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Research Article

Social Assistance and Working Poverty: An Interdisciplinary Analysis of Institutional Design in Germany and Turkey

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Abstract

Objective: This study conceptualizes working poverty as an institutional equilibrium located at the intersection of the wage floor, work intensity, household composition, and the tax–transfer architecture. Using harmonized microdata from Germany and Turkey, it examines the relationship between social assistance, working poverty, and health [1-4].

Methods: Effective marginal tax rates (EMTR) and participation tax rates (PTR) are microsimulated from tax–benefit rules [5] and integrated with panel fixed effects, multi-period difference-in-differences/event study designs [6], and threshold-neighborhood RDD/IV strategies [7,8]. Health mechanisms are tested within a causal mediation framework—food insecurity, out-of-pocket medical spending, and job stress/sleep [9,10]. Measurement attends to equivalized income, PPP adjustments, and alternative poverty thresholds [11].

Findings (directional): Greater transfer generosity lowers the probability of in-work at-risk-of-poverty (AROP_work), whereas high EMTR corridors weaken incentives at the participation and hours margins [5,12,13]. In Germany, the 2015 national minimum wage establishes a protective floor at the bottom of the distribution [14,15]; in Turkey, informality and take-up frictions render effects heterogeneous [16,17]. Adverse health patterns are partially mediated by food insecurity and stress/sleep pathways, consistent with demand–control and effort–reward imbalance gradients [18-21]. Effects are stronger for women and second earners [22-24].

Conclusion: A policy bundle targeting the Income–Time–Care–Security (ITCS) axes—wage floor and inclusive collective bargaining; low-EMTR corridors/Second-Earner Neutrality; care infrastructure/parental leave; and automatic/simple one-stop enrollment—effectively reduces working poverty and associated health inequalities [5,12,14,17,24-26].

Keywords: Working Poverty; Social Assistance; Tax–Benefit Microsimulation; Effective Marginal and Participation Tax Rates (EMTR, PTR); Minimum Wage; Non-Take-Up; Food Insecurity; Causal Mediation Analysis; Health Inequalities; Germany and Turkey

Introduction

"Working poverty" denotes a risk condition produced by the intersection of labor market dynamics and the tax–transfer architecture, whereby an individual is employed yet the household's equivalized disposable income falls below a fixed share—typically 60%—of the contemporary median [1]. The phenomenon cannot be reduced to "low pay" alone: work intensity (part-time/temporary jobs, in-year unemployment spells, unpredictable shifts), household composition and care burdens, informality, and skill mismatch interact with tax/contribution burdens and benefit withdrawal profiles to shape trajectories of disposable income [2,27]. In means-tested programs, effective marginal tax rates (EMTR) and participation tax rates (PTR) set up a tension between poverty alleviation and labor-supply incentives; second-earner participation and hours responses are particularly sensitive to these slopes [12,28].

Comparative institutional context. In Germany, reforms since the 2000s and the spread of atypical work increased clustering in the low-wage segment; the 2015 national minimum wage introduced substantial policy variation at the bottom [14,15]. In Turkey, despite the expansion of social assistance over the past two decades, high informality, regional inequality, and the gendered organization of the care economy yield a different risk architecture [16]. The contrast offers a comparative laboratory to causally disentangle the wage floor–incentive–access triangle and second-earner dynamics [23,25].

Conceptual positioning and theoretical bridge. We conceptualize working poverty along the Income–Time–Care–Security (ITCS) axes as a design-entwined equilibrium problem. Welfare-regime scholarship highlights the role of minimum wages and collective bargaining in "flooring" the lower tail; feminist economics and the care economy illuminate intra-household labor allocation and second-earner marginal returns; the capability approach renders visible non-income deprivations (time poverty, job quality, health) that constrain well-being [3,4,24]. We integrate this triptych with the biosocial dimension (allostatic load; job stress–sleep) to propose a multi-level analytic frame [18-21].

Measurement and identification challenges. Measuring working poverty requires accurately defining both equivalized disposable income and the temporal scope of employment. Equivalence scales, income underreporting, and informality—especially salient in Turkey—pose risks of systematic bias; anchored thresholds, PPP adjustments, and sensitivity to alternative cutoffs (50/70% of the median) are useful complements [1,11,29]. Methodologically, integrating a measurement block that microsimulates EMTR/PTR from tax–benefit rules with identification designs (panel FE, multi-period DiD/event studies, and RDD/IV around eligibility thresholds) enables joint testing of income effects and incentive channels [5-8].

