frac{\left[(c_t/\eta_S)^\omega (l_t^f)^{1-\omega}\right]^{1-\sigma}}{1-\sigma} + K \right\}, \tag{8}$$

where η_S is the equivalence scale for single households, ω is the consumption share, and σ is the coefficient of relative risk aversion. The scaling factor $B(b_t)$ is associated with the agent's subjective belief state. We normalize $b^{\text{Healthy}} = 1.0$ and assume $1.0 > b^{\text{CIN}} > b^{\text{Cancer_early}} > b^{\text{Cancer_late}}$, reflecting the decline in the capacity to derive utility from goods and leisure as the disease progresses. K is a positive constant to ensure utility remains positive.

For married couples ($q_t = M$), the utility takes a symmetric form with a different equivalence scale η_M:

$$u^M(c_t, l_t^f, b_t) = B(b_t) \left\{ \frac{\left[(c_t/\eta_M)^\omega (l_t^f)^{1-\omega}\right]^{1-\sigma}}{1-\sigma} + K \right\}. \tag{9}$$

Husband's leisure is not explicitly modeled and is absorbed into η_M.

5.5 Stochastic Screening Mechanism

I model screening not as a deterministic choice but as a stochastic realization that emerges from the interaction between institutional constraints and cognitive awareness. Specifically, the probability that an agent undergoes screening at time t, denoted by $p_{\text{scr},t}$, is decomposed into two multiplicative components: institutional *Access* $A(\cdot)$ and subjective *Awareness* Φ_t. This product form imposes a structural hierarchy: Φ_t represents the agent's latent intent to screen, while $A(\cdot)$ acts as a regime-specific access cap. Even with high intent ($\Phi_t \to 1$), realized screening probability is bounded by institutional frictions.

Insurance regimes and institutional access caps

Institutional access is governed by the agent's health insurance regime

$$Ins_t \in \{\text{Employee}, \text{Dependent}, \text{NHI}\},$$

which is institutionally determined by employment status e_t, marital status q_t, and own earnings relative to the dependent threshold $\bar{y}$:

$$Ins_t = f(e_t, q_t, y_t^f; \bar{y}).$$

Given Ins_t, access is summarized by an upper bound on feasible screening probability:

$$A(Ins_t) = \begin{cases} 1.0 & \text{if } Ins_t = \text{Employee}, \\ \kappa_{\text{access}} & \text{if } Ins_t \in \{\text{Dependent}, \text{NHI}\}, \end{cases}$$

where $\kappa_{\text{access}} \in (0, 1)$ captures transaction costs such as self-booking requirements, limited clinic hours, and administrative frictions in municipal screening. I normalize $A(\text{Employee}) = 1.0$ because workplace-based screening is low-friction, and discipline κ_{access} using the observed screening gap by insurance type.

Awareness and belief-driven motivation

Awareness is endogenously determined by socioeconomic status, policy-driven information, and subjective health beliefs:

$$\Phi_t = \frac{1}{1 + \exp\left[-\left(\alpha_{\text{base}} + \delta_{25\text{–}29} + \alpha_{\text{skill}} \mathbb{1}_{\{s=H\}} + \alpha_{\text{info}} \mathcal{I}_t + \alpha_{\text{fear}} \mathbb{1}_{\{b_t \neq \text{Healthy}\}}\right)\right]}. \tag{10}$$

The parameter α_{skill} captures higher baseline knowledge and lower information processing costs among high-skilled individuals. The term α_{info} captures the impact of policy interventions ("cues to action"). Finally, α_{fear} represents a feedback mechanism from beliefs: when an agent suspects an underlying health issue ($b_t \neq$ Healthy), awareness increases and follow-up screening becomes more likely.

For ages 30–69, the intercept α_{base} is calibrated to match FY1999 screening moments. For ages 25–29, I introduce an age-specific intercept shift $\delta_{25\text{–}29}$ to capture frictions unique to younger individuals.

Realized screening probability

Finally, realized screening probability is given by

$$p_{\text{scr},t} = A(Ins_t) \cdot \Phi_t. \tag{11}$$

5.6 Dynamic Problem

At the beginning of each period t, a woman observes her current state vector $X_t = (a_t, h_t^{\text{true}}, b_t, s, q_t, e_{t-1})$. Here, a_t represents financial assets, h_t^{true} the true health state, b_t the subjective health belief, s the fixed skill type, q_t the marital status, and e_{t-1} the employment status in the previous period. The agent chooses her current employment status $e_t \in \{R, C, N\}$, consumption c_t, and next-period assets a_{t+1} to maximize her expected lifetime utility.

A key feature of the model is that the screening outcome $\text{screen}_t \in \{0, 1\}$ is not a direct choice variable but a stochastic realization determined by the chosen employment e_t. This realization, in turn, dictates the information set for the subsequent period.

