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Leisure, aspirations, and multiple job holding[☆]

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ABSTRACT

Workers value leisure, but they are often forced to hold multiple jobs to raise income. This paper develops a prospect-theory model in which individuals jointly choose leisure and allocate time between a safe job (e.g., low-skill service) and a risky occupation (e.g., self-employment). Outcomes are evaluated relative to an income reference point, with losses weighted more heavily than comparable gains. The model yields a nonmonotonic relationship between income aspirations and leisure: as aspirations rise, leisure first declines and then increases once aspirations are sufficiently high. At high aspiration levels, a higher safe wage (e.g., minimum-wage increase) shifts time toward safe employment and away from both leisure and risky activity. At low aspiration levels, the effect on work–leisure allocation is ambiguous. From a policy perspective, income-protection measures alter employment choices across aspiration levels, particularly when workers cannot self-insure through safe employment.

1. Introduction

Workers often hold multiple jobs to meet income aspirations and manage unstable earnings. The literature has modeled multiple job holding as a portfolio choice across jobs with different risk profiles, treating leisure as exogenous. However, leisure is intrinsically valued and must be traded off against income and risk. Ignoring leisure therefore yields an incomplete account of labor decisions when income risk and aspirations are central.

We apply prospect theory to time allocation by assuming that individuals evaluate outcomes relative to a reference income, with losses weighted more heavily than equivalent gains (loss aversion). We interpret this reference income as the worker's income aspiration. Labor-supply decisions therefore depend not only on wages and preferences over leisure and income, but also on aspirations and loss aversion.

We develop a tractable labor–leisure model under prospect theory in which workers allocate time among leisure, a safe job, and a risky job. The safe job pays a certain wage, while the risky job pays an uncertain wage across two states of nature, good and bad. The risky activity is interpreted broadly to include entrepreneurial or project-based work with both upside and downside risk relative to the safe job.

Income aspirations enter as a reference point, and loss aversion governs how gains and losses are evaluated relative to this benchmark. Unlike portfolio models that abstract from leisure, the framework allows workers to jointly choose time allocated to safe work, risky work, and leisure. This inclusion introduces the standard work–leisure trade-off central to labor-supply analysis and relevant for policy, including wage taxation and income support. The core problem is thus a time-allocation decision across leisure, certain income, and risky but higher expected income, shaped by the reference income.

We derive closed-form solutions across four behavioral regimes defined by the level of reference income. At very low and very high reference levels, the solution is a corner outcome in which the safe job is abandoned and time is allocated between leisure and risky work. At intermediate levels, the solution is interior, with positive time in all activities. When reference income exceeds the maximum attainable safe-job income, the bad state is perceived as a loss, and loss aversion shifts time away from the safe job toward the risky job, with leisure potentially increasing.

These results clarify how income aspirations and loss aversion shape time allocation across safe work, risky work, and leisure. They also imply that wage floors and income-protection policies have heterogeneous

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effects depending on whether workers can meet aspirations through safe employment alone.

Despite a growing literature on labor–leisure choice under reference-dependent preferences, no tractable framework captures how loss aversion and the level of income aspiration jointly shape the simultaneous choice of leisure, safe work, and risky work. Hlouskova et al. (2017) analyzed time allocation between safe and risky jobs in a portfolio setting but exclude leisure. We address this gap by deriving closed-form solutions for optimal time shares across all three activities and tracing their responses to wages, reference-income shifts, and loss aversion.

Empirical evidence shows that income risk, aspirations, and psychological factors are key drivers of multiple job holding. A nontrivial share of workers in the United States and Europe hold more than one job, often in response to unstable earnings or unmet income targets (Shishko and Rostker, 1976; Campion et al., 2020; Conen, 2020; Lalé, 2025; Klinger and Weber, 2020; Pouliakas and Conen, 2023). Workers in volatile occupations (e.g., artists, entrepreneurs, and independent consultants) commonly combine risky activities with stable jobs to diversify income risk (Guariglia and Kim, 2004; Throsby and Zednik, 2011; Menger, 2017). Others take secondary jobs to reach income goals, support career transitions, or pursue intrinsically rewarding activities (Averett, 2001; Renna and Oaxaca, 2006; Arora, 2013; Wrzesniewski et al., 2013).

In this paper, reference income is treated as an exogenous aspiration parameter within the decision period. It may reflect adaptive or rational expectations, stated income goals, or social benchmarks. Reference points need not be imposed ex ante and can be inferred from observed behavior, providing testable foundations for reference-dependent preferences (Werner and Zank, 2019). Experimental and empirical evidence shows that income expectations directly influence labor effort under such preferences (Koszegi and Rabin, 2006; Abeler et al., 2011). Camerer et al. (1997) and Farber (2005, 2015) showed that New York City cab drivers adjust hours in response to daily income targets, consistent with loss aversion around reference income levels. Crawford and Meng (2011) provided further evidence that both income and hours targets shape labor supply. Although this literature focuses on single occupations, it underscores the central role of reference income and loss aversion in work decisions.

We bridge these strands by embedding reference-dependent preferences in a setting with multiple jobs and endogenous leisure. This framework characterizes how income aspirations jointly shape risk-taking, job diversification, and leisure, and identifies behavioral regimes that cannot arise with exogenous leisure or a single employment margin.

The remainder of the paper is organized as follows. Section 2 introduces the model, and Section 3 characterizes optimal time allocation across leisure, a safe job, and a risky job under prospect theory. Section 4 presents comparative statics with respect to wages, reference income, and loss aversion, highlighting implications for time allocation and public policy. Section 5 discusses implications for multiple job holding, taxation, and minimum-wage policies, and concludes.

2. Model

The worker's preferences are described by the following utility function, which depends on leisure, E, and income, Y. Uncertain income enters through a prospect-theory value component defined over income relative to an exogenously given reference level, $\hat{Y}$, interpreted as the worker's income aspiration[3]

$$U(E,Y) = \frac{E^{1-\gamma}}{1-\gamma} + V(Y-\hat{Y}) \tag{1}$$

The prospect-theory value component, $V(\cdot)$, is given by

$$V(Y-\hat{Y}) = \begin{cases} \frac{(Y-\hat{Y})^{1-\gamma}}{1-\gamma}, & Y \geq \hat{Y} \\ -\lambda \frac{(\hat{Y}-Y)^{1-\gamma}}{1-\gamma}, & Y < \hat{Y} \end{cases}$$

for $\lambda > 1$, where λ is the loss-aversion parameter. The condition, $\lambda > 1$, implies that losses relative to the reference income receive greater weight than gains of the same magnitude.[4] Consistent with prospect theory, the value function is concave in gains and convex in losses and evaluates final income as gains or losses relative to the reference level, $\hat{Y}$.