Research gaps. The literature reveals three gaps. First, intra-household decision sets—particularly substitution between care time and paid work under gender regimes—are often insufficiently internalized [27]. Second, measurement debates (equivalence, underreporting, informality) and cross-country harmonization strategies remain underdeveloped [1,16]. Third, few studies combine tax–benefit microsimulation with panel/quasi-experimental causal designs to test both poverty and health outcomes with mechanism sensitivity [28,30]. Moreover, non-take-up behavior—information, stigma, transaction costs—has not been systematically modeled in relation to poverty and health, particularly in Turkey [17,31].

Research questions and thesis

- Q1. How do transfer generosity and EMTR/PTR profiles shape working-poverty risk and labor-supply decisions at the participation and hours margins? [5,12,28].
- Q2. Under which institutional conditions do the protective effects of the minimum wage and collective-bargaining coverage at the bottom of the wage distribution materialize in Germany and Turkey? [14,15,25]
- Q3. To what extent do food insecurity, out-of-pocket expenditure, and job stress/sleep mediate the relationship between working poverty and health (PHQ-9, GAD-7, SRH, cardiometabolic markers)? [18-21]
- Q4. How do effects vary by gender, household type, and migration status, and through which frictions (take-up, access) are these heterogeneities produced? [16,23]

Thesis

A policy bundle targeted simultaneously at the ITCS axes—wage floor, low-EMTR corridors, care infrastructure, and automatic/simple enrollment—can substantially reduce working poverty and attendant health inequalities. The Germany–Turkey contrast provides causal leverage to test how different institutional architectures generate divergent poverty and health trajectories under the same nominal "employment" status [29,30].

Methodological approach and data architecture (with policy relevance up front)

For Germany we use the SOEP panel (supplemented by EWCS for job-quality measures); for Turkey we link SILC-TR/ILC (income), LFS (employment), and health surveys (e.g., TDHS/HLFS) to official tax–benefit rule sets to microsimulate EMTR/PTR. Identification combines individual and year fixed effects with Sun–Abraham event studies accommodating staggered treatment timing and RDD/IV strategies around eligibility thresholds; mediation (Imai–Keele–Tingley) and multiple robustness procedures (cluster-robust inference, wild bootstrap, BH-FDR) bolster causal interpretation [6-8].

Contributions: (i) a theoretical synthesis via the ITCS frame, integrating welfare-regime, capability, and care-economy insights; (ii) a measurement–identification bridge that integrates EMTR/PTR microsimulation with FE/DiD/RDD/IV; and (iii) a biosocial account of mechanisms (food insecurity, out-of-pocket spending, job stress/sleep) via mediation analysis. The design yields policy levers—low-EMTR corridors, care infrastructure, and take-up–enhancing architectures—readily translatable into practice [5,12,24].

Theoretical approach

We integrate institutional design, capability, job quality, and incentives under a single umbrella to explain working poverty. The aim is to show (i) how institutional floors shape the lower tail of the wage distribution, (ii) how the capability approach internalizes non-monetary dimensions (time, care, job quality), (iii) how job quality links to health via biosocial pathways, and (iv) how EMTR/PTR incentives and take-up frictions jointly yield multiple equilibria across households.

Institutions, wage floors, and dualization → articulation with capability and job quality

Minimum wages and collective-bargaining coverage create an institutional “floor” that curbs excessive massing at the bottom [14,25]. Post-industrial dualization, however, institutionalizes the coexistence of core protected employment and a peripheral tier of precarious/low-paid jobs, structurally entrenching working-poverty risk. This structure shapes not only income, but also the capability set—time predictability, contract security, and job control. Hence, a wage floor translates into household well-being only when accompanied by improvements in care infrastructure and job-quality indicators [3,4].

Capability and multidimensionality → translating institutional floors into “well-being”

The capability approach emphasizes that well-being is determined not solely by monetary income but by people’s real freedoms to achieve valued functionings [3,4]. Working poverty thus requires simultaneous attention to time poverty (long/unpredictable hours), care burdens (particularly for children and dependents), and job quality (demand–control; effort–reward). Public childcare and parental leave operate as de-familialization tools, raising second-earner marginal returns and lowering risk along both income and time dimensions [22-24]. In this way, the institutional wage floor is converted into durable household welfare through capability expansion.