For a living agent ($h_t^{\text{true}} \neq$ Death), the value function $V_t(X_t)$ satisfies the following Bellman equation:

$$V_t(X_t) = \max_{e_t, a_{t+1}} \left\{ u^{q_t}(c_t, l_t^f, b_t) + \beta(1 - \mu_{t,h}) \cdot \mathbb{E}\big[V_{t+1}(X_{t+1}) \mid X_t, e_t, a_{t+1}\big] \right\} \tag{12}$$

where $1 - \mu_{t,h}$ is the age- and health-specific survival probability. Given the stochastic nature of screening and health transitions, the expectation term is explicitly decomposed

as follows:

$$\begin{aligned}\mathbb{E}[V_{t+1}] = p_{\text{scr},t}(Ins_t, b_t) \sum_{h'} \pi(h'|h_t^{\text{true}}, 1) V_{t+1}(a_{t+1}, h', b_{t+1}^{\text{scr}}, s, q_{t+1}, e_t) \\ + (1 - p_{\text{scr},t}(Ins_t, b_t)) \sum_{h'} \pi(h'|h_t^{\text{true}}, 0) V_{t+1}(a_{t+1}, h', b_{t+1}^{\text{unscr}}, s, q_{t+1}, e_t)\end{aligned} \tag{13}$$

The law of motion for the subjective health belief b_{t+1} depends crucially on the screening realization. If the woman is screened, she gains perfect information regarding her health status; if not, her belief persists:

$$b_{t+1} = \begin{cases} h' & \text{if screened (Perfect Information Update)} \\ b_t & \text{if unscreened (Information Persistence)} \end{cases} \tag{14}$$

The probability of screening $p_{\text{scr},t}(Ins_t, b_t)$ is determined by the institutional access associated with e_t and the awareness function. Future marital status q_{t+1} and the spouse's income follow the exogenous processes described in Section 4. At the terminal age T, the value function is defined by the utility from terminal consumption and any bequest motives.

This formulation ensures that the labor supply decision e_t affects the household not only through the immediate budget constraint but also by altering the probability of detecting life-threatening health transitions. The "1.3 million yen wall" thus creates a trade-off: while non-regular employment maximizes current disposable income by avoiding social insurance premiums, it simultaneously reduces the expected value of future health capital by increasing information frictions in the screening process.

6 Numerical Analysis

The model is calibrated to represent the socioeconomic and epidemiological environment of Japan, with a particular focus on the late 1990s as a baseline. The calibration strategy proceeds in two steps. First, we set a subset of parameters directly from external data sources and existing literature. Second, we calibrate the unobserved health transition and behavioral parameters by matching simulated moments to empirical targets.

6.1 Demographics and Economic Environment

The model begins at age 25 ($age_{min} = 25$) and continues until the terminal age of 95. Agents face age-specific mortality risks μ_a, which are obtained from the Japanese Life Tables for 1999. The discount factor is set at $\beta = 0.98$, and the risk-free interest rate is $r = 0.02$.Labor income profiles are central to the socioeconomic gradient in this model. We construct gender- and skill-specific wage paths using the Basic Survey on Wage Structure. Male wage profiles are used to determine the income of spouses for married women, where

we account for assortative mating: high-skilled women have a higher probability ($\alpha_{HH} = 0.60$) of marrying high-skilled men compared to their low-skilled counterparts ($\alpha_{LH} = 0.35$). For women, the wage profile incorporates a productivity gap between regular and non-regular employment, reflecting the "dual labor market" structure in Japan. To capture the institutional constraints of the tax-and-transfer system, we include an income threshold ($\bar{y}$), representing the "1.3 million yen wall," which incentivizes married women to limit their labor supply to remain as dependents.

Table 3: Model Parameters and Calibration Targets

Parameter	Description	Value	Source / Target
A. Fixed or Externally Determined			
β	Discount factor	0.98	Standard literature
r	Risk-free interest rate	0.02	Standard literature
a_{min}, T	Age range	25–95	Model setup
μ_a	Age-specific mortality	–	1999 Life Tables (Japan)
OR_{info}	Policy info effect (Odds Ratio)	1.33	Cui et al. (2022)
α_{HH}	Prob(High-skill spouse | High-skill)	0.60	Wage Structure Survey
α_{LH}	Prob(High-skill spouse | Low-skill)	0.35	Wage Structure Survey
$\bar{y}$	Tax-dependency threshold	0.18	"1.3M Yen Wall" (normalized)
B. Calibrated to Epidemiological (1999) and Behavioral (2022) Moments			
κ_{access}	Access cap (Non-regular/NHI)	0.35–0.40	Screening gap by employment
δ_{25-29}	Intercept shift for ages 25–29	0.80	Age-specific screening rate
α_{base}	Baseline screening intercept	-2.02	Overall screening rate (1999)
α_{skill}	Skill-specific awareness	0.25	Screening gap by education
α_{fear}	Belief feedback effect	0.40–1.20	Follow-up screening rates
$\pi(H \to CIN)$	Transition: Healthy to CIN	0.001	Stage distribution (MCIJ/NCC)
$\pi(CIN \to E)$	Transition: CIN to Early Cancer	0.03–0.06	CIN-to-Invasive ratio (1:2)
δ_{Late}	Excess mortality (Late-stage)	0.02	Survival rates by stage

Note: Epidemiological transition parameters are anchored to 1999 registry data, while screening behavior parameters are calibrated to 2022 screening rates.