Given these preferences, we describe the worker's time-allocation environment and the constraints determining income. The model assumes that a worker allocates a fixed time endowment, $T > 0$, across a safe job, $L \geq 0$, a risky job, $J \geq 0$, and leisure, $E \geq 0$, such that $L + J + E = T$.[5]

The safe job pays a wage rate w_s while the risky job pays an uncertain wage, w. In two states of nature, the risk job pays $w_g > w_s$ in the good state of nature with probability p and in the bad state of nature $w_b > 0$ with probability $1-p$. The lower wage, w_b, captures the downside payoff of the risky activity, reflecting poor project outcomes rather than institutional wage-setting. Examples include artistic work, entrepreneurship, independent consulting, and taxi driving, where earnings are project-based and depend on demand conditions. By contrast, the safe-job wage, w_s, reflects institutional wage-setting, including minimum-wage policies, as in retail or food-service employment. Hence, $0 < w_b < w_s < w_g$. We assume that the expected wage of the risky job exceeds the safe wage, $\mathbb{E}(w) = pw_g + (1-p)w_b > w_s$, ensuring participation in the risky job.[6] Income from the two jobs is given by $Y = w_s L + wJ$, $w \in \{w_b, w_g\}$. Thus, net income relative to the reference level, $Y - \hat{Y}$, is uncertain and equals

$$Y - \hat{Y} = w_s L + wJ - \hat{Y} = (w - w_s)J + w_s(T-E) - \hat{Y}.$$

The worker earns $w_s(T-E)$ with certainty by allocating $(T-E)$ units of time to the safe job, but can obtain higher income through the risky job if the good state occurs.[7] The worker chooses time allocated to the risky job, J, and leisure, E, by solving

$$\begin{array}{ll} \text{Max}_{(E,J)} & \mathbb{E}(U(E,Y)) = \text{Max}_{(E,J)} \left[\frac{E^{1-\gamma}}{1-\gamma} + \mathbb{E}(V(Y-\hat{Y}))\right] \\ \text{such that} & Y - \hat{Y} = (w-w_s)J + w_s(T-E) - \hat{Y} \\ & E,\ J \geq 0, \quad J + E \leq T \end{array} \tag{2}$$

The next section characterizes the optimal time allocation implied by this problem.

3. Optimal time allocation

This section characterizes optimal time allocation across leisure, the safe job, and the risky job over all reference-income regimes. The

[3] We assume that leisure enters the utility function separately and that leisure, like relative income, exhibits constant diminishing sensitivity measured by γ. In prospect theory, the curvature parameter in the value function typically satisfies $0 \leq \gamma < 1$, capturing diminishing sensitivity to gains and losses relative to a reference point (Tversky and Kahneman, 1992). This restriction is imposed for tractability and to obtain closed-form solutions. Although such preferences are commonly used in economic models (see Bodie et al. 1992, among others), relaxing this assumption may be important for empirical applications and is left for future research.

[4] In empirical applications, Tversky and Kahneman (1992) reported the classic estimate, $\lambda = 2.25$, while meta-analyses by Brown et al. (2024) and Walasek et al. (2024) reported mean estimates of 1.96 and 1.31, respectively.

[5] T is the time available to allocate between work and leisure: the net of biologically necessary activities.

[6] Equivalently, this requires $p > \frac{w_s - w_b}{w_g - w_b} \equiv p_L$.

[7] As stated, the reference income, $\hat{Y}$, is taken as exogenous within the period and reflects pre-existing income aspirations rather than a choice variable. We assume that $0 \leq \hat{Y} \leq w_g T$; hence, the reference level does not exceed the income attainable if all time is allocated to the risky job at the highest wage, w_g.

Table 1
Summary of optimal time-allocation regimes.

Reference-income regime	Proposition	Solution	Optimal allocation pattern
Very low income aspirations $0 < \hat{Y} \leq \max\{0, w_L T\}$	1	Corner	Time allocated only between risky job and leisure; safe job abandoned
Low income aspirations $\max\{0, w_L T\} < \hat{Y} < w_s T$	2	Interior	Positive time allocated to leisure, safe job, and risky job
High income aspirations $w_s T < \hat{Y} < w_U T$	3	Interior	Positive time allocated to leisure, safe job, and risky job, with losses arising in the bad state
Very high income aspirations $w_U T \leq \hat{Y} < w_g T$	4	Corner	Time allocated only between risky job and leisure; safe job abandoned

solution space partitions into four regimes: very low ($0 < \hat{Y} \leq w_L T$), low ($w_L T < \hat{Y} < w_s T$), high ($w_s T < \hat{Y} < w_U T$), and very high ($w_U T \leq \hat{Y} < w_g T$), each associated with a distinct allocation pattern. The cutoff values, w_L and w_U, defined below, separate adjacent regimes. When reference income is low, realized income exceeds the reference level in both states, so loss aversion does not bind through realized losses. When reference income is high (i.e., $\hat{Y} > w_s T$) the good state yields gains, and the bad state yields losses, making loss aversion behaviorally relevant.

We assume throughout that the worker is sufficiently loss averse, in the sense that $\lambda > 1$. The solutions further impose regime-specific lower bounds on λ, so that the relevant parameter satisfies $\lambda > \max\{1, \text{regime-specific cutoff}\}$. Empirical estimates of λ typically exceed one, supporting the relevance of loss aversion, although they do not validate the model-specific thresholds derived here (e.g., Tversky and Kahneman, 1992; Brown et al., 2024; Walasek et al., 2024).[8]

Depending on the reference level, the model yields either interior solutions, with positive time allocated to all activities, or corner solutions in which the safe job is abandoned.[9]

Table 1 summarizes the four regimes, corresponding propositions, and associated allocation patterns. Each regime is described in the following propositions, ordered from very low to very high income aspirations.

3.1. Lower reference income ($0 < \hat{Y} < w_s T$): No losses in any state of nature

This subsection analyzes optimal time allocation when reference income is sufficiently low, $\hat{Y} < w_s T$; hence, realized income exceeds the reference level in both states.

3.1.1. Very low income aspirations ($0 < \hat{Y} \leq \max\{0, w_L T\}$): Abandonment of safe job

The lowest-aspiration region is defined by a cutoff wage, $w_L < w_s$.[10] In this regime, a sufficiently loss-averse worker abandons the safe job, allocating time only between the risky job and leisure.[11] The safe job therefore no longer provides meaningful protection against falling below the reference level.[12] Proposition 1 characterizes the optimal allocation.

Proposition 1. *When $0 < \hat{Y} \leq w_L T$, and the worker is sufficiently loss averse*[13] *with a sufficiently high probability of the good state, problem (2) admits a unique corner solution with $L^* = 0$. Time is allocated between leisure and the risky job, and the optimum satisfies equality between the expected marginal utility of risky earnings (evaluated relative to the reference income) and the marginal utility of leisure, as shown in Eq. (B.12) of Appendix B.*

Proof. The result follows directly from Supplementary Material A, specifically (S2-P1) and (S5-P2), which also provide bounds for E^* and J^*. J^* solves (B.12). A more detailed formulation is given in Proposition B1 in Appendix B. ■

In this regime, income in both states exceeds the reference level, so time is allocated between leisure and the risky job. This outcome corresponds to workers with modest aspirations and a high probability of favorable outcomes in the risky activity, such as entrepreneurs, self-employed consultants, or taxi drivers facing strong demand. Safe employment is therefore optimally forgone, with time shifted toward risky work while preserving leisure.

3.1.2. Low income aspirations ($\max\{0, w_L T\} < \hat{Y} < w_s T$): Diversification across all activities

In the next regime, $\max\{0, w_L T\} < \hat{Y} < w_s T$, realized income again exceeds the reference level in both states; hence, losses do not arise. Unlike the previous case, however, the worker does not abandon the safe job. A sufficiently loss-averse worker allocates time across leisure, the safe job, and the risky job.