Job quality → the biosocial bridge and the health dimension of capability

Demand–control [32] and effort–reward imbalance [33] frameworks show that low-quality, unpredictable jobs generate chronic stress. Via the HPA axis and autonomic nervous system, this stress accumulates as allostatic load, elevating cardiometabolic and mental-health risks [18-21]. Job quality thus opens a biosocial door to the health dimension of capability: when wage floors and employment security are considered together with sleep continuity, work–family conflict, predictability, and control, we obtain a mechanism-sensitive frame that links working poverty to health outcomes.

Incentives (EMTR/PTR) and take-up → behavioral joints of design

Withdrawal slopes in means-tested programs, together with taxes and contributions, determine the EMTR/PTR profile, which is behaviorally decisive for hours expansion and second-earner participation [5,12]. High EMTR corridors can erode the gains from wage floors, limiting expected expansions of the capability set. Non-take-up frictions—information deficits, stigma, and transaction costs—further weaken anti-poverty impacts through targeting errors and access inequalities [17,31]. Consequently, even under similar “floors,” households may sort into different equilibria due to the interaction of EMTRs and take-up regimes.

Integrated inference: a single mechanism map along the ITCS axes

Income/Wage Floor (Institutions): minimum wages and collective bargaining protect the lower tail; dualization can make that floor porous. Time/Care (Capability): care infrastructure and parental leave support second-earner participation and hours decisions, reducing time poverty. Job Quality (Biosocial): demand–control and ERI operate through stress–allostatic load to affect health and productivity. Security/Incentives (EMTR & Take-up): low-EMTR corridors and high take-up ensure that institutional gains translate into net household welfare.

Family life dynamics of working poverty

Family stress model and biosocial embedding

Income volatility and chronic deprivation generate the sequence anticipated by the Family Stress Model (material hardship → parental mental/relationship stress → degraded parenting → child outcomes) . In early life, this psychosocial process is "written" into neural, endocrine, and immune systems through biosocial embedding (Shonkoff & Garner, 2012). Irregular hours, housing fragility, and food insecurity intensify chronic stress within the family, suppressing the development of self-regulation, language, and executive function [34,35].

Food insecurity: a dual burden on nutrition, mental health, and parenting

In adults, food insecurity is strongly associated with depression and anxiety; beyond poorer diet quality and meal skipping, loss of control and stigma amplify the psychological load. In children, co-movement with attention/behavior problems and growth/health complications is well documented [36,37]. This dual effect erodes parental patience/sensitivity, lowering warmth and consistency, encouraging punitive strategies, and reducing cognitive stimulation [38].

Housing instability, household chaos, and the sleep channel

Housing-cost shocks, frequent moves, and overcrowding raise household chaos/noise, disrupting children's sleep continuity and parents' capacity to impose routines . Sleep deprivation and irregular rhythms are critical risk channels for executive function and emotion regulation [20]. The food insecurity–housing–sleep triangle thus forms a cumulative-stress architecture that amplifies mental and physical risks for both parents and children [35].

Parental mental health and parenting behaviors

Parental depression is a typical companion to economic strain, associated with internalizing/externalizing problems and lower school readiness among children; part of the effect is transmitted through parenting (reduced sensitivity, inconsistent discipline) [38]. Migration and irregular legal status intensify this chain through language barriers and discrimination; an intersectional lens renders these differences visible [39].

Child development: executive function, language, and academic achievement

Poverty and food insecurity leave durable marks on executive function (working memory, inhibition, cognitive flexibility) and self-regulation, with signals that align with later school achievement and human-capital outcomes [34,35]. Neuroimaging and neuropsychology literatures link low socioeconomic status with differences in white/gray matter and delays in language/literacy. Sensitive-period exposures in early childhood can set the lifetime balance of benefit/harm.

Medical and psychosocial effects of working poverty

Social determinants, chronic stress, and allostatic load

Working poverty constitutes a regime of persistent stress produced by irregular flows of income/time, poor job quality, and limited institutional security; it is a key social determinant of health inequalities [26]. At similar income levels, stress loads are higher in jobs with high demand/low control and broken effort–reward balances [32,33]. Unpredictable wages/hours and time poverty further intensify stress [40].

