Effects of wage shocks and saving changes on leisure time: The role of dynamic intra-household commitment*

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Abstract

The ability of spouses to commit to future behaviors has important implications for the design of policy interventions targeting specific household members. Using longitudinal data from the Japanese Panel Survey of Consumers (1993-2019), we find robust evidence consistent with limited commitment: positive own past wage shocks increase current leisure, while positive current husband wage shocks reduce the wife's leisure. Additionally, changes in the wife's private savings have lasting negative effects on the husband's leisure time, as limited commitment predicts. These findings extend previous tests of commitment and underscore the importance of accounting for historical changes in the household's economic environment.

Keywords: dynamic collective model, commitment, leisure, JPSC data.

JEL classification: D13, D14, J16, J22, J31, H31.

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1 Introduction

Spouses interact repeatedly throughout marriage, allowing them to share risks and provide mutual insurance against economic or health shocks (Mazzocco, 2007; Lise and Yamada, 2019). A crucial aspect for these interactions is the degree to which partners can commit to future behaviors. On the one hand, a high level of commitment is necessary for efficient investment in common assets, the joint production of household public goods and risk sharing across family members. On the other hand, limits to commitment prevent spouses from exploiting one another.

In addition, many microeconomic policies aim to influence household behaviors and target specific household members. To evaluate the effectiveness of such programs, it is important to understand the level of commitment between spouses, as different commitment regimes lead to different theoretical predictions and outcomes. Consider a cash transfer that shift the intra-household distribution of income to empower a given spouse: it may fail and have no effect under some commitment regimes, its impact may be only temporary under other regimes, or it can succeed and produce long-lasting impacts under different commitment environments. This paper studies the extent to which spouses are able to commit to future behaviors in Japan, using a dynamic collective model of household consumption and leisure (Chiappori, 1988, 1992).

Traditionally, household studies have relied on the so-called unitary model, which considers the household as a single decision-making unit in which all family members' resources are pooled to maximize a common utility function subject to a budget constraint, regardless of household composition. This unitary framework has faced strong criticism on theoretical grounds, and its predictions, such as the income pooling hypothesis, have been frequently rejected by data (Thomas, 1990; Browning et al., 1994; Lundberg et al., 1997; Duflo, 2003; Quisumbing and Maluccio, 2003; Ward-Batts, 2008; Dunbar et al., 2013; Cesarini et al., 2017; Golosov et al., 2024).

Beginning in the 1980s, several alternative approaches (cooperative and non-cooperative) were developed to move beyond the unitary framework (for reviews, see, e.g., Vermeulen (2002), Donni and Chiappori (2011), and Almås et al. (2023)). Among these, Chiappori (1988, 1992) introduced the collective model, a general framework for analyzing intra-household behavior based on cooperative game theory. In this model, households consist of spouses with distinct preferences who cooperate to reach a Pareto efficient state (for a recent survey of the literature, see, Chiappori et al. (2022)).

The collective model has been extensively analyzed and estimated in static settings, but its intertemporal aspects remain relatively underexplored, with only a limited number of contributions to date. One key reason is empirical: the intertemporal context imposes heavy data requirements that restrict testability. For instance, standard household surveys typically collect data on consumption and assets at the household level, with only few notable exceptions that provide individual-level consumption and savings data (Lee and Pocock, 2007; Phipps and Woolley, 2008; Bonke and Browning, 2011; Cherchye et al., 2012; Menon et al., 2012; Lise and Yamada, 2019).[1] Consequently, most literature on household decisions is set in the intertemporal unitary model (Krueger and Perri, 2006; Scholz et al., 2006; Heathcote et al., 2014; Blundell et al., 2016). Another important challenge arises from the complexity of modeling intertemporal choices and the dynamics of intra-household bargaining power (Chiappori and Mazzocco, 2017). A recent strand of literature has extended the collective model by incorporating a dynamic dimension, relaxing the ex ante efficiency assumption of the static framework and explicitly addressing the commitment issue. Within this context, three main models of intertemporal household behavior have been developed: full commitment (FC), no commitment (NC), and limited commitment (LC).