Proposition 2. *Let $\max\{0, w_L T\} < \hat{Y} < w_s T$ and $\lambda > \max\left\{1, \frac{1}{K_\gamma}, \left(\frac{w_s}{k_2}\right)^\gamma\right\}$, where K_γ, k_2, and w_L are defined in (B.1), (B.4), and (B.5) in Appendix B. Then problem (2) admits a unique interior solution with closed-form solutions (E^*, J^*) given by*

$$E^* = \frac{1}{k(1 + K_\gamma^{1/\gamma}) + w_s}(w_s T - \hat{Y}) > 0, \tag{3}$$

$$J^* = \frac{(1 - K^{1/\gamma})}{w_s - w_b} k E^* > 0, \tag{4}$$

$$L^* = T - J^* - E^* > 0, \tag{5}$$

where K and k are defined in (B.2) and (B.3) in Appendix B.

Proof. The result follows directly from Supplementary Material A, specifically (S1-P1), (S3-P2), and (S5-P2). (E^*, J^*) solves problem (P1). ■

For $\max\{0, w_L T\} < \hat{Y} < w_s T$, the worker allocates time to all three activities. In both states, realized income exceeds the reference level, so expected utility remains positive. Unlike the very low regime,

[8] When λ falls below these bounds, the corresponding choice structure no longer applies. The analysis therefore focuses on parameter values for which well-defined optimal allocations across leisure and the two jobs exist, excluding the region $1 < \lambda <$ regime-specific cutoff.

[9] Zero leisure arises only in knife-edge or limiting cases. Specifically, leisure equals zero when $\hat{Y} = w_s T$, with all time allocated to the safe job, or when $\hat{Y} = w_g T$, with all time allocated to the risky job. These cases are summarized in Supplementary Material A and Fig. 1. Leisure also vanishes asymptotically as $\lambda \to \infty$. For all interior reference-income levels and finite loss aversion, optimal leisure is strictly positive, so zero-leisure outcomes are not emphasized.

[10] See Appendix B Eq. (B.5) for the expression of w_L. The cutoff depends on wage differentials, probability of the good state, and preference curvature. We assume the probability of the good state is sufficiently high so that $w_L > 0$; otherwise, this regime does not arise.

[11] The risky job is the worker's primary job. Throughout, the job receiving more time is referred to as the primary job and the other as the secondary job.

[12] When $\hat{Y} = 0$, the model collapses to the standard von Neumann–Morgenstern expected-utility case.

[13] As stated, a sufficiently loss-averse worker has λ exceeding the regime-specific threshold. The conditions are $\lambda > \max\left\{1, \left(\frac{w_s}{k_2}\right)^\gamma\right\}$ and $p > p_U$, where k_2 and p_U are defined in (B.4) and (B.11) in Appendix B.

the safe job now provides sufficient marginal value to be combined with the risky job, generating diversification rather than specialization. Leisure is maintained while balancing the certain return from the safe job against the higher but uncertain payoff of the risky job. A key feature of the interior solution is that risky-job time is proportional to leisure, and vice versa, implying a tight linkage between the two. Time allocations are proportional to the surplus, $w_sT - \hat{Y} > 0$, the gap between maximum safe-job income, and the reference income. A larger surplus increases leisure and risky-job time while reducing safe-job time. As aspirations rise within this regime, the surplus shrinks, reducing leisure and risky work and shifting time toward the safe job.[14] Depending on the probability of the good state, the risky job may receive more or less time than leisure.[15]

This regime describes workers who combine safe and risky activities, such as retail or service workers engaged in freelance or self-employed work. The primary income source depends on aspirations, wage rates, and the probability of the good state.

3.2. Higher reference income ($w_sT < \hat{Y} < w_gT$): losses in the bad state

We now consider reference income levels exceeding what can be earned with certainty in the safe job. In this regime, income realizations generate gains in the good state and losses in the bad state, making loss aversion behaviorally relevant. Depending on the reference level and the degree of loss aversion, the optimal allocation is either interior or involves abandonment of the safe job.

3.2.1. High income aspirations ($w_sT < \hat{Y} < w_UT$): Diversification across all activities

We next consider the regime, $w_sT < \hat{Y} < w_UT$, where w_U is a cutoff wage separating high from very high income aspirations, defined in (B.6) in Appendix B.[16,17] As in the previous interior regime, $\max\{0, w_LT\} < \hat{Y} < w_sT$, a sufficiently loss-averse worker allocates time across leisure, the safe job, and the risky job. The key difference is that losses in the bad state are now unavoidable. This is formalized in the following proposition.

Proposition 3. *Let $w_sT < \hat{Y} < w_UT$ and $\lambda > \max\left\{1, \lambda_T, \left[\frac{(w_g-w_s)\hat{Y}}{(w_gT-\hat{Y})k_2}\right]^\gamma\right\}$, where k_2, w_U and λ_T are given by (B.4), (B.6) and (B.8). Thus, problem (2) obtains its maximum at (E^*, J^*) where*

$$E^* = \frac{1}{k\left[\left(\lambda K_\gamma\right)^{1/\gamma} - 1\right] - w_s}(\hat{Y} - w_sT) > 0 \tag{6}$$

$$J^* = \frac{1 + (\lambda K)^{1/\gamma}}{w_s - w_b}\, k\, E^* > 0 \tag{7}$$

$$L^* = T - J^* - E^* > 0 \tag{8}$$

with K_γ, K, and k defined by (B.1), (B.2), and (B.3), respectively.

Proof. The proposition follows directly from the Supplementary Material A, (S4-P1) and (S1-P2). ■

Note that $0 < E^*, J^*, L^* < T$. Unlike the previous regime, the reference level now exceeds the maximum income attainable from the safe job. As a result, the worker cannot avoid a shortfall in the bad state, so that $Y_b^* < \hat{Y} < Y_g^*$. Loss aversion is therefore behaviorally relevant and shapes time allocation across leisure, the risky job, and the safe job. As in the low-aspiration regime, risky-job time is proportional to leisure, and vice versa, but the proportionality now depends on loss aversion. Time allocations are proportional to the shortfall, $\hat{Y} - w_sT$, the gap between reference income, and maximum safe-job income. As this shortfall increases, for example with higher aspirations, time shifts away from the safe job toward the risky job, with leisure also increasing. However, the safe job is not abandoned, as it provides a source of certain income alongside the risky activity's upside potential. In this regime, risky-job time exceeds leisure (i.e., $J^* > E^*$).[18]

This outcome corresponds to workers facing substantial income pressure relative to aspirations, who reduce safe-job time and increase reliance on risky activities to close the income shortfall.