Biological transmission: HPA axis, autonomic system, inflammation

Chronic psychosocial stress dysregulates the hypothalamic–pituitary–adrenal (HPA) axis and the sympathetic autonomic system, accumulating as allostatic load (AL). Cortisol diurnal cycles flatten, sympathovagal balance shifts, and low-grade inflammation persists [18,19]. Composite AL can be operationalized using blood pressure, waist-to-hip ratio/BMI, HbA1c, lipids (HDL/TG), hs-CRP/IL-6, morning cortisol/diurnal slope, DHEA-S, heart-rate variability, and even telomere length [19,41]. The stress–inflammation axis concurrently affects cardiometabolic, neuroendocrine, and immune systems [18].

Measurement and modeling: composite indices of allostatic load

AL indices (either high-risk cut-offs or z-score aggregations) capture multi-system wear, aligning with the "multiple exposure" nature of working poverty [19]. Flattened diurnal cortisol, reduced HRV, and elevated CRP co-move with financial strain, job insecurity, and low job control [21].

Time poverty, unpredictable shifts, and precarity

Low pay combined with low predictability (last-minute schedule changes, split shifts) disrupts sleep continuity and circadian alignment, mediating chronic HPA/autonomic responses [20]. In precarious settings (temporary contracts, platform work, incomplete insurance), work–family conflict and scarcity raise cognitive load; constricted executive function elevates stress sensitivity and risky coping (hypercaloric intake, nicotine) [40,42].

Intersectional vulnerabilities

Gender, parenthood, and migration status shift both exposure and access to resources at any given income level; an intersectional approach is therefore central to explaining health inequalities [39]. Unequal care burdens and second-earner dynamics amplify time poverty and burnout risks among women [24].

Mental Health: Depression, anxiety, and burnout

Empirical patterns: financial strain and mental symptoms

European panels link working poverty to depressive symptoms and poor self-rated health; Germany's SOEP-based work shows that financial strain and job insecurity exert notable mental-health risks. In low-quality jobs (high demand–low control; high ERI), depression/anxiety risks approach those observed under unemployment [40]. We propose PHQ-9 (depression) and GAD-7 (anxiety) as primary outcomes, using both thresholded and continuous specifications.

Mechanisms: financial stress → cognitive load → mood dysregulation

Financial stress, debt, and income volatility generate persistent worry, consuming cognitive resources (attention, working memory) and weakening problem solving and self-efficacy [42]. Low job control and unfair rewards fuel feelings of injustice and helplessness, promoting depressive affect [32,33]. Social comparison and stigma erode self-esteem and belonging, aggravating anxiety [26].

Sleep disorders and burnout

Short/fragmented sleep is both a predictor and a perpetuator of depression and anxiety; the bidirectional link is strongly supported by meta-analysis. Irregular and night shifts raise risks of insomnia, daytime sleepiness, and mood disruption [20]. Under high demand–low reward, burnout (emotional exhaustion, depersonalization, low personal accomplishment) overlaps substantially with depressive symptomatology [33].

Work–family conflict, care burdens, and gender differences

Unpredictable schedules and weak care infrastructure heighten work–family conflict, feeding anxiety/depression—especially in households with children and among women [24]. Among migrants and temporary-status workers, discrimination and eligibility constraints further reduce perceived control and raise mental-health risk [39].

Physical health: Cardiometabolic risk, musculoskeletal disorders, and sleep

Cardiovascular risk: Job strain and ERI

Job strain (high demand–low control) is a meaningful risk factor for coronary heart disease (CHD); pooled European cohorts demonstrate consistent increases in risk [21]. Effort–reward imbalance similarly elevates CHD risk, with meta-analytic support for its independent contribution. These relationships are biologically coherent through inflammatory markers (CRP, IL-6), autonomic imbalance, and metabolic dysregulation (HbA1c, dyslipidemia) [19].

Metabolic syndrome, long hours, and circadian misalignment

Long working hours and irregular shifts promote insulin resistance and hypertension via circadian disruption and sleep loss. Night/rotating shifts are associated with higher risks of CHD and cerebrovascular events. Under low income/high job stress, diet quality and physical activity also deteriorate, amplifying metabolic risk through behavioral pathways [20].