While the effiency assumption of the collective model is realistic in a static sense, as it refers to the ability of spouses to cooperate to take advantage of marriage, it requires further justification in a dynamic context (Choukhmane et al., 2025). Consequently, these intertemporal household models distinguish between different notions of ex ante efficiency in dynamic household choices for every period. Under FC, spouses fully commit at the beginning of marriage to all future allocations of resources between them, resulting in ex ante efficient outcomes. As a result, spouses make fully efficient choices in a dynamic sense, and the model closely resembles the static one. However, FC is a strong assumption and may be difficult to achieve in practice. For example, it implies that spouses do not renegotiate the initial allocation of resources even if a large shock hits one of the two spouses. By contrast, under NC, spouses renegotiate intra-household allocations in every period, regardless of past circumstances. NC models thus represent a sequence of static efficiency models and are ex ante inefficient. The LC model lies between these two extremes.[2]

In LC, each spouse has an outside option (e.g., divorce) that must be respected at all times. As a result, individual rationality must always be satisfied: if an exogenous shock causes a spouse's individual rationality constraint (or marital participation constraint) to be violated under the current intra-household plan, this may either result in separation (if both spouses' rationality constraints cannot be satisfied) or trigger a renegotiation through a shift in intra-household bargaining power from the spouse who prefers to stay married to the spouse who wants to divorce. Therefore, under LC, the household contract is ex ante second-best efficient, and both the allocation of resources and bargaining power depend on the household's history (i.e., the past intra-household contract).

Mazzocco (2007) was the first to test for commitment, rejecting FC using consump-

[1] Data of this kind is difficult to collect and datasets with such information are still not widespread (Bargain et al., 2022)

[2] Mazzocco (2007) introduced the LC model in a household context adapting Ligon et al. (2002)

tion data in the United States. More recently, Blau and Goodstein (2016), Lise and Yamada (2019), and Toriyabe (2025) have all found evidence inconsistent with FC in the United States and Japan, focusing respectively on inheritances, wage shocks and pension income. These studies share the same intuition: under FC, intra-household bargaining power, unobservable but identifiable through household consumption or labor supply, remains constant over time. Therefore, the realization of certain contemporaneous shocks (i.e., news) should not change the Pareto weights and alter the optimal plans of the couples if they were correctly anticipated at the start. However, the existing tests are generally limited to distinguishing between FC and *non*-FC, but they cannot distinguish between NC and LC. Therefore, rejection of FC may be due to NC being a reasonable representation of the data or, alternatively, due to LC. This is the question this paper explicitly addresses.

In this context, Theloudis et al. (2025) propose a novel empirical test that distinguishes between FC, NC, and LC. Their identification strategy relies on the presence of effects from *current* and *past* wage shocks and distribution factors, as well as the sign of such effects. Their intuition is the following: current shocks serve to separate FC from NC and LC, while *past* (i.e., historical) shocks distinguish LC from both FC and NC. This latter exclusion restriction allows them to distinguish NC from LC. In particular, NC is conceived as a series of independent renegotiations, while LC is history-dependent. As a result, they show that FC is nested within NC (consistent with Mazzocco (2007) and Lise and Yamada (2019)), which is is turn nested within LC, a new result in the literature. Empirical evidence from Theloudis et al. (2025) supports the LC model, using household labor supply responses to current, past, and historical wage shocks in the United States. All in all, FC has been rejected in both Japan and the United States, while NC has also been rejected in the United States, where household behavior is consistent with LC predictions.

Within this framework, this paper anayzes the extent to which spouses in Japan are able to commit to one another for life, and evaluates empirically the prevailing intra-household commitment regime in Japanese households building on the above exclusion restrictions. To do so, we use annual longitudinal data from the Japanese Panel Survey of Consumers (JPSC) covering the period 1993-2019, and focus on the dynamic effects of specific economic shocks, such as wage shocks and saving changes, on family leisure time.[3] By analyzing how these *assignable* shocks affect spouses' hours of leisure, we are able to identify the prevailing commitment regime in Japan. As a result, this paper is the first to distinguish among all three commitment regimes within the Japanese context,

[3]This paper also relates to the extensive labor economics literature on the added worker effect, which typically examines women's labor supply in response to men's job loss. Recent studies for Japan include Kohara (2010) and Fukuda (2024). Our contribution differs by focusing on *leisure time* responses of both husband and wife to current wages, as well as the dynamic responses to spousal wages over multiple past periods.

thereby extending and improving upon the tests of Lise and Yamada (2019) and Toriyabe (2025).