3.2.2. Very high income aspirations ($w_UT \le \hat{Y} < w_gT$): Abandonment of the safe job

At the highest reference-income levels, the worker allocates time between the risky job and leisure, abandoning the safe job (as in Proposition 1). The risky job becomes the sole income source and thus the primary job. High aspirations create unavoidable losses in the bad state, and loss aversion governs the response to this exposure. The following proposition characterizes this case:

Proposition 4. *When $w_UT \le \hat{Y} < w_gT$, and the worker is sufficiently loss averse,[19] problem (2) admits a unique corner solution with $L^* = 0$. Time is allocated between leisure and the risky job, and the optimum satisfies equality between the expected marginal utility of risky earnings (evaluated relative to the reference income and weighted by loss aversion in the bad state) and the marginal utility of leisure, as shown in Eq. (B.14) in Appendix B.*

Proof. The result follows directly from Supplementary Material A, (S4-P1) and (S2-P2), which also provide bounds for E^* and J^*. A more detailed formulation is given in Proposition B2 in Appendix B. ■

Note that $0 < E^*, J^* < T$. Corner solutions in both low- and high-reference regimes do not arise from reference income alone. At low reference levels, risky specialization requires a sufficiently high probability of success, whereas at high reference levels it requires sufficiently strong loss aversion. Safe employment is abandoned at low reference income because losses do not occur, while at high reference income it is abandoned because losses are unavoidable. In the latter case, workers reallocate time away from safe employment, which cannot meet the reference income even with certainty, toward risky activities that offer upside potential to offset income shortfalls.

4. Comparative statics

This section examines how optimal time allocations respond to changes in reference income, wages, and loss aversion across regimes. The comparative-statics results admit both cross-sectional and within-individual interpretations. Full results are reported in Appendix A (Tables A.2–A.4); here we emphasize the key behavioral mechanisms and sign reversals.

4.1. Low income aspirations

We begin with the case in which reference income is sufficiently low so that realized income exceeds the reference level in both states (Propositions 1 and 2). In this regime, loss aversion does not operate through realized losses but continues to affect behavior through aspirations.

[14] More detailed comparative statics are provided in Section 4.

[15] For sufficiently large probability, $J^* > E^*$, as in Fig. 1. For sufficiently small p, $J^* < E^*$.

[16] This cutoff depends on wage differentials, probability structure, and loss aversion. A higher λ increases w_U, expanding the range of reference-income levels over which all three activities are chosen.

[17] While w_L marks the lower threshold below which the safe job is unnecessary, w_U marks the upper threshold beyond which safe employment cannot meaningfully reduce the income shortfall.

[18] Since $\frac{1+(\lambda K)^{1/\gamma}}{w_s-w_b}k > 1$ is equivalent to $\lambda^{1/\gamma} > \lambda_T^{1/\gamma} - \frac{1}{K_\gamma^{1/\gamma}}\left(\frac{w_b}{k} + 2\right)$, this condition holds under the assumptions of Proposition 3, namely $\lambda > \lambda_T$.

[19] A sufficiently loss-averse worker has λ exceeding the regime-specific threshold, namely $\lambda > \max\{1, \lambda_T\}$, where λ_T is defined in (B.8) in *Appendix* B.

4.1.1. Comparative statics with respect to reference income

When the safe job is not undertaken (Proposition 1), higher reference income increases time allocated to the risky job at the expense of leisure. Rising aspirations therefore shift time from leisure toward risky work to raise expected income.

Under Proposition 2, higher reference income reallocates time across all three activities. Leisure and risky-job time are proportional to surplus income, $w_s T - \hat{Y}$, and thus decline as the reference level rises, while safe-job time increases.

For low reference levels, the model predicts a continuous reallocation across jobs. At lower reference levels, the risky job receives a larger share of working time; as reference income rises, time shifts toward the safe job, which eventually becomes dominant. Thus, the risky job is primary at lower reference levels, while the safe job becomes primary as aspirations increase (see Fig. 1).

4.1.2. Comparative statics with respect to wage rates

Under Proposition 1, wage effects depend on reference income. At sufficiently low reference levels, higher risky wages increase risky work and reduce leisure. As reference income approaches the upper bound of this regime, the response may reverse, with higher risky wages increasing leisure and reducing risky work.

Under Proposition 2, increases in the risky wage — whether in the good or bad state — raise risky-job time and reduce both leisure and safe-job time. The welfare gain reflects higher expected income, with loss aversion inactive.

When all activities are chosen, the effect of the safe-job wage is ambiguous due to offsetting income and substitution effects. For details, see Table A.2 in Appendix A and Supplementary Material A.[20]

Interpreting the safe-job wage as reflecting regulated wage-setting institutions (e.g., minimum wages), these results imply that wage floors may have limited or ambiguous effects on total labor supply among low-aspiration workers who already diversify across jobs and leisure.

Finally, an increase in the bad-state wage raises the expected risky wage while reducing its variance. The risk-adjusted expected excess return therefore increases unambiguously as the bad-state wage rises (Supplementary Material B).

4.1.3. Mean-preserving changes in risky wage dispersion

We next consider a mean-preserving change in risky wage dispersion, holding expected wages constant. For low reference levels $\hat{Y} \in [\max\{0, w_L T\}, w_s T]$, households avoid losses in all states. Risk nevertheless remains relevant through diminishing sensitivity in the gains domain. A reduction in wage variance decreases leisure, while effects on risky and safe work are generally ambiguous (see Supplementary Material B).

4.2. High income aspirations

We now consider comparative statics when reference income exceeds what can be earned with certainty in the safe job (Propositions 3 and 4). In this regime, gains arise in the good state and losses in the bad state, making loss aversion behaviorally relevant.

4.2.1. Comparative statics with respect to loss aversion

Higher degree of loss aversion causes relative gains in the good state and the leisure related utility to decline which is the main driving force behind decreasing the subjective well-being even when relative losses in the bad state decline.

Under Proposition 3, greater aversion to loss reduces the time allocated to risky work and leisure, while increasing the safe work time. A higher degree of loss aversion lowers the indirect expected utility by reducing (relative) gains and the utility derived from leisure, and although it also reduces (relative) losses through less time in the risky job, the net effect is a decline in subjective well-being. Conversely, a marginal decrease in loss aversion raises subjective well-being.

4.2.2. Comparative statics with respect to reference income

When reference income is high (Proposition 3), further increases raise time allocated to the risky job and leisure while reducing safe-job time. At lower values within this regime, the safe job remains dominant; as reference income rises, time shifts toward the risky job, which becomes the primary activity (see Fig. 1). This pattern reverses the response under low reference income.

At very high reference levels (Proposition 4), an increase in reference income induces a tradeoff between risky work and leisure: risky work increases while leisure declines. Although gains rise and losses fall, the reduction in leisure lowers subjective well-being.[21] As a result, higher reference income reduces subjective well-being throughout the high-reference regime.[22]

4.2.3. Comparative statics with respect to wage rates

Under Proposition 3, an increase in the good-state wage reduces risky work and increases leisure, reversing the low-reference result. Higher upside wages raise gains and reduce losses relative to the reference level, increasing expected utility. An increase in the bad-state wage raises both risky work and leisure while reducing safe-job time.

An increase in the safe-job wage reduces risky work and leisure while increasing safe-job time. Although gains and leisure decline, subjective well-being rises due to reduced losses in the bad state.

Under Proposition 4, higher good-state wages increase risky work and reduce leisure, while higher bad-state wages reduce risky work and increase leisure. In both cases, subjective well-being rises with wages in either state.[23] When only the risky job and leisure are chosen, changes in the safe-job wage have no effect.

Together, the model generates a nonmonotonic reallocation of time across leisure, safe work, and risky work as income aspirations rise. Very low and very high reference levels induce specialization, while low and high levels produce diversification. This disconnect between effort, aspirations, and well-being has implications for labor taxation, minimum-wage policy, and policies affecting income risk, such as loss-offset provisions or unemployment benefits, as well as for understanding multiple job holding.