6.2 Model Fit: Employment Transitions

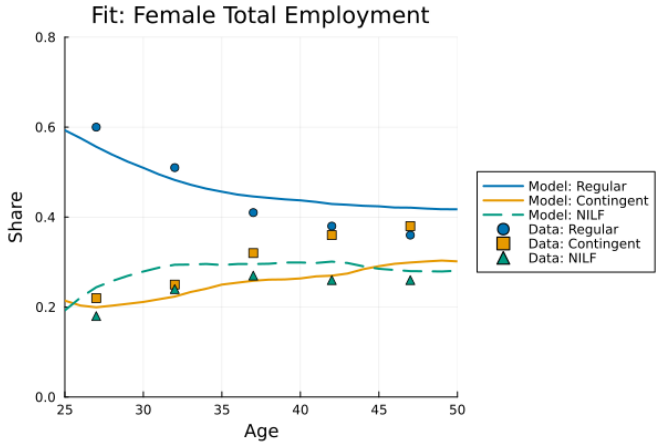
To validate the structural parameters of the model, we evaluate its ability to replicate the lifecycle employment profiles of Japanese women. Figure 4 presents the comparison between the simulated distributions and the empirical moments from the 2024 Labour Force Survey for three groups: the total female population, married women, and single women.

My model successfully captures the distinctive "M-shaped" participation pattern of the contemporary Japanese labor market. Specifically, for married women (Panel b), the model replicates the sharp decline in regular employment during the late 20s and early 30s, followed by a gradual reentry into the labor force primarily through contingent positions. Notably, by targeting 2024 data rather than historical cohorts, this calibration

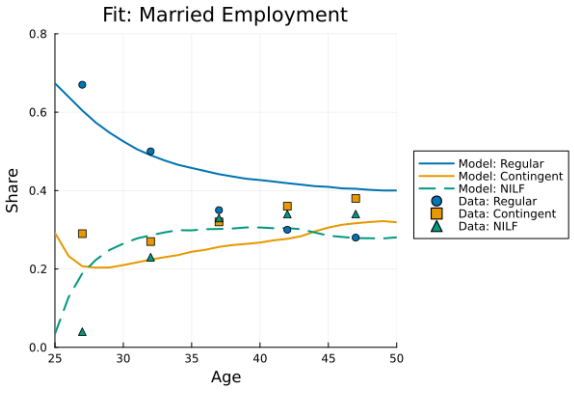
accounts for the recent "shallowing" of the M-curve, where a higher proportion of women maintain regular employment compared to previous decades.

The model reproduces a concentration of contingent employment among married women in the income and age ranges where the 1.30 million yen threshold is most salient. The model's ability to fit the steady share of regular workers at approximately 20–25 percent for married women across their 30s and 40s suggests that the participation costs (ϕ) and switching costs (χ) provide a parsimonious representation of the institutional frictions associated with the current tax and social insurance system. For single women (Panel c), the model correctly predicts a high and stable regular employment rate, further confirming that the observed labor supply shifts are driven by marital-status-dependent policy treatments rather than age-specific productivity shocks alone.

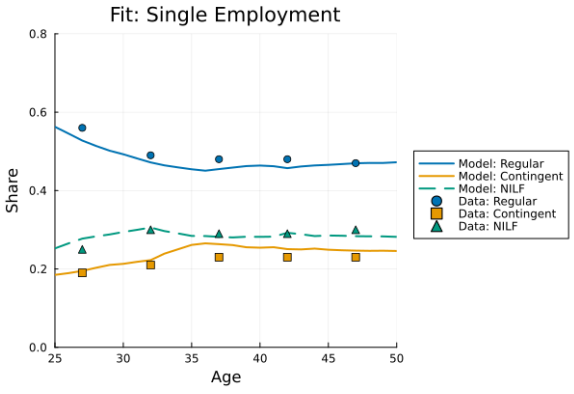
These fits provide a consistent baseline from which to conduct counterfactual experiments. Since the model accurately replicates the current distribution of women across different insurance regimes, it can reliably predict how a removal of fiscal barriers would alter the screening access landscape for the Vaccine Void generation.



(a) Fit: Female Total



(b) Fit: Married Women



(c) Fit: Single Women

Figure 4: Calibration Fit: Lifecycle Employment Shares (Ages 25–50). Solid lines represent the model's simulated paths, while markers represent empirical moments from the Labour Force Survey (2024).

Table 4: Calibration to FY1999 screening moments (A-method).