Moreover, we examine a previously overlooked component of individuals' utility functions: the time each spouse spends on leisure activities. Leisure time contributes directly to individual utility. Unlike most national household surveys which do not cover all types of activities, the JPSC provides detailed information on the complete time allocation of both spouses across the entire week.[4] This allows us to observe leisure time directly, rather than infer it as a residual by substracting hours spent on work and other tasks.[5] For example, Theloudis et al. (2025) base their commitment test under the assumption that all non-market time is pure leisure, thus linking reduced labor supply to increased leisure. This approach is natural given that leisure is unobservable in their data, but it can lead to misleading welfare implications due to household specialization in home production, including housework and childcare (Apps and Rees, 1996, 1997; Chiappori, 1997; Aguiar and Hurst, 2007; Blundell et al., 2007; Donni, 2008; Rapoport et al., 2011; Himmelweit et al., 2013; Saelens, 2022). Our study also differs from Theloudis et al. (2025) in terms of data frequency. The annual structure of the JPSC data allows us to mitigate concerns related to the short-term transmission of economic shocks. This smoother transmission process reduces the risk of bias in estimated responses to income shocks (Crawley, 2020; Commault, 2022; Ghosh and Theloudis, 2025). Finally, we introduce saving changes as another potential economic shock that may induce bargaining effects in our test for commitment. Wealth is assignable in Japan according to current marital property laws at divorce, so private savings play the role of a stochastic distribution factor in our setting.

The remainder of the paper is structured as follows. Section 2 lays out the theoretical household model and derives the equations for estimation. Section 3 outlines the data and provides some descriptive results. Section 4 describes the empirical implementation, and Section 5 presents the results. Finally, Section 6 concludes.

[4] For example, the Household, Income and Labour Dynamics in Australia (HILDA), the Panel Study of Income Dynamics (PSID), the Russian Longitudinal Monitoring Survey (RLMS) and the UK Household Longitudinal Study (UKHLS), along with its predecessor, the British Household Panel Survey (BHPS), provide consistent data on hours worked and household chores. Notable exceptions include panel datasets corresponding to Germany and the Netherlands, such as the Socio-Economic Panel Study (Bonsang and van Soest, 2020) and the Longitudinal Internet Studies for the Social Sciences (Cosaert et al., 2023).

[5] For some works following this approach, see, among others, Lise and Seitz (2011), Browning and Gørtz (2012), Cherchye et al. (2015, 2017), Blundell et al. (2018), Browning et al. (2021), or Hwang and Nguyen (2025).

2 Theoretical framework

2.1 The setting

The theoretical framework resembles Theloudis et al. (2025), and is based on the collective model (Chiappori, 1988, 1992). We consider a household composed by a male ($j = 1$) and a female ($j = 2$) spouse, with or without non decision-making children, who get married at $t = 0$ and live for a finite horizon of T periods. Spouses enjoy utility from household consumption q_t, private leisure l_{jt}, and joint leisure L_t (hereafter togetherness), represented by a well-behaved function:

$$u_{jt} = u_j(q_t, l_{jt}, L_t; \boldsymbol{x}_{jt}), \quad j \in \{1, 2\}, \ t = 0, \dots, T,$$

where $\boldsymbol{x}_{jt}$ is a vector of taste shifters (individual and household characteristics such as age, education, or the presence of children, among other characteristics).