4.2.4. Mean-preserving changes in risky wage dispersion

We now consider a mean-preserving change in risky wage dispersion when reference income exceeds the safe-job benchmark. For high reference income levels, $\hat{Y} \in [w_s T, w_U T]$, income realizations generate gains in the good state and losses in the bad state, making loss aversion behaviorally relevant. In this regime, a reduction in wage variability increases time allocated to the risky job and leisure, while reducing safe-job time. Unlike the low-reference case, dispersion changes directly affect the magnitude of losses relative to the reference income, yielding less ambiguous responses (see Supplementary Material B).

[20] For $\hat{Y} = w_s T$, safe-job time decreases while risky-job time and leisure increase. When $\hat{Y}$ falls below $w_s T$, the pattern reverses: risky-job time declines with higher safe wages, while safe-job time increases.

[21] Throughout, subjective well-being refers to indirect expected utility.

[22] The decline reflects the net effect of changing gains, losses, and leisure.

[23] Higher good-state wages increase gains and reduce losses, while higher bad-state wages raise utility primarily through increased leisure.

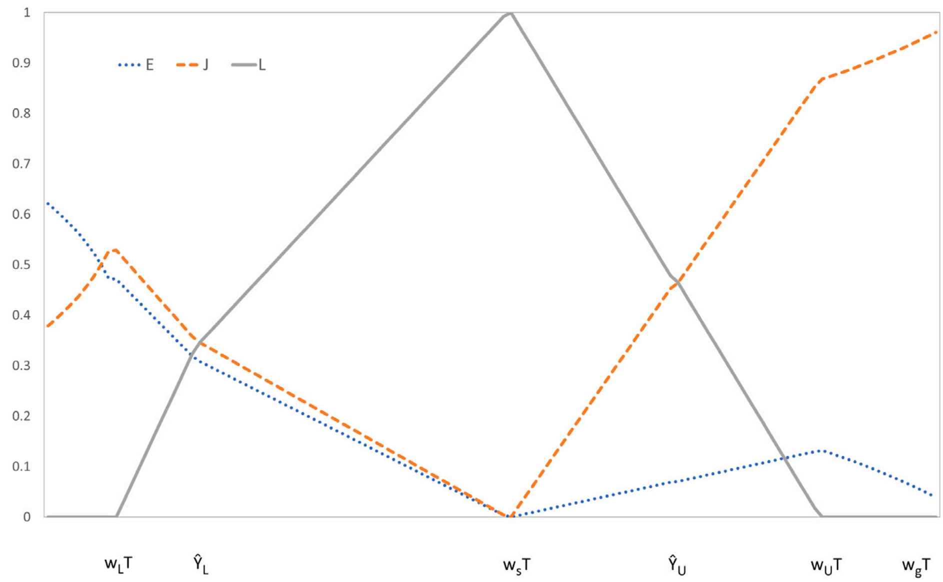

Fig. 1. Time allocated to the safe job (L), risky job (J), and leisure (E) as a function of reference income $\hat{Y}$, with $T = 1$. Parameters: $p = 0.7$, $w_s = 0.4$, $w_b = 0.2$, $w_g = 0.8$, $\lambda = 10$, and $\gamma = 0.5$.
Notes: The safe job is primary and the risky job secondary for $\hat{Y} \in (\hat{Y}_L, \hat{Y}_U)$. The risky job is primary and the safe job secondary for $\hat{Y} \in (0, \hat{Y}_L)$ and $\hat{Y} \in (\hat{Y}_U, w_g T)$.

4.3. Comparative statics across reference-income regimes

Comparative-statics results across income aspirations admit both cross-sectional and within-individual interpretations. Cross-sectionally, workers with different aspirations may choose different leisure levels even under identical wages and risks. Longitudinally, a given worker may adjust leisure and work effort as aspirations evolve over time — due to social comparisons, career benchmarks, or life-cycle factors — even without wage changes.

Fig. 1 summarizes how optimal time allocation to leisure, safe work, and risky work varies with the reference income $\hat{Y}$, holding wages, risk, and loss aversion fixed.

At very low reference income levels ($0 \leq \hat{Y} \leq \max\{0, w_L T\}$), the safe job is not undertaken, and time is allocated between leisure and the risky job (Proposition 1). In this range, higher reference income increases risky work and reduces leisure.

At low levels ($\max\{0, w_L T\} \leq \hat{Y} \leq w_s T$), all three activities are undertaken (Proposition 2). As $\hat{Y}$ increases, time shifts toward the safe job, while both leisure and risky-job hours decline. At lower values within this range, the risky job dominates; as $\hat{Y}$ rises, the safe job becomes primary, and at $\hat{Y} = w_s T$ all time is allocated to the safe job.

At high reference income levels ($w_s T \leq \hat{Y} \leq w_U T$), time is again allocated across all three activities (Proposition 3), but the pattern reverses: higher aspirations reduce safe-job time and increase both risky work and leisure. Within this range, the safe job initially dominates, but sufficiently high reference income shifts the primary activity to the risky job.

At very high reference income levels ($w_U T \leq \hat{Y} \leq w_g T$), safe employment is no longer chosen, and time is allocated between risky work and leisure (Proposition 4). As $\hat{Y}$ increases further, risky-job time expands relative to leisure.

Fig. 1 can be interpreted either cross-sectionally, as differences across workers with distinct aspirations, or longitudinally, as movements for a given worker as aspirations evolve.

Overall, higher income aspirations reduce subjective well-being.

4.4. Downside income guarantees and the benchmark case, $w_b = 0$

A useful benchmark is the case in which the risky job yields zero income in the bad state ($w_b = 0$), as in entrepreneurial or commission-based work where earnings depend on realized transactions. This captures environments without institutional income protection: failure yields zero income in the bad state. The worker can still partially insure total income by allocating time to the safe job, which thus provides self-insurance.

The benchmark, $w_b = 0$, is most relevant when the optimal allocation excludes the safe job, so income depends entirely on risky work and leisure. In this case, income is fully exposed to the realized state. When the safe job is used, diversification already provides private insurance, and introducing $w_b > 0$ supplements rather than replaces it.

This introduction can therefore be interpreted as a guaranteed-income mechanism in the bad state (e.g., unemployment insurance or income support) that imposes a lower bound on income.

Comparative-statics results in Appendix A show that the effects of increasing w_b vary across aspiration regimes. For both low and high reference-income regimes (Tables A.2 and A.3, respectively), a higher bad-state wage increases risky-job time J^* and reduces safe-job time L^*. At very high aspiration levels (Table A.4), the effect reverses: increasing w_b reduces risky-job time. This occurs because higher w_b reduces losses in the bad state and weakens incentives for loss-repair effort. As a result, improved downside protection reduces risky effort despite lower income risk.[24]

For the lowest aspiration regime (Table A.1), the effects are ambiguous. Downside protection can therefore either increase or decrease risky effort, depending on the degree of loss pressure relative to the reference income.

Beyond level effects, Sections 4.1.3 and 4.2.4 show that changes in wage risk also produce regime-dependent responses. Because increasing w_b raises the expected risky wage while reducing its variance (see Supplementary Material B), its effects combine higher returns with lower risk. Thus, w_b captures both the severity of the bad state and a shift in the risk–return profile of risky activity.