Age band	Referral rate	Cancer/screened	Cancer share among FU	FU coverage
30–39 (Data)	0.0136	0.00326	0.595	0.402
30–39 (Model)	0.0102	0.00087	0.216	0.395
40–49 (Data)	0.0119	0.00231	0.497	0.391
40–49 (Model)	0.0205	0.00355	0.446	0.388
50–59 (Data)	0.00914	0.00159	0.420	0.414
50–59 (Model)	0.0235	0.00479	0.491	0.416

6.3 Health Transitions and Epidemiological Anchoring

A central challenge in modeling cervical cancer progression is that transition probabilities between health states—specifically from Healthy to CIN, and from CIN to invasive cancer—are not directly observable. We select 1999 as the baseline anchor to identify these structural health parameters. This period is ideal as it predates the introduction of HPV vaccination in Japan, allowing us to isolate the natural progression of the disease.We use the observed stage distribution of cervical lesions from the Monitoring of Cancer Incidence in Japan (MCIJ) and National Cancer Center (NCC) registry data as a disciplining device. Specifically, the model is calibrated to match the composition of newly detected cases across three clinical stages: CIN III (Carcinoma in situ), Early-stage Invasive Cancer, and Late-stage Invasive Cancer. As shown in the registry data, CIN cases accounted for approximately 35–45% of detections, while early and late invasive cancers accounted for 30–40% and 15–20%, respectively. We initialize the model to maintain a steady-state ratio of CIN to invasive cancer cases of approximately 1:2, consistent with the 7,000–8,000 annual invasive cases recorded in the late 1990s. This ensures that the welfare costs of delayed detection are consistent with the high mortality risks documented during this "Vaccine Void" era.

6.4 Screening Behavior and Institutional Frictions

The parameters governing the stochastic screening mechanism are calibrated to match age- and skill-specific screening rates. The baseline intercept (α_{base}) and the institutional access parameters (κ_{access}) are identified using the screening moments from the 1999 Comprehensive Survey of Living Conditions.For the youngest cohort (ages 25–29), we introduce an age-specific intercept shift (δ_{25-29}). This adjustment is necessary to capture additional frictions faced by younger women, such as information gaps regarding cancer risk or the use of non-municipal screening channels that are not captured in standard moments. The skill-specific parameters (α_{skill}) are set to reflect the observed educational gradient in screening participation. Furthermore, we incorporate a feedback mechanism from health beliefs (α_{fear}), where the probability of screening increases when an agent

suspects a non-healthy state. This parameter is calibrated to match the higher follow-up rates observed among individuals with previous abnormal results, ensuring that the model captures the endogenous motivation for screening as health risks escalate. While the epidemiological block is anchored to the pre-vaccine era, screening behavior is re-calibrated to the contemporary environment to reflect institutional and informational changes over time.

Table 5: Calibration Results: Annual Screening Probabilities (2022)

Age Group	Empirical Data (2022)	Model Prediction	Gap
25–29	0.2097	0.1957	−0.0140
30–39	0.3063	0.2981	−0.0082
40–49	0.3344	0.2876	−0.0468
50–59	0.2808	0.2797	−0.0011
60–69	0.1893	0.2344	+0.0450
Calibrated Parameters			
α_{base} (Baseline intercept)		−0.4	
δ_{25-29} (Age-specific shift)		−0.6	

Note: Empirical data is derived from the 2022 Comprehensive Survey of Living Conditions, converted into annual probabilities. The parameters α_{base} and δ_{25-29} were identified via grid search to minimize the sum of squared residuals ($L \approx 0.0045$).

We calibrate a single screening-intercept shifter, `offset_scr`, to match FY1999 age-band moments in the pre-vaccine era. Importantly, we solve the dynamic program once and re-simulate the economy over a grid of `offset_scr` values, so identification comes purely from simulated moments rather than repeated DP re-solves. The loss function places greater weight on (i) referral rates and (ii) follow-up coverage, which are directly tied to screening access and belief-driven engagement in care.

As a diagnostic exercise, we also report the calibration results obtained when fitting the screening intercept to FY1999 moments. The best-fitting value is `offset_scr` $= -0.85$. Under this calibration, the model reproduces follow-up coverage remarkably well across all age bands (e.g., 0.402 vs. 0.395 at ages 30–39; 0.391 vs. 0.388 at ages 40–49; 0.414 vs. 0.416 at ages 50–59), suggesting that the belief/awareness mechanism delivers realistic follow-up behavior. Residual discrepancies remain for some incidence-related moments (e.g., cancer per screened), which we discuss in Section X as reflecting simplifications in disease incidence and detection.

7 Results

This section quantifies the health consequences of fiscal distortions operating through the employment–screening access channel.

I proceed in three steps. First, I document that the calibrated model reproduces the

institutional mechanism: tax incentives shift women into employment states associated with lower screening access. Second, I conduct counterfactual reforms that relax the 1.30 million yen wall and quantify the implied changes in screening behavior and disease progression.

Third, I decompose the effects to isolate the role of access frictions from standard income and labor-supply channels.