The household is subject to a period-specific budget constraint:

$$(1 + r)a_t + \tau(y_t) = q_t + a_{t+1}, \quad t = 0, \dots, T, \tag{1}$$

where r is the deterministic interest rate, a_t is common financial assets at the start of the period, and $\tau(y_t)$ denotes disposable household income. We follow Heathcote et al. (2014) and Blundell et al. (2016) and assume that $\tau(y_t) \approx (1 - \chi_t)y_t^{1-\kappa_t}$, where χ_t and κ_t represent the proportionality and progressivity of the tax and benefit systems. Household income is defined as $y_t = w_{1t}h_{1t} + w_{1t}h_{2t}$, where w_{jt} represents hourly wages, and h_{jt} hours of work at date t, $h_{jt} = 1 - l_{jt}$.

2.2 The household objective

We now describe the household problem under three prominent commitment regimes, namely full commitment (FC), no commitment (NC), and limited commitment (LC). All the details and mathematical derivations can be read in Theloudis et al. (2025).

Full commitment

Under FC, the household solves the following program:

$$\max_{C_t} \sum_{j=1,2} \left\{ \mu_j(\Theta_0)\mathbb{E}_0 \sum_{t=0}^{T} \beta^t u_{jt} \right\} \tag{2}$$
$$\text{s.t.: the budget constraint (1) } \forall t.$$

The intuition is as follows. Spouses commit at $t = 0$ to a plan that disciplines their future behavior, and choices are then ex ante efficient (Mazzocco, 2007; Chiappori and

Mazzocco, 2017). The weights μ_j are the so called Pareto weights that determine ex ante the allocation of resources between spouses. In FC, these weights depend on some initial distribution factors Θ_0 determined at $t = 0$, i.e., at marriage, and are time-invariant.

No commitment

In NC spouses do not commit to future behavior, and new information that becomes available each time period t changes the allocation of resources between the spouses, summarized by the Pareto weights. Then, the household solves the following program:

$$\max_{C_t} \sum_{j=1,2} \left\{ \mathbb{E}_0 \sum_{t=0}^{T} \mu_j(\Theta_0, w_{1t}, w_{2t}, Z_t, a_t) \beta^t u_{jt} \right\} \tag{3}$$
$$\text{s.t.: the budget constraint (1) } \forall t.$$

The intuition under NC is that spouses engage in repeated bargaining over the marital surplus. Besides, under a finite period horizon, this bargaining process at each period t depends only on the economic environment at t. In other words, the Pareto weights at t depend on wages at t, stochastic distribution factors Z at t, and wealth at t, while past information and past Pareto weights are irrelevant (Theloudis et al., 2025).[6] Besides that, Θ_0 matters because it represents the bargaining game played by the spouses. As a consequence, choices under NC are ex ante inefficient (Browning et al., 2014).

Limited commitment

Finally, under LC, spouses can unilaterally divorce and dissolve the marriage (Voena, 2015), as certain plans may make one spouse better off outside the household.[7] These are the so called marital participation constraints, which ensure that at each time period t the spouses prefer the value of the marriage over the value of the so-called outside option.

[6]Distribution factors are defined as variables that afftect the spouses' bargaining positions, but do not affect preferences or budget constraints, after controlling for total income (Browning et al., 1994, 2014; Bourguignon et al., 2009). Several variables have been used as distribution factors. Possible examples include sex ratio (Chiappori et al., 2002; Hwang and Nguyen, 2025), body mass index (Chiappori et al., 2012), legislation governing divorce and property rights (Voena, 2015), or inheritances (Blau and Goodstein, 2016). The key distinction betweeen initial and stochastic distribution factors is that initial distribution factors vary cross sectionally across households and capture characteristics at the time of marriage, fixed thereafter, that shift spouses' initial bargaining power, while stochastic distribution factors vary cross sectionally and longitudinally within a given family and affect bargaining power in *each* period.

[7]Although Japanese divorce law requires mutual consent in Japan, its enforcement is not strict and in practice operates similarly to a unilateral divorce (Lise and Yamada, 2019; Toriyabe, 2025).