Corollary 1. *For both low and high income aspirations regimes (Propositions 2 and 3), introducing $w_b > 0$ increases risky-job time J^* relative to*

[24] In the highest-aspiration regime, $L^* = 0$; hence, income is $Y = wJ$ and expected income is $\mathbb{E}(Y) = J\mathbb{E}(w) = J\left(pw_g + (1-p)w_b\right)$. Increasing w_b raises $\mathbb{E}(w)$ but reduces optimal J^* because losses relative to the reference income are smaller. Since income depends on $J^*\mathbb{E}(w)$, expected income may fall even as risk declines, increasing the realized shortfall relative to the reference income and explaining the pattern in Table A.4.

Table 2
Risk-management mechanisms and their primitive effects.

Policy mechanism	Expected income (holding L, J fixed)	Variance	Model interpretation
Endogenous self-insurance through the safe job (positive L)	constant	↓	Time allocated to the safe job provides private income insurance by diversifying total income across a certain and risky source.
Increase in w_b (institutional downside income protection)	↑	↓	Raises income in the bad state and provides institutional downside protection.
Mean-preserving variance reduction	constant	↓	Abstract reduction in risky income dispersion holding expected earnings fixed (comparative-statics experiment).
Symmetric tax on $(w - w_s)$ with rebate	constant	↓	Institutional risk-sharing: compresses deviations of risky earnings around safe wage w_s while preserving expected income through the rebate.

$w_b = 0$. *Under very high reference income (Proposition 4), J^* decreases as w_b rises, while under very low reference income (Proposition 1) the effect is ambiguous. However, in all regimes characterized in Propositions 1–4, introducing $w_b > 0$ strictly increases subjective well-being relative to $w_b = 0$. That is,*

$$\mathbb{E}(U(E^*_{w_b>0}, J^*_{w_b>0})) > \mathbb{E}(U(E^*_{w_b=0}, J^*_{w_b=0})).$$

Thus, downside income protection unambiguously increases subjective well-being, even though its effects on occupational choice differ across aspiration regimes. These results are positive rather than normative: the model characterizes behavioral responses to institutional changes but does not incorporate fiscal costs or determine an optimal level of w_b. A full welfare evaluation is beyond the scope of this paper and would require a general equilibrium framework with government budget constraints.

Full loss-offset taxation of risky income. An alternative institutional mechanism is a symmetric risk-sharing tax on entrepreneurial income relative to the safe wage, w_s. Gains above w_s are taxed, while shortfalls below w_s receive a tax credit (full loss offset). For any realized risky wage w, total income under a tax rate $\tau > 0$ is given by

$$Y^\tau = w_s L^* + \left[w_s + (1-\tau)(w - w_s)\right] J^*.$$

Holding time allocation fixed, the tax compresses wage dispersion toward w_s and reduces income variance by a factor, $(1-\tau)^2$. It raises revenue in good states and provides credits in bad states, reducing exposure to adverse outcomes. Expected income generally changes because the risky wage is shifted toward w_s. However, with an offsetting nonstate-contingent rebate, mean income can be preserved, yielding $\mathbb{E}(Y) = w_s L^* + \mathbb{E}(w) J^*$ prior to behavioral adjustment.[25]

This policy relates to the classic analysis of risk-sharing taxation (Domar and Musgrave, 1944) and its extension to human capital earnings (Ahsan and Tsigaris, 2011). In the standard benchmark, proportional taxation with full loss offset may induce a compensating increase in risk-taking. Here, endogenous time allocation and reference-dependent preferences prevent full offset, consistent with the incomplete adjustment documented in Ahsan and Tsigaris (2011).[26]

Table 2 summarizes risk-management mechanisms while holding time allocation fixed. In equilibrium, expected income and its variance may change through endogenous adjustments in risky and safe time (J^* and L^*). Thus, although symmetric taxation with rebate preserves expected income per unit of risky time mechanically, aggregate income and welfare depend on behavioral responses (Sections 4.1–4.3). Because leisure is endogenous, these mechanisms affect both job composition and total labor supply; without leisure, only the composition margin would adjust.

Policy implementation and moral hazard. In practice, introducing a positive bad-state wage ($w_b > 0$) or a symmetric risk-sharing tax alters the risk–return profile of risky activity by reducing losses in the bad state (holding time allocation fixed). Within the model, this changes reference-dependent behavior by weakening loss pressure relative to the reference income. As a result, time allocation and occupational choice adjust, with responses varying by aspiration regime.

In real settings, income guarantees may also create moral hazard, as insurance against downside risk can affect effort, participation, or reporting. These mechanisms are not modeled here; the analysis isolates behavioral responses driven solely by reference-dependent preferences.

5. Conclusion

Workers facing income risk, financial constraints, or strong income aspirations often hold multiple jobs. This paper provides a positive analysis of how reference income and loss aversion shape time allocation across leisure, a safe job, and a risky job. Embedding reference-dependent preferences in a labor–leisure framework with heterogeneous job risk shows that behavioral forces fundamentally alter labor-supply decisions beyond standard income-risk predictions.

When reference income is low, realized income exceeds the benchmark in all states, and loss aversion does not operate through realized losses. When reference income is high, losses arise in the bad state and loss aversion becomes behaviorally relevant. In this setting, further increases in aspirations increase leisure. Thus, rising aspirations at high levels generate distinct reallocations across leisure, safe work, and risky activity.

Comparative statics reveal sharp, regime-dependent responses with policy relevance. At low reference levels, higher aspirations reduce leisure and risky work while increasing safe-job time. At high reference levels, the same change increases leisure and risky work while reducing safe-job time. Wage effects are similarly asymmetric. In particular, increases in the safe-job wage — interpretable as minimum-wage or regulated wage-setting — raise safe-job time only when reference income is high. Changes in downside payoffs can increase risky participation but may crowd out leisure and safe work at low reference levels.

Interpreting the risky job as entrepreneurial or contract-based work, the model highlights the role of risk-sharing policies in shaping labor supply under reference-dependent preferences. Policies that reduce

[25] Holding (L, J) fixed, after-tax income is $Y^\tau = w_s L + \left(\tau w_s + (1-\tau)w\right) J$. Thus, $\mathbb{E}(Y^\tau) = w_s L + \left(\tau w_s + (1-\tau)\mathbb{E}(w)\right) J$, while $\mathbb{E}(Y^0) = w_s L + \mathbb{E}(w) J$. The difference is $\tau(w_s - \mathbb{E}(w))J < 0$. Thus, the offsetting rebate equals $\tau(\mathbb{E}(w) - w_s)J > 0$, restoring $\mathbb{E}(Y) = w_s L + \mathbb{E}(w) J$ while reducing dispersion.

[26] Future work should examine the welfare implications of such policies.

downside risk, such as loss-offset provisions, income-contingent taxation, or unemployment benefits, weaken loss aversion and can promote more balanced time allocation among high-aspiration workers. Such mechanisms may complement traditional wage policies in influencing multiple job holding.

The analysis is positive and abstracts from welfare evaluation. Extensions include constraints on safe-job hours to study involuntary multiple job holding and the introduction of fiscal instruments — wage taxes, lump-sum taxes, and insurance schemes — to examine incidence under reference-dependent preferences. In this framework, autonomous taxes shift reference income, while wage taxes mirror the wage changes analyzed here, implying that revenue-neutral reforms may induce nontrivial reallocations of time and welfare effects.