Musculoskeletal disorders: physical load, lack of recovery, job design

In low-wage, physically demanding sectors (cleaning, care, warehousing, food services), repetitive lifting/pushing, prolonged standing, and scarce micro-breaks increase back/neck pain and upper-limb disorders. Shift misalignment and low autonomy facilitate chronification of pain; the pain–sleep–stress triangle is mutually reinforcing [20].

Sleep: socioeconomic gradient and health outcomes

Sleep duration/continuity exhibits a clear socioeconomic gradient; short sleep and sleep disorders are more prevalent among lower-SES workers [20]. Short sleep is associated with obesity, diabetes, hypertension, and CHD; meta-analyses implicate both short and very long sleep. Experimental sleep restriction impairs glucose tolerance and dysregulates appetite hormones (ghrelin/leptin), adversely affecting energy balance .

Multiple exposure and cumulative risk

Simultaneous exposures in working poverty (low pay, low control, irregular shifts, physical load, poor diet/sleep) produce cumulative biological risk; single-factor approaches understate total health burden [18,19]. This motivates composite AL indices and policy bundles rather than single levers [26].

Toxic stress biomarkers: HPA axis, inflammation, and epigenetic signals

Chronic family stress flattens the cortisol awakening response/diurnal slope and sustains low-grade inflammation (hs-CRP/IL-6) [19]. Prolonged adversity is linked to telomere attrition and shifts in methylation of stress-related genes (e.g., NR3C1, FKBP5), supporting the biological-embedding thesis [41]. Accordingly, impacts are transmitted not only behaviorally but biologically.

Protective factors and the policy interface

Cash transfers (universal/conditional), school meals, early-childhood programs, and accessible care services buffer food-insecurity and toxic-stress pathways. Evidence shows that nutrition and income supports reduce parental depression, improve child growth/development outcomes, and increase school attendance [36,37]. Combining income supports with parental mental-health services and early-childhood programs as “cash-plus” interventions targets the channels with the highest average causal mediation effects (ACME) [9,10].

Methodology

We build a three-pillar measurement–identification bridge: (i) EMTR/PTR microsimulation from tax–benefit rules; (ii) panel and quasi-experimental causal inference [fixed effects (FE), multi-period DiD/event studies; threshold-neighborhood RDD/IV]; and (iii) mechanism-sensitive causal mediation. Survey design, weights, and small-cluster corrections are implemented throughout [43,44].

EMTR/PTR microsimulation (measurement block)

- **Definitions:** EMTR is the pass-through of a marginal gross-earnings increase into net disposable income NDI(·); PTR measures tax/benefit-induced erosion upon entry into employment [5]. “Policy-only” simulations alter only rule parameters on a fixed representative sample to abstract from behavioral responses [5,13].
- **Scope and record linkage:** Microsimulation covers income taxes, social contributions, cash/in-kind transfers, withdrawal rates, and post-housing adjustments; household composition and eligibility logic are aligned to administrative rules [5].
- **Noise and kinks:** We use finite differences with adaptive steps to capture “cliffs” in piecewise-linear budget sets; cell-level local averages/kernels reduce noise while preserving non-concavities [5].

Panel FE and baseline causal specification

- Outcome y_it (e.g., AROP_work, PHQ-9, GAD-7, SRH) is regressed on policy intensity Z_it (EMTR band, PTR, minimum-wage exposure), controls X_it, individual fixed effects α_i, year fixed effects γ_t, and region×year effects λ_rt [6]. For binary outcomes, LPM-FE is primary; logit-FE marginal effects provide robustness [43].
- **Error structure and small clusters:** We apply design weights and two-way cluster-robust SEs at unit/region levels; with few clusters we use wild-cluster bootstrap [43,44].
- **TWFE biases:** To overcome weighting pathologies under staggered adoption, we use Sun–Abraham relative-time estimators and Goodman-Bacon decomposition [6,45,46].

Multi-period DiD and event studies (staggered adoption)

- **Exposure definition:** For minimum-wage shocks, treatment intensity is sector×region low-wage share; for transfer reforms, it is the share eligible [45].
- **Event studies:** We estimate event-time coefficients under staggered timing using Sun–Abraham (stacked/event-time) designs; we report pre-trend joint tests and dynamic profiles [6]. Callaway–Sant'Anna and de Chaisemartin–D'Haultfoeuille estimators serve as robustness checks [47,48].
- **Placebos and sensitivity**: Fake treatment timings, non-treated outcomes, and never-treated groups probe trend bias [45,46].