In LC, then, spouses solve the program:

$$\begin{aligned} &\max_{C_t} \sum_{j=1,2} \left\{ \mu_j(\Theta_0) \mathbb{E}_0 \sum_{t=0}^{T} \beta^t u_{jt} \right\} \\ &\text{s.t.: the budget constraint (1) } \forall t \text{, and the participation constraints} \\ &\qquad V_{jt}^{\text{marriage}} \geq V_{jt}^{\text{outside}}, \ j \in \{1,2\}, \ t > 0. \end{aligned} \tag{4}$$

In other words, spouses commit to future allocations up to the point that one's marital participation constraint is violated. If a participation constraint binds and the outside option becomes more attractive, two outcomes are possible. If no renegotiation of the marital contract that disciplines the allocation of resources is feasible in such a way that spouses are satisfied simultaneously, the constrained spouse chooses the outside option and then divorces. If, on the contrary, a renegotiation is feasible, the bargaining position of the constrained spouse shifts so that he/she becomes indifferent between divorcing and staying married (Mazzocco, 2007). As a consequence, choices under LC are ex ante second-best efficient (Chiappori and Mazzocco, 2017; Theloudis et al., 2025).

The participation constraints ensure that each spouse enjoys as much value inside marriage as they can get from their outside option, which is represented by V_{jt}^{outside}. In other words, the participation constraints represent individual rationality. The marriage value of spouse j at date t, V_{jt}^{marriage}, reflects the current and future share of marital surplus allocated to j given the household choices in the period t. On the other hand, the value of the outside option of spouse j at date t, V_{jt}^{outside}, depends on wages w_{jt}, distribution factors Z_t, assets a_t, and the applicable Pareto weights (Theloudis et al., 2025), and represents the current and future value of divorce.

2.3 The dynamics of Pareto weights

The three programs (2), (3), and (4) can be reformulated as a recursive program, following Marcet and Marimon (2019), as follows:

$$\begin{aligned} V_t = &\max_{C_t} \left(\mu_{1t} u_{1t} + \mu_{2t} u_{2t} - \nu_{1t} V_{1t}^{\text{outside}} - \nu_{2t} V_{2t}^{\text{outside}} + \beta \mathbb{E}_t V_{t+1} \right) \\ &\text{s.t.: the budget constraint (1) } \forall t \text{, and} \\ &\qquad \text{the restrictions on the Pareto weights under FC, NC, and LC.} \end{aligned} \tag{5}$$

The terms $\nu_{jt} V_{jt}^{\text{outside}}$ represent the outside options under LC, and depend on the Lagrange multipliers of participation constraints, ν_{jt}, which are null under FC and NC, as well as under LC if j's participation constraint does not bind at date t. As such, ν_{jt} depends on variables that affect j's participation constraint in period t, namely, w_{jt}, Z_t, a_t and μ_{jt-1}.

The Pareto weights that appear in the recursive program (5), μ_{jt}, are the period-specific Pareto weights at date t, which are characterized by the dynamics of the Pareto weights under the different commitment regimes, as derived by Theloudis et al. (2025). The main property of FC is that the Pareto weights are fully determined at $t = 0$ in terms of Θ_0, and remain constant over time. Conversely, under NC, the Pareto weights change each period t in terms of the information available at t, and do not depend on past information. Finally, under LC, the Pareto weights at date t depend on the previous Pareto weights, and change only if participation constraints are violated as a consequence of changes in wages, distribution factors, or wealth: $\mu_{jt} = \mu_{jt-1} + \nu_{jt}$ for $t \geq 1$ and $\mu_{j0} = \mu_j(\Theta_0)$.

As a consequence, the dynamics of the period-specific Pareto weights can be expressed as follows:

$$\begin{aligned}
\text{FC:}\quad & \mu_{jt} = \mu_j(\Theta_0) \quad \forall t, \\
\text{NC:}\quad & \mu_{jt} = \mu_j(\Theta_0, w_{1t}, w_{2t}, Z_t, a_t) \quad \forall t, \\
\text{LC:}\quad & \mu_{jt} = \mu_j(w_{1t}, w_{2t}, Z_t, a_t, \mu_{jt-1}) = \text{(substituting recursively)} \\
& = \mu_j(\Theta_0, w_{1t}, w_{2t}, Z_t, a_t, \underbrace{w_{1t-1}, w_{2t-1}, Z_{t-1}, a_{t-1}, \underbrace{w_{1t-2}, w_{2t-2}, Z_{t-2}, a_{t-2}, \dots}_{\text{enters through } \mu_{jt-2}}}_{\text{enters through } \mu_{jt-1}}) \quad t > 0.
\end{aligned} \tag{6}$$