The model also treats reference income as exogenous within the decision period. In practice, aspirations may evolve with labor-market conditions, policy changes, or past income through adaptive or expectation-based mechanisms. Experimental evidence shows that higher income expectations increase labor effort under reference-dependent preferences (Abeler et al., 2011), consistent with the behavioral regimes identified here.[27]

Endogenizing reference income would allow analysis of long-run labor-supply responses to taxation, insurance, and employment policies. In particular, modeling dynamic aspiration formation would enable calibration with household or administrative data, facilitating empirical identification of reference-income thresholds and testing of the predicted regimes over the life cycle.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Jaroslava Hlouskova reports financial support was provided by Austrian Science Fund FWF, project number V 438-N32. Anetta Caplanova reports financial support was provided by VEGA V-23-229-00. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Comparative statics tables

This appendix reports the full comparative-statics results underlying the behavioral responses discussed in Section 4. The tables summarize how optimal time allocation, relative gains and losses, and expected utility (subjective well-being) respond across reference-income regimes. Threshold conditions are included for completeness.

Lower reference income

See Tables A.1 and A.2.

Higher reference income

See Tables A.3 and A.4.

[27] Abeler et al. (2011) stated in the abstract: "If expectations are high, subjects work longer and earn more money than if expectations are low".

Table A.1
Comparative statics for very low income aspirations ($0 < \hat{Y} \leq w_L T,\ p > p_U$).

	dJ^*	dE^*	dL^*	$d\left(Y_g^* - \hat{Y}\right)$	$d\left(Y_b^* - \hat{Y}\right)$	$d\mathbb{E}(U(E^*, J^*))$
$d\lambda$	$= 0$	$= 0$	$= 0$	$= 0$	$= 0$	$= 0$
$d\hat{Y}$	> 0	< 0	$= 0$	< 0	< 0	< 0
				$\hat{Y} < \tilde{Y}_U$		$\hat{Y} < \tilde{Y}_U$
dw_g	$\sim$	$\sim$	$= 0$	> 0	$\sim$	> 0
	> 0	< 0			> 0	
	$\hat{Y} < \hat{Y}_{U,w_g}$	$\hat{Y} < \hat{Y}_{U,w_g}$			$\hat{Y} < \hat{Y}_{U,w_g}$	
	< 0	> 0			< 0	
	$\hat{Y} > \hat{Y}_{U,w_g}$	$\hat{Y} > \hat{Y}_{U,w_g}$			$\hat{Y} > \hat{Y}_{U,w_g}$	
dw_s	$= 0$	$= 0$	$= 0$	$= 0$	$= 0$	$= 0$
dw_b	$\sim$	$\sim$	$= 0$	$\sim$	> 0	> 0
	> 0	< 0		> 0		
	$\hat{Y} < \hat{Y}_{U,w_b}$	$\hat{Y} < \hat{Y}_{U,w_b}$		$\hat{Y} < \hat{Y}_{U,w_b}$		
	< 0	> 0		< 0		
	$\hat{Y} > \hat{Y}_{U,w_b}$	$\hat{Y} > \hat{Y}_{U,w_b}$		$\hat{Y} > \hat{Y}_{U,w_b}$		

Notes: $w_L = \frac{w_b - w_g K^{1/\gamma}}{1 - K^{1/\gamma} + \frac{w_s - w_b}{k}}$, $p_U = \frac{w_s - w_b}{(w_g - w_s)\left(\frac{w_b}{w_g}\right)^{\gamma} + w_s - w_b}$, $\tilde{Y}_U = w_b J^* - \left[(1-p) w_b (w_g - w_b)\right]^{\frac{1}{1+\gamma}} (T - J^*)$, $\hat{Y}_{U,w_b} = (1-\gamma) w_b J^*$, $\hat{Y}_{U,w_g} = (1-\gamma) w_g J^*$, $K = \frac{(1-p)(w_s - w_b)}{p(w_g - w_s)}$, $k = \left[w_s p \left(\frac{w_g - w_b}{w_s - w_b}\right)^{1-\gamma}\right]^{1/\gamma}$,
$\sim$ indicates an indeterminate sign.

Table A.2
Comparative statics for low income aspirations ($\max\{0, w_L T\} < \hat{Y} < w_s T$).

	dJ^*	dE^*	dL^*	$d\left(Y_g^* - \hat{Y}\right)$	$d\left(Y_b^* - \hat{Y}\right)$	$d\mathbb{E}(U(E^*, J^*))$
$d\lambda$	$= 0$	$= 0$	$= 0$	$= 0$	$= 0$	$= 0$
$d\hat{Y}$	< 0	< 0	> 0	< 0	< 0	< 0
dw_g	> 0	< 0	< 0	> 0	< 0	> 0
dw_s	$\sim$	$\sim$	$\sim$	$\sim$	> 0	> 0
		> 0				
		$w_L > \gamma w_s$				
		$\hat{Y} < \hat{Y}_T$				
		or				
		$w_L < \gamma w_s$				
		$\hat{Y} > \hat{Y}_T$				
	< 0	< 0	> 0	< 0		
	$w_L < \gamma w_s$	$w_L < \gamma w_s$	$w_L < \gamma w_s$	$w_L < \gamma w_s$		
	$\hat{Y} < \hat{Y}_T$	$\hat{Y} < \hat{Y}_T$	$\hat{Y} < \hat{Y}_T$	$\hat{Y} < \hat{Y}_T$		
	or	or	or	or		
	$w_L > \gamma w_s$	$w_L > \gamma w_s$	$w_L > \gamma w_s$	$w_L > \gamma w_s$		
	$\hat{Y} > \hat{Y}_T$	$\hat{Y} > \hat{Y}_T$	$\hat{Y} > \hat{Y}_T$	$\hat{Y} > \hat{Y}_T$		
dw_b	> 0	< 0	< 0	> 0	< 0	> 0

Notes: $w_L = \frac{w_b - w_g K^{1/\gamma}}{1 - K^{1/\gamma} + \frac{w_s - w_b}{k}}$, $\hat{Y}_T = \frac{(1-\gamma)(-w_L) w_s T}{\gamma w_s - w_L}$, $w_L = \frac{w_b - w_g K^{1/\gamma}}{1 - K^{1/\gamma} + \frac{w_s - w_b}{k}}$, $K = \frac{(1-p)(w_s - w_b)}{p(w_g - w_s)}$, $k = \left[w_s p \left(\frac{w_g - w_b}{w_s - w_b}\right)^{1-\gamma}\right]^{1/\gamma}$,
$\sim$ indicates an indeterminate sign.