7.1 Baseline mechanism: fiscal incentives endogenously shift access regimes

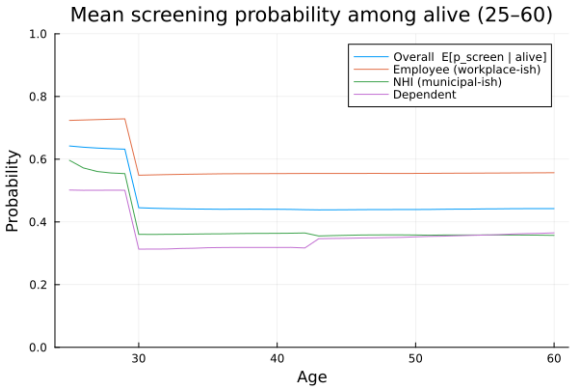
The key object in the model is the endogenous mapping from employment to screening access. Regular employment is bundled with low-friction occupational screening, whereas contingent work and dependent/NHI regimes rely on municipal screening with higher transaction costs. In the model, married women face a discrete increase in social insurance contributions above the 1.30 million yen threshold, which generates incentives to limit labor supply and sort into contingent work.

Figure 5 summarizes this mechanism in the simulated baseline. Panel (a) reports the life-cycle employment composition by marital status. Consistent with the calibration targets, the share of regular employment among married women declines sharply in the early 30s and remains low through the late 40s, while contingent employment and non-participation increase. Panel (b) translates these employment patterns into access-regime outcomes by plotting the implied composition of insurance categories. The model therefore generates an endogenous "access gradient" even under universal health insurance coverage for treatment.

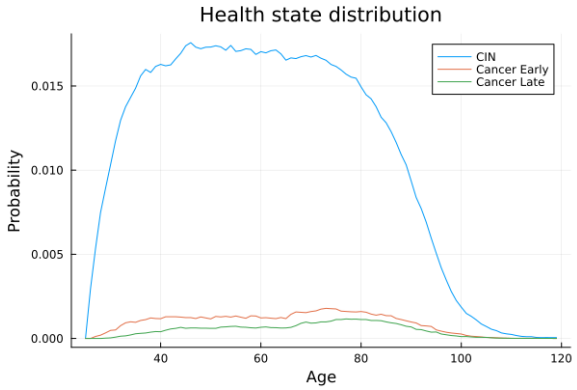
Panel (c) plots the mean screening probability among alive agents by insurance category, which is bounded above by the access cap. Despite identical monetary prices of screening, the model produces a sizable screening gap across regimes. Finally, Panel (d) shows that this gap maps into a wedge in early detection: groups facing higher frictions exhibit lower detection of CIN and early-stage cancer and a higher incidence of late-stage detection.

7.2 Counterfactual: Removing the income wall.

Table 6 reports insurance regime shares for ages 25–64 under the baseline and the counterfactual that removes the income wall. The change in insurance composition is quantitatively small. Under age-equal averaging, the employee-insurance share increases from 0.390 to 0.390 and the NHI share rises slightly from 0.403 to 0.404, while the dependent share declines marginally from 0.207 to 0.206. The population-weighted averages yield a similarly small shift (employee: 0.391 to 0.392; NHI: 0.401 to 0.402; dependent: 0.207 to 0.207). Overall, removing the wall has very limited effects on insurance regime composition in this model.



(a) Screening probability by insurance regime



(b) Health-state distribution: CIN / Early / Late

Figure 5: Baseline mechanism in the model: fiscal incentives sort women into employment and insurance regimes with differential screening access, generating systematic gaps in early detection.

Table 6: Insurance Regime Shares among Women (Ages 25–64)

Scenario	Weighting	Employee	NHI	Dependent
Baseline	Age-equal	0.390	0.403	0.207
Baseline	Population-weighted	0.391	0.401	0.207
Remove wall	Age-equal	0.390	0.404	0.206
Remove wall	Population-weighted	0.392	0.402	0.207

Notes: Shares are computed from simulated counts by insurance regime. The sample is restricted to ages 25–64 (pre-retirement). *Age-equal* averages the regime shares equally across ages (each age receives the same weight), whereas *population-weighted* averages using the number of alive individuals at each age as weights.

7.3 Baseline Insurance Composition and Screening Access

Before turning to counterfactual policy experiments, we document the baseline distribution of women across insurance regimes and its stability over the working-age life cycle. Table 6 reports average insurance shares for women aged 25–64, computed using both age-equal and population-weighted aggregation.

In the baseline economy, employee insurance accounts for approximately 39–40% of coverage, while National Health Insurance (NHI) represents about 40%, and dependent coverage about 20%. The similarity between age-equal and weighted averages indicates that insurance composition is relatively stable across working ages, and is not driven by a small set of high-population cohorts.

Removing the income wall induces only modest changes in these aggregate shares. Employee insurance declines by less than 0.3 percentage points, while NHI and dependent coverage increase slightly. This suggests that the counterfactual policy does not operate primarily through large mechanical shifts in insurance enrollment.