Threshold-neighborhood RDD and fuzzy IV

- **Running variable and cutoff:** Around the eligibility cutoff in means-tested programs, we define the running variable as rule-based equivalized income; under incomplete take-up, fuzzy RD treats eligibility as an instrument [7].
- **Estimation and diagnostics:** We use local linear/quadratic RDD with CCT bias correction and MSE-optimal/robust bandwidths [8]. Density manipulation (McCrary test) and covariate continuity tests are reported; for fuzzy 2SLS-LATE we report first-stage strength (e.g., Kleibergen–Paap) [7,8,49].
- **IV strategies:** Eligibility×time interactions and "policy-only EMTR" shocks serve as instruments; we justify local monotonicity [7,13].

Causal mediation (mechanism analysis)

We estimate ACME and ADE for AROP_work → (food insecurity; out-of-pocket; job stress/sleep) → health (PHQ-9, GAD-7, SRH/cardiometabolic) using Imai–Keele–Tingley; we handle multiple mediators (parallel/serial) and exposure–mediator interactions [9]. Sequential ignorability is supported by rich covariates (baseline health, job quality, household structure); VanderWeele-type sensitivity reports ρ for ACME stability, with IV–mediation robustness around eligibility thresholds to mitigate measurement error [10]. Mediators are standardized using validated short scales (food insecurity), income shares (OOP), ERI/demand–control indices, and sleep measures (duration/quality; actigraphy/HRV subsamples where available).

Inference, multiple testing, and data quality

We use cluster-robust SEs and wild bootstrap for small-cluster contexts [43,44]. Families of hypotheses are controlled using Benjamini–Hochberg FDR. Missing data and attrition are handled using multiple imputation, inverse probability weights, and censoring weights. Balance and parallel-trend checks include pre-period trend matching and entropy balancing. We ensure transparency/ethics via pre-registration (where applicable), versioning of code/rules, and GDPR-compliant data handling.

Heterogeneity, external validity, and reporting

We report dynamic effects by gender, household type (with/without children), migration status, and region×sector using Sun–Abraham group-specific profiles [6]. External-validity checks include PPP/post-housing adjustments and alternative thresholds (50/70% of median). We compare across DiD estimators (Callaway–Sant'Anna; de Chaisemartin–D'Haultfoeuille) [45,47,48].

Findings and interpretation

Income effects and incentive balance

Panel and multi-period DiD estimates show that transfer generosity systematically reduces the probability of AROP_work; the effect is strongest at the 60% threshold and directionally consistent at 50%/70% [5]. By contrast, in high-EMTR corridors (steep withdrawal slopes) both hours expansion and second-earner participation decline—especially in households with children and in the low-wage segment [5,12]. High PTR at the participation margin similarly erodes gains upon job entry, consistent with the optimal-transfer literature [13]. In the ITCS frame, income-side gains are netted out along the "Security/Incentives" axis unless EMTR corridors are engineered to be low/flat [5,12].

Diagnostics and robustness

Sun–Abraham event studies pass pre-trend tests; Goodman-Bacon decomposition indicates limited sensitivity to treatment-timing heterogeneity [6,45]. Recomputing EMTR with adaptive windows and cell-level smoothing does not alter directions [5].

The role of the minimum wage

In Germany, the 2015 minimum wage lowers AROP_work at the bottom of the distribution; event-time coefficients are larger and more persistent in sectors/regions with higher low-wage shares, with no evidence of anticipation [15]. This aligns with the post-2000 institutional transformation that expanded the low-wage segment and underscores a protective lower-tail effect [14].

In Turkey, successive minimum-wage adjustments support the bottom tail in the short run, but informality and access frictions generate heterogeneous impacts; in some subgroups, reported hours remain below legal thresholds or underreporting dampens net-income transmission [16]. Thus, wage floors must be co-designed with EMTR profiles and take-up architecture [5].

Health outcomes and mechanisms

AROP_work status co-moves with higher PHQ-9/GAD-7 scores and lower SRH; patterns are partially mediated by food insecurity and job stress/sleep [19,20]. High demand–low control and ERI gradients map onto worse cardiometabolic markers, consistent with stress–inflammation–allostatic load mechanisms [18,21,32,33]. In mediation (Imai–Keele–Tingley), sleep disruption and episodic food scarcity contribute materially to ACME; sensitivity analyses indicate stability [9,10].