Appendix B. Notations and Propositions 1 and 4

We now introduce the following notation:

$$K_\gamma = \frac{(1-p)(w_s - w_b)^{1-\gamma}}{p\,(w_g - w_s)^{1-\gamma}} \tag{B.1}$$

$$K = \frac{(1-p)(w_s - w_b)}{p\,(w_g - w_s)} \tag{B.2}$$

$$k = \left[w_s p \left(\frac{w_g - w_b}{w_s - w_b}\right)^{1-\gamma}\right]^{1/\gamma} \tag{B.3}$$

Table A.3
Comparative statics for high income aspirations ($w_s T < \hat{Y} < w_U T$).

	dJ^*	dE^*	dL^*	$d\left(Y_g^* - \hat{Y}\right)$	$d\left(\hat{Y} - Y_b^*\right)$	$\mathbb{E}(U(E^*, J^*))$
$d\lambda$	< 0	< 0	> 0	< 0	< 0	< 0
$d\hat{Y}$	> 0	> 0	< 0	> 0	> 0	< 0
dw_g	< 0	> 0	$\sim$	> 0	< 0	> 0
	$\lambda > \hat{\lambda}_1$				$\lambda > \hat{\lambda}_1$	
dw_s	< 0	< 0	> 0	< 0	< 0	> 0
dw_b	> 0	> 0	< 0	> 0	< 0	> 0
	$\lambda > \frac{1}{K}$	$\lambda > \frac{1}{K}$	$\lambda > \frac{1}{K}$	$\lambda > \frac{1}{K}$	$\lambda^{1/\gamma} > \hat{\lambda}_2$	

Notes: $w_U = \frac{w_b + w_g\,(\lambda K)^{1/\gamma}}{1+(\lambda K)^{1/\gamma} + \frac{w_s - w_b}{k}}$, $\hat{\lambda}_1 = \frac{1}{\gamma^\gamma}\left(\lambda_T + \frac{1-\gamma}{K^{1/\gamma}}\right)^\gamma$, $\hat{\lambda}_2 = \frac{1}{\gamma}\left(\lambda_T - \frac{1-\gamma}{K^{1/\gamma}}\right)$, $K = \frac{(1-p)(w_s - w_b)}{p(w_g - w_s)}$,
$\lambda_T = \frac{1}{K_\gamma}\left(1 + \frac{w_s}{k}\right)^\gamma$, $K_\gamma = \frac{(1-p)(w_s - w_b)^{1-\gamma}}{p\,(w_g - w_s)^{1-\gamma}}$, $k = \left[w_s p \left(\frac{w_g - w_b}{w_s - w_b}\right)^{1-\gamma}\right]^{1/\gamma}$,
$\sim$ indicates an indeterminate sign.

Table A.4
Comparative statics for very high income aspirations ($w_U T \le \hat{Y} < w_g T$).

	dJ^*	dE^*	dL^*	$d\left(Y_g^* - \hat{Y}\right)$	$d\left(\hat{Y} - Y_b^*\right)$	$\mathbb{E}(U(E^*, J^*))$
$d\hat{Y}$	> 0	< 0	$= 0$	> 0	< 0	< 0
dw_g	> 0	< 0	$= 0$	> 0	< 0	> 0
	$\hat{Y} > \hat{Y}_{U,w_g}$	$\hat{Y} > \hat{Y}_{U,w_g}$			$\hat{Y} > \hat{Y}_{U,w_g}$	
	< 0	> 0			> 0	
	$\hat{Y} < \hat{Y}_{U,w_g}$	$\hat{Y} < \hat{Y}_{U,w_g}$			$\hat{Y} < \hat{Y}_{U,w_g}$	
dw_s	$= 0$	$= 0$	$= 0$	$= 0$	$= 0$	$= 0$
dw_b	< 0	> 0	$= 0$	< 0	> 0	> 0

Notes: $w_U = \frac{w_b + w_g\,(\lambda K)^{1/\gamma}}{1+(\lambda K)^{1/\gamma} + \frac{w_s - w_b}{k}}$, $\hat{Y}_{U,w_g} = (1-\gamma) w_g J^*$.

$$k_2 = \left[w_s(1-p)\left(\frac{w_g - w_b}{w_g - w_s}\right)^{1-\gamma}\right]^{1/\gamma} = k K_\gamma^{1/\gamma} \tag{B.4}$$

$$w_L = \frac{w_b - w_g\,K^{1/\gamma}}{1 - K^{1/\gamma} + \frac{w_s - w_b}{k}} \tag{B.5}$$

$$w_U = w_U(\lambda) = \frac{w_s + w_g\,(\lambda K)^{1/\gamma}}{1 + (\lambda K)^{1/\gamma} + \frac{w_s - w_b}{k}} \tag{B.6}$$

$$\tilde{w}_U = \tilde{w}_U(\lambda) = \frac{w_g}{1 + \frac{w_g - w_s}{\lambda^{1/\gamma} k_2}} \tag{B.7}$$

$$\lambda_T = \left(\frac{1}{K_\gamma^{1/\gamma}} + \frac{w_s}{k_2}\right)^\gamma = \frac{1}{K_\gamma}\left(1 + \frac{w_s}{k}\right)^\gamma \tag{B.8}$$

$$\hat{\lambda}_1 = \frac{1}{\gamma^\gamma}\left(\lambda_T + \frac{1-\gamma}{K^{1/\gamma}}\right)^\gamma \tag{B.9}$$

$$\hat{\lambda}_2 = \frac{1}{\gamma}\left(\lambda_T - \frac{1-\gamma}{K^{1/\gamma}}\right) \tag{B.10}$$

$$p_U = \frac{w_s - w_b}{(w_g - w_s)\left(\frac{w_b}{w_g}\right)^\gamma + w_s - w_b} \tag{B.11}$$

Note that $w_U(\lambda)$ and $\tilde{w}_U(\lambda)$ are increasing functions in λ, and $\lim(w_U)_{\lambda\to+\infty} = \lim(\tilde{w}_U)_{\lambda\to+\infty} = w_g$. Additionally, (B.5) and (B.11) imply that $p > p_U \Leftrightarrow w_L > 0$; hence, $p < p_U \Leftrightarrow w_L < 0$. Finally, $p_U > p_L = \frac{w_s - w_b}{w_g - w_b}$, and $p > p_L$ guarantees that $\mathbb{E}(w) > w_s$.

More analytical formulation of Proposition 1:

Proposition B1. *Let* $0 \le \hat{Y} < w_L T$, $\lambda > \max\left\{1, \left(\frac{w_s}{k_2}\right)^\gamma\right\}$, *and* $p > p_U$, *where* w_L *and* p_U *are defined in* (B.5) *and* (B.11). *As such, Problem* (2) *admits a unique solution,* (E^*, J^*), *with* $L^* = 0$ *and*

$$-(T - J^*)^{-\gamma} + p\,(w_g J^* - \hat{Y})^{-\gamma} w_g + (1-p)(w_b J^* - \hat{Y})^{-\gamma} w_b = 0, \tag{B.12}$$

$$E^* = T - J^*. \tag{B.13}$$

More analytical formulation of Proposition 4:

Proposition B2. *Let* $w_U T \le \hat{Y} \le w_g T$ *and* $\lambda > \max\left\{1, \lambda_T\right\}$, *where* w_U *and* λ_T *are given by* (B.6) *and* (B.8). *Then, problem* (2) *attains its maximum at* (E^*, J^*), *with* $E^* = 0$ *where* $J^* \in \left(\frac{\hat{Y}}{w_g}, T\right)$ *solves*

$$-(T - J^*)^{-\gamma} + p\left(w_g J^* - \hat{Y}\right)^{-\gamma} w_g + \lambda(1-p)\left(\hat{Y} - w_b J^*\right)^{-\gamma} w_b = 0 \tag{B.14}$$

$$E^* = T - J^*. \tag{B.15}$$

Appendix C. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.econmod.2026.107654.

Data availability

No data was used for the research described in the article.

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