Equation (6) reflects the nesting of the sets of variables that matter for bargaining in each commitment mode. Current shocks do not matter in the FC Pareto weight, but they matter in the non-FC alternatives. Past shocks do not matter in FC and NC, but they matter in the LC Pareto weight. However, the Pareto weight is unobserved, and then (6) does not serve to test for commitment. Nevertheless, the optimal leisure functions that solve (5) depend on the state space of each commitment model, and the exclusion restrictions summarized in (6) translate into analogous exclusion restrictions on spouses' leisure time l_{jt}. In the most general model:

$$\begin{aligned}
l_{jt} = l^*_{jt}\Big(& w_{jt}, a_t, q_t, L_t, y_t, \mu_{jt}(\Theta_0, w_{1t}, w_{2t}, Z_t, a_t, \\
& w_{1t-1}, w_{2t-1}, Z_{t-1}, a_{t-1}, w_{1t-2}, w_{2t-2}, Z_{t-2}, a_{t-2}, \dots)\Big).
\end{aligned} \tag{7}$$

2.4 Estimating equations

Theloudis et al. (2025) summarize the different paths to estimate (7), and propose various specifications. We mimic their approach, and first, we compute the intra-temporal optimality conditions of (5): $\mu_{jt} u_{jt[l]} = \lambda_t \left(w_{jt}(1 - \chi_t) y_t^{-\kappa_t}(1 - \kappa_t) \right)$, with $u_{jt[l]} = \partial u_{jt} / \partial l_{jt}$. Secondly, we carry out a standard log-linealization of the marginal utility of leisure $u_{jt[l]}$,

$j \in \{1,2\}$, $-j \neq j$ (Blundell et al., 2008, 2016), as follows:

$$\Delta \log l_{jt} = \underbrace{\delta_{jt} l_{jt}^{-1} \Delta \log(1-\chi_t)}_{\text{(1) tax effects}} - \underbrace{\delta_{jt}\kappa_t s_{-jt-1} l_{jt}^{-1} \Delta \log y_{-jt}}_{\text{(2) disincentives from spouse earnings}}$$
$$+ \underbrace{\delta_{jt} l_{jt}^{-1} \Delta \log \lambda_t}_{\text{(3) wealth and income effects}} \underbrace{- \delta_{jt}\zeta_j^q q_{t-1} l_{jt}^{-1} \Delta \log q_t - \delta_{jt}\zeta_j^L L_{t-1} l_{jt}^{-1} \Delta \log L_t}_{\text{(4) consumption and leisure complementarities}}$$
$$+ \underbrace{\delta_{jt}(1-\kappa_t s_{jt-1}) l_{jt}^{-1} \Delta \log w_{jt}}_{\text{(5) substitution effects}} - \underbrace{\delta_{jt} l_{jt}^{-1} \Delta \log \mu_{jt}}_{\text{(6) bargaining effects}}.$$

where the term s_{jt} is j's share of family earnings, χ_t and κ_t reflect the proportionality and progressivity of the tax and benefits system, and ζ_j^q and ζ_j^L reflect the nature of the consumption-leisure and togetherness-leisure relationships, and Δ is the first difference operator. For simplicity, we denote $\delta_{jt} = \left(\gamma_t - l_{jt-1}^{-1} h_{jt-1}^{-1} \kappa_t s_{jt-1}\right)^{-1}$. The term $\gamma_t - l_{jt}^{-1} h_{jt}^{-1} \kappa_t s_{jt-1} < 0$ is determined by $\gamma_t < 0$, which represents the elasticity of leisure, and disciplines all the signs.