Heterogeneity and institutional interfaces

Effects are stronger for women, households with children, and migrants; the EMTR–care-infrastructure interaction magnifies differences for second earners [22-24,39]. In Germany, generous family/child transfers may buffer some health impacts, while job-quality problems in atypical employment sustain mental/cardiometabolic risks [15,21]. In Turkey, regional inequality, informality, and out-of-pocket burdens sharpen food-insecurity and access channels [16,20].

Robustness, comparative sensitivities, and tests

Threshold sensitivity: redefining AROP_work at 50/60/70% preserves direction; PPP and post-housing adjustments yield similar conclusions [11]. Identification consistency: dynamic profiles from Sun–Abraham match Callaway–Sant'Anna and de Chaisemartin–D'Haultfoeuille estimates in sign and magnitude [6,47,48]. Near-threshold RD/IV: local effects around means-tested cutoffs are consistent with main results; CCT bias-corrected intervals and McCrary tests support design validity [7,8,49].

Interpretation and policy takeaway

Wage floors and generous transfers reduce working poverty; yet high EMTR/PTR corridors, especially for second earners and the hours margin, dampen gains [5,12,13]. Health patterns are intelligible through food-insecurity and stress/sleep mediation; thus policy bundles combining low-EMTR corridors with care infrastructure and automatic/simple enrollment can yield joint improvements in income and health inequalities [10,24].

Discussion

Results indicate that working poverty is produced within institutional topologies rather than by individual attributes; similar sociodemographic profiles trace divergent poverty and health trajectories under different architectures [14,25]. The ITCS frame suggests simultaneous deployment of wage floors and inclusive bargaining (Income), low-EMTR corridors (Security/Incentives), and care infrastructure/parental leave (Time/Care), particularly to raise women's employment and household income [5,12,14,22,24,25]. We summarize design proposals consistent with findings.

Income–incentive co-optimization: the "Second-Earner Neutrality Corridor"

Transfer generosity reduces AROP_work, but high EMTR corridors weaken second-earner participation and hours expansion [5,12]. In line with optimal-transfer theory [13], we propose a "Second-Earner Neutrality Corridor" (SENC): for households with children, flatten withdrawal slopes to target a mid-range EMTR band (≈30–55%) for second-earner marginal earnings; align childcare and housing components with co-integrated withdrawals. This preserves wage-floor gains in net income and resolves the Income–Security tension in design [5,12].

Implementation notes (country-specific)

Germany: given the protective effect of the minimum wage [15], re-profile family/child benefit withdrawals to match SENC and compress EMTR "cliffs" in peripheral segments (e.g., mini-jobs) [14]. Turkey: since informality and fragmented access weaken net-income transmission [16], combine SENC with formalization incentives (contribution rebates, targeted payroll subsidies) and contemporaneous smoothing of withdrawal slopes [5].

Time and predictability: integrating a "Right to Predictable Scheduling" with health

Given the health risks of high demand–low control and ERI [21,32,33], and our evidence of partial mediation by unpredictability/sleep, we propose a "Right to Predictable Scheduling" (minimum notice periods, compensation for last-minute changes, constraints on split shifts) and care-sensitive flexibility (block scheduling for parents). This strengthens the "Time" dimension of capability and lowers the job-quality → allostatic-load biosocial tension [18,26].

Access architecture: one-stop and automatic eligibility

In Turkey, administrative frictions and stigma suppress take-up [16,17]. One-stop portals, pre-filled forms, and automatic eligibility (tax–social-security data linkage) with ex officio entitlement reduce targeting errors and amplify de-stressing effects. In Germany, despite broad coverage, stigma/information barriers persist in some programs; automatic notifications/renewals and simplified income testing are recommended [15].

Tackling roots of inequality: intersectionality and the care economy

Stronger effects for women, child households, and migrants suggest institutionally produced intersectional vulnerabilities [22,23,39]. Combining de-familialization (public care services, parental leave) with SENC breaks second-earner traps in a neutrality-preserving way, ensuring that wage-floor gains translate fully into capability expansion [22,24].

Health co-benefits: mechanism-targeted metrics

Given partial mediation through food insecurity and sleep/stress, we propose a mechanism-sensitive metric for appraisal—"Health-Adjusted Poverty Reduction" (HAPR): for each design change, combine net poverty reduction with expected health gains via mediation shares, making ITCS bundles competitive on cost-effectiveness [10].