Figure 6 plots the average screening probability among alive individuals by age. Screening rates exhibit a sharp decline around age 30, reflecting transitions in employ-

ment and insurance eligibility, followed by relatively flat profiles thereafter. Importantly, baseline and counterfactual screening paths almost overlap at the aggregate level. The maximum difference in screening probabilities across ages is below 0.15 percentage points, suggesting that the income wall reform has a limited impact on average screening participation.

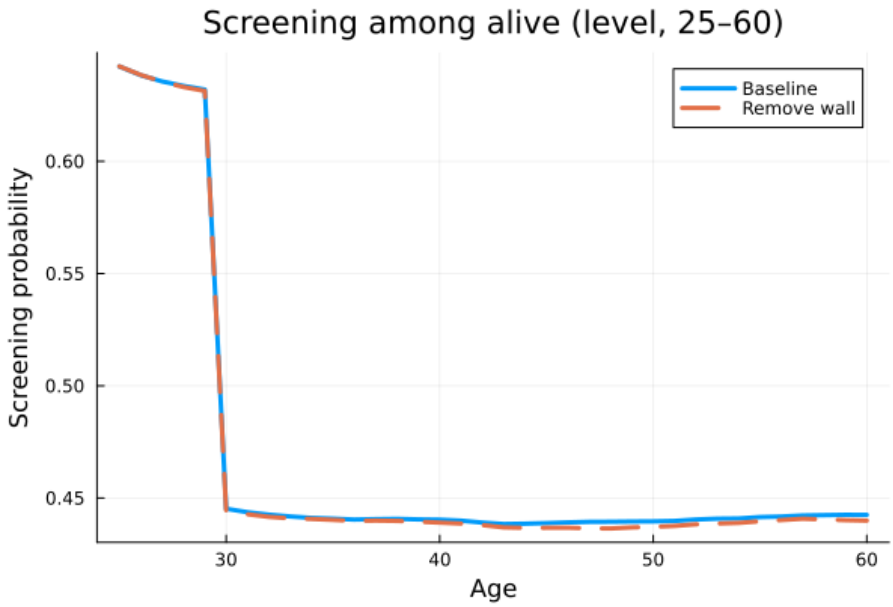


Figure 6: Screening probability among alive women (ages 25–60)

Note: Solid line shows the baseline economy, dashed line the counterfactual without the income wall. Aggregate screening profiles are nearly identical across scenarios.

7.4 Heterogeneity by Skill: Where the Policy Bites

While aggregate effects are small, disaggregated results reveal substantial heterogeneity by skill. Figure 7 shows screening probabilities by age and skill under the baseline and counterfactual economies. High-skill women consistently exhibit higher screening rates than low-skill women throughout the life cycle, reflecting higher wages, stronger labor market attachment, and better access to employment-based screening channels.

Figure 8 plots the age-specific change in screening probabilities induced by the removal of the income wall. For low-skill women, screening probabilities decline slightly across most ages. In contrast, high-skill women experience increases in screening after their early 40s, with effects reaching up to 0.3–0.5 percentage points. These opposite responses are largely masked in aggregate averages.

Further decomposition by insurance regime indicates that these effects are concentrated among employment-linked insurance channels. Screening behavior under NHI is largely unaffected, while dependent and employee coverage drive most of the observed changes. This pattern highlights the role of labor-supply incentives and insurance-linked access to preventive care in shaping screening behavior.

Taken together, these results imply that the income wall reform primarily redistributes screening access across groups rather than expanding screening participation uniformly. The combination of stable aggregates and heterogeneous individual responses provides a disciplined environment for evaluating health consequences in the counterfactual analysis that follows.

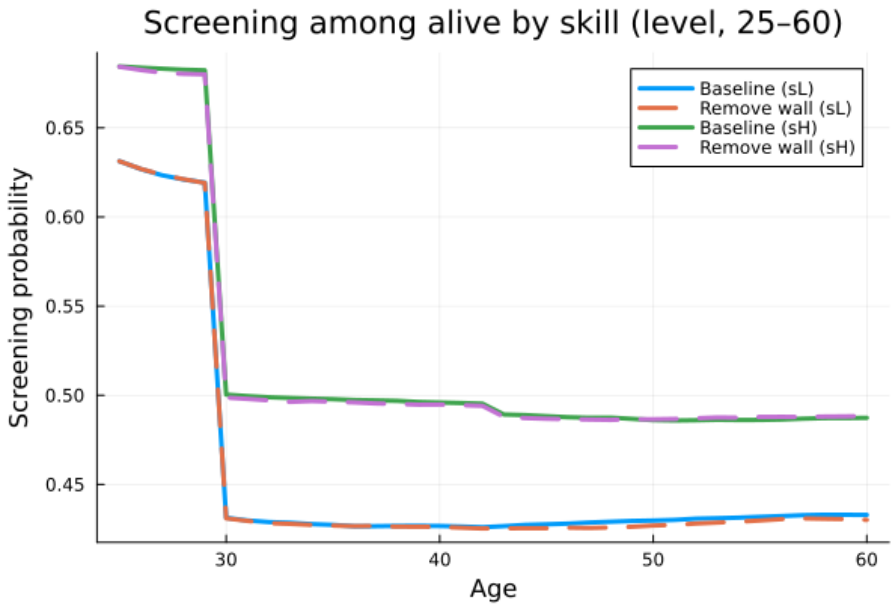


Figure 7: Screening probability by skill level (ages 25–60)

Note: High-skill women exhibit consistently higher screening rates than low-skill women. Baseline and counterfactual paths largely overlap at the level.