Finally, we log-linearize $\Delta \log \mu_{jt}$ using first-order Taylor series. Assembling everything, the optimal leisure behavior of spouse $j \in \{1,2\}$ at time period t can be represented, assuming one single stochastic distribution factor $z_{2t} \in Z_t$ and one initial distribution factor $\theta_{10} \in \Theta_0$ as follows:

$$\begin{aligned}
\Delta \log l_{jt} = {} & \delta_{jt} l_{jt}^{-1} \Delta \log(1-\chi_t) - \delta_{jt}\kappa_t s_{-jt-1} l_{jt}^{-1} \Delta \log y_{-jt} \\
& + \delta_{jt} l_{jt}^{-1} \Delta \log \lambda_t - \delta_{jt}\zeta_j^q q_{t-1} l_{jt}^{-1} \Delta \log q_t - \delta_{jt}\zeta_j^L L_{t-1} l_{jt}^{-1} \Delta \log L_t \\
& \underbrace{+\delta_{jt}(1-\kappa_t s_{jt-1} - \eta_{j0}^{w_j})}_{\substack{\beta_{j[w_{jt}]}\text{: substitution and bargaining} \\ \text{effects of own current wage}}} l_{jt}^{-1} \Delta \log w_{jt} \underbrace{-\delta_{jt}\eta_{j0}^{w_{-j}}}_{\substack{\beta_{j[w_{-jt}]}\text{: bargaining} \\ \text{effect of partner's current wage}}} l_{jt}^{-1} \Delta \log w_{-jt} \\
& \underbrace{-\sum_{\tau=1}^{t-1} \delta_{jt}\eta_{j\tau}^{w_j}}_{\substack{\beta_{j[w_{jt-\tau}]}\text{: bargaining effects} \\ \text{of own past wages}}} l_{jt}^{-1} \Delta \log w_{jt-\tau} \underbrace{-\sum_{\tau=1}^{t-1} \delta_{jt}\eta_{j\tau}^{w_{-j}}}_{\substack{\beta_{j[w_{-jt-\tau}]}\text{: bargaining} \\ \text{effects of partner's past wages}}} l_{jt}^{-1} \Delta \log w_{-jt-\tau} \\
& \underbrace{-\sum_{\tau=0}^{t-1} \delta_{jt}\eta_{j\tau}^{z_2}}_{\substack{\beta_{j[z_{2t-\tau}]}\text{: bargaining effects} \\ \text{of current and past } z_2}} l_{jt}^{-1} \Delta \log z_{2t-\tau} \underbrace{-\sum_{\tau=0}^{t-1} \delta_{jt}\eta_{j\tau}^{a}}_{\substack{\beta_{j[a_{t-\tau}]}\text{: bargaining effects} \\ \text{of current and past assets}}} l_{jt}^{-1} \Delta \log a_{t-\tau} \underbrace{-\delta_{jt}\eta_{jt}^{\theta_1}}_{\substack{\beta_{j[\theta_{10}]}\text{: bargaining} \\ \text{effect of } \theta_{10}}} l_{jt}^{-1}\theta_{10}.
\end{aligned} \tag{8}$$

The key terms are the η's, which represent the elasticity of μ_{jt} with respect to w_{1t}, w_{2t}, z_{2t}, and θ_{10}. The focus on our test of commitment stems from these estimates which capture bargaining effects.[8] Specifically, we can test FC and NC as follows from that

[8] Appendix A summarizes the process to obtain the closed-form analytical expression for the dynamics of individual hours of leisure.

quasi-structural specification:

$$\begin{aligned}\mathcal{H}_0^{FC} &: \eta_{j0}^{w_j} = \eta_{j0}^{w_{-j}} = \eta_{j1}^{w_j} = \eta_{j1}^{w_{-j}} = \eta_{j0}^{z_2} = \eta_{j1}^{z_2} = \eta_{jt}^{\theta_1} = 0 \\ \mathcal{H}_0^{NC} &: \eta_{j1}^{w_j} = \eta_{j1}^{w_{-j}} = \eta_{j1}^{z_2} = \eta_{jt}^{\theta_1} = 0\end{aligned}$$