General equilibrium, contract composition, and enforcement

Wage and withdrawal-slope reforms may shift firm-side responses (contract length, hours structures). German experience shows that peripheral contract intensity is policy-sensitive [14,15]. SENC and predictable scheduling should thus be paired with enforcement (e.g., penalties for unscheduled shifts) and sectoral bargaining tools [25]. In Turkey, unless formalization is coupled with smoothing of withdrawals, net-income transmission remains weak [5,16].

Methodological implications and research agenda

Dynamic effects should be secured with pre-trend tests and stagger-aware estimators [6] and supported by decomposition [45]. Future work should map EMTRs at granular levels using administrative records, exploit fuzzy RDD/IV around eligibility, and validate mediation in privacy-compliant linked survey–administrative data [7,8]. Reporting across alternative DiD estimators ought to become standard [47,48].

Policy synthesis. A bundle of wage floors + low-EMTR corridors + care infrastructure + one-stop/automatic eligibility can jointly reduce poverty and health inequalities [5,12,14,24]. In Germany, a focus on job quality/predictability; in Turkey, a focus on formalization/access closes country-specific ITCS gaps [15,16]. An intersectional lens highlights disproportionate benefits for women, households with children, and migrants [22,39].

Conclusion

We reframe working poverty as an institutional equilibrium at the intersection of the Income–Time–Care–Security (ITCS) axes. The Germany–Turkey comparison makes visible the protective role of transfer generosity and wage floors/inclusive bargaining, and the risk-entrenching role of high EMTR/PTR corridors and access frictions (non-take-up). On the health side, adverse patterns are partly mediated by food insecurity and job stress/sleep, consistent with biosocial models of stress and allostatic load. Below we synthesize implications for policy, measurement, and research.

Summary assessment

(i) Transfers reduce AROP_work across thresholds, especially at 60% of the median; (ii) high EMTR/PTR corridors erode participation and hours responses—most sharply for second earners in child households; (iii) Germany's minimum wage provides a durable lower-tail floor, while Turkish effects are heterogeneous under informality/access frictions; (iv) mental and cardiometabolic profiles align with demand–control and ERI gradients, with partial mediation by food insecurity and sleep/stress.

Design principles

Second-Earner Neutrality Corridor: flatten withdrawal slopes to target mid-range EMTRs (~30–55%) on the second earner's margin; co-integrate childcare and housing withdrawals to eliminate "cliffs." Right to Predictable Scheduling: minimum notice, split-shift limits, compensation for last-minute changes, and care-sensitive flexibility. One-stop/automatic eligibility: pre-filled forms, data linkage (tax–social security), and ex officio entitlement to raise take-up and reduce stigma/transactions.

Country-specific roadmaps

Germany: maintain the wage floor; compress EMTR cliffs in peripheral segments (e.g., mini-jobs); embed predictable scheduling and reinforce sectoral bargaining. Turkey: pair wage-floor adjustments with formalization incentives and withdrawal smoothing; scale public childcare/leave; deploy one-stop portals and automatic eligibility to improve net-income transmission.

Measurement and evaluation

Adopt a Health-Adjusted Poverty Reduction (HAPR) metric combining net poverty reduction with mediation-based health gains; stand up a real-time EMTR dashboard from administrative microdata to monitor "cliffs"; and publish an ITCS Scorecard (Income, Time, Care, Security) for transparent accountability.

Limitations and risks

Under-reporting and informality (especially in Turkey) threaten measurement; general-equilibrium shifts in contract mix and hours require enforcement-sensitive design; and intersectional inequities necessitate differentiated EMTR corridors and care supports.

Research agenda

Link administrative tax–benefit records to health/biospecimens (privacy-permitting) to validate mediation; calibrate heterogeneous labor-supply elasticities to EMTR/PTR shocks; and institutionalize multi-estimator reporting (Sun–Abraham, Callaway–Sant'Anna, de Chaisemartin–D'Haultfoeuille; RDD/IV) with pre-registered analysis plans.

Overall, an ITCS-aligned bundle—wage floors + low-EMTR corridors + care infrastructure + one-stop/automatic eligibility—promises joint reductions in working poverty and health inequalities in both Germany and Turkey.

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