7.5 The Information Paradox: Widening Health Disparities

The analysis above establishes that labor market reforms primarily redistribute screening access. We now turn to a key result: the long-run impact of universal information provision on disease burden. Figure 9 presents the cumulative incidence of invasive cervical cancer by skill group, which serves as a sufficient statistic for the total disease burden experienced by each cohort.

Universal information provision—operationalized as a reduction in the subjective uncertainty regarding health states—leads to a non-monotonic impact on health inequality. While the policy successfully reduces the absolute cumulative incidence for both groups, the reduction is disproportionately concentrated among high-skilled women. For this group, the enhanced belief-updating process triggers a more aggressive screening response, effectively leveraging their superior institutional access to regular-employment-based screening.

In contrast, for low-skill women, the behavioral response to information is severely dampened by the institutional frictions and fiscal barriers identified in Section 4.2. Even when they suspect a non-healthy state, the higher transaction costs associated with

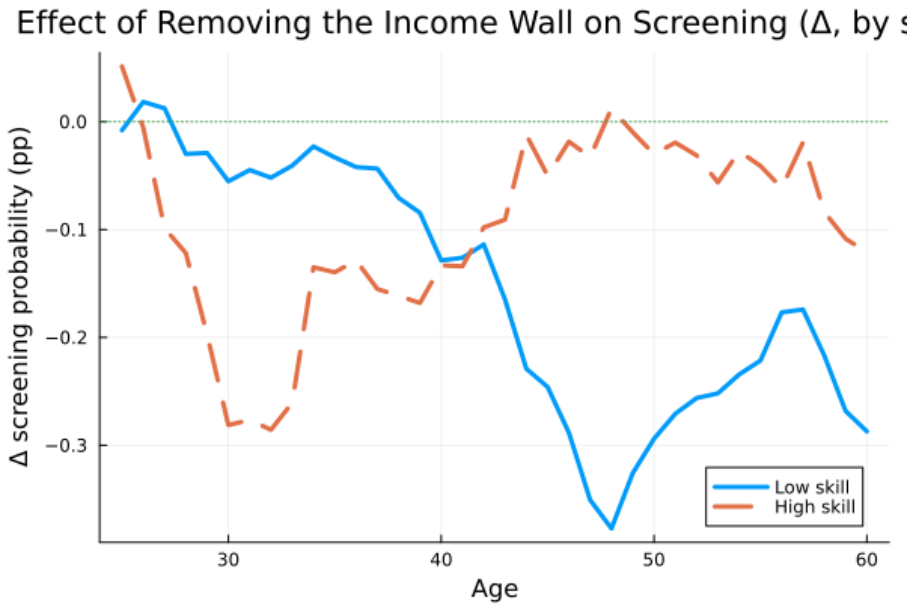


Figure 8: Effect of removing the income wall on screening (by skill)

Note: The figure plots the difference in screening probabilities between the counterfactual and baseline economies. Effects are small on average but differ sharply by skill and age.

non-regular employment and municipal screening channels act as a "glass ceiling" for preventive care. Consequently, as shown in Figure 9, the health gap between skill groups—measured by the disparity in cumulative invasive risk—paradoxically widens under the universal information policy.

This finding identifies a critical "Information Paradox" in public health: in the presence of structural labor market distortions, untargeted information campaigns may inadvertently exacerbate socioeconomic disparities. The policy, while effective at a mean level, fails to reach those constrained by the income wall, suggesting that information is a complement to, rather than a substitute for, institutional access. This result underscores the necessity of targeting both cognitive frictions and fiscal barriers simultaneously to achieve equitable health outcomes.

This finding highlights a key limitation of untargeted information campaigns: while effective at increasing average screening, they may inadvertently exacerbate socioeconomic disparities in long-run health outcomes.

8 Conclusion

This paper identifies and characterizes a novel mechanism through which fiscal policy inadvertently generates health disparities, even within a system of universal health coverage. In the Japanese context, I demonstrate that preventive care is institutionally bundled with labor market status: regular employment provides low-friction occupational screening, whereas the tax-incentivized shift toward non-regular work decouples individuals from efficient preventive access. By inducing women to remain below income

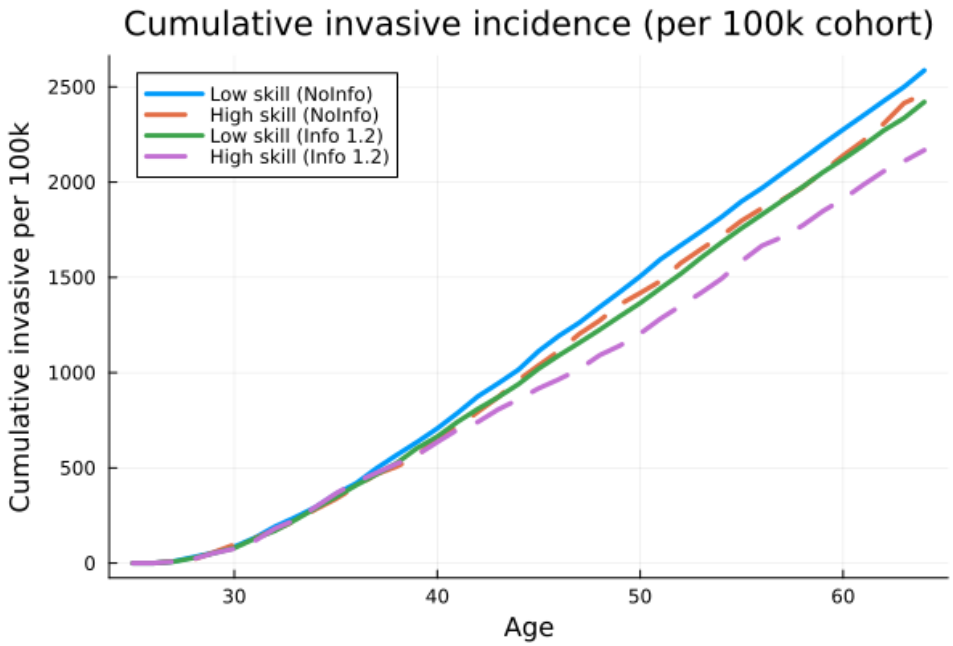


Figure 9: Cumulative incidence of invasive cervical cancer by skill group. The figure plots the share of women who have experienced invasive cancer by each age, normalized by cohort size at age 25. Solid lines correspond to low-skilled women, dashed lines to high-skilled women. Blue lines indicate the No-Information benchmark, while red lines show the universal information policy (Info 1.2).

thresholds, the fiscal system endogenously creates a "health penalty" characterized by delayed detection and elevated mortality risks.

Using a structural life-cycle model that integrates female labor supply with the biological progression of cervical cancer, I find that removing the 1.30 million yen "income wall" yields a limited but highly uneven set of gains. Beyond its implications for labor market behavior, the reform significantly improves health outcomes for the "Vaccine Void" generation by re-linking them to high-access insurance regimes. Crucially, my decomposition analysis reveals that these gains are driven primarily by the reduction of access frictions rather than standard income effects. This suggests that the fiscal system's impact on health is not merely a byproduct of wealth redistribution, but a fundamental distortion of lifetime well-being and health accumulation.

The broader implication of this study is that in economies where social insurance and preventive care are bundled, fiscal policy is, in effect, health policy. Policy reforms intended to eliminate labor market dualism can serve as powerful, cost-effective instruments for advancing health equity.

While this study focuses on Japan, the mechanism—where means-tested fiscal benefits or tax notches create barriers to life-saving preventive behavior—is relevant for any UHI system facing socioeconomic gradients in health. Future research could further refine these insights by linking structural models with administrative claims data to track follow-up dynamics after abnormal screening results. Additionally, exploring the interaction

between family policy (e.g., childcare) and health investments would clarify the broader trade-offs women face across the life cycle. Ultimately, achieving health equity requires a transition from siloed policymaking to an integrated framework where fiscal and public health objectives are aligned.

Acknowledgements

The author declares no financial support and no conflicts of interest related to this research.

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Appendix A.1 Institutional meaning of income thresholds

In Japan, two income thresholds are commonly referred to as "income walls" (*nenshū no kabe*). The first threshold, at 1.03 million yen, corresponds to the point at which individual income tax liability begins and spousal tax dependency is lost. While the statutory marginal tax burden at this point is small, the threshold has become a salient reference point in labor supply decisions.

The second threshold, at 1.30 million yen, marks the loss of dependent status in public pension and health insurance systems. Crossing this threshold requires the spouse to pay pension and health insurance premiums independently, implying an annual increase in contributions of approximately 300,000 yen. As a result, the 1.30 million yen threshold represents a large discontinuous notch in household disposable income.

Appendix A.2 Data accessibility and empirical strategy

Although income bunching around the 1.03 and 1.30 million yen thresholds has been well documented in the literature, the micro-level administrative data required to construct precise income histograms are not publicly accessible. Previous studies rely either on municipal tax records (Kondo and Fukai, 2023) or on proprietary payroll service data (Cabinet Office, 2025), neither of which can be directly replicated by researchers using public-use files.

Given these constraints, I follow the existing literature and rely on established descriptive evidence to motivate our modeling framework, rather than reconstructing reduced-form income distributions.