Estimating Equation (8) is hard due to non-lineariety and flexibility, so we simplify it assuming that coefficients are constant. Equation (8) produces the following estimating equations, for $j \in \{1, 2\}$ and $j \neq -j$:

$$\begin{aligned}\Delta \log l_{jt} = l_{jt}^{-1}\Big(& b_{j[0]} + \boldsymbol{b_{j[x]}}'\boldsymbol{x}_{jt} + b_{j[\Delta y_{-jt}]}\, s_{-jt-1}\, \Delta \log y_{-jt} \\ & + b_{j[\Delta y_t]}\, \Delta \log y_t + b_{j[y_{t-1}]} \log y_{t-1} \\ & + b_{j[\Delta a_t]} \Delta \log a_t + b_{j[\Delta a_{t-1}]} \Delta \log a_{t-1} + b_{j[a_{t-1}]} \log a_{t-1} \\ & + b_{j[\Delta q_t]} q_{t-1} \Delta \log q_t + b_{j[\Delta l_{-jt}]} l_{-jt-1} \Delta \log l_{-jt} \\ & + \beta_{j[w_{jt}]} \Delta \log w_{jt} + \beta_{j[w_{-jt}]} \Delta \log w_{-jt} \\ & + \beta_{j[w_{jt-1}]} \Delta \log w_{jt-1} + \beta_{j[w_{-jt-1}]} \Delta \log w_{-jt-1} \\ & + \beta_{j[\Delta z_{2t}]} \Delta \log z_{2t} + \beta_{j[\Delta z_{2t-1}]} \Delta \log z_{2t-1} + \beta_{j[\theta_{10}]} \theta_{10} \Big)\end{aligned} \tag{9}$$

The coefficients of interest for our test on commitment are those accompanying wage shocks, the time-variant distribution factor, and the initial distribution factor (i.e., the β's). However, as shown in Equation (8), $\beta_{j[w_{jt}]}$ aggregates both substitution and bargaining effects, meaning that this parameter cannot be used for our test of commitment in this reduced-form setting. Therefore, we can test across all three commitment regimes as follows:

$$\begin{aligned}\mathcal{H}_0^{FC} &: \beta_{j[w_{-jt}]} = \beta_{j[w_{jt-1}]} = \beta_{j[w_{-jt-1}]} = \beta_{j[\Delta z_{2t}]} = \beta_{j[\Delta z_{2t-1}]} = \beta_{j[\theta_{10}]} = 0 \\ \mathcal{H}_0^{NC} &: \beta_{j[w_{jt-1}]} = \beta_{j[w_{-jt-1}]} = \beta_{j[\Delta z_{2t-1}]} = \beta_{j[\theta_{10}]} = 0\end{aligned}$$

The test for commitment is not only about the presence of bargaining effects from current and past wage shocks, along with potential distribution factors, but also about the *sign* of such effects. Theory disciplines how these variables change bargaining power and affect family leisure time. For example, $\beta_{j[w_{-jt}]} < 0$, as the partner's wage worsens j's Pareto weight ($\eta_{j0}^{w_{-j}} < 0$) and reduces j's leisure hours accordingly. In contrast, $\beta_{j[w_{jt-1}]} > 0$, as own past wages improve past bargaining power ($\eta_{j1}^{w_j} > 0$) and, through persistence in the Pareto weight, increase own leisure at present. For opposite reasons, $\beta_{j[w_{-jt-1}]} < 0$. Coefficients for time-variant and time-invariant distribution factors depend on the assignability of such variables. In this particular case, z_{2t} empowers spouse $j = 2$, whereas θ_{10} empowers spouse $j = 1$, as denoted by the subscript.

3 Data

3.1 The Japanese Data

As outlined in the previous section, estimating Equation (8) requires detailed micro-level panel data on hours of leisure and income for both spouses, along with key information on household wealth, household consumption, and demographic characteristics (e.g., age, education, household composition, and region of residence). These data requirements are quite substantial, and as a result, few micro-level datasets provide all the necessary variables (Blundell et al., 2008, 2016; Blundell, 2014; Arellano et al., 2017, 2024; Fisher et al., 2020; Browning et al., 2021). Fortunately, the JPSC, which is a rich longitudinal survey that has trackled a sample of Japanese households annually since 1993, contains detailed information on the large range of economic and demographic variables that are relevant to our context for a panel of Japanese households, collected annually over a long period, so it is well suited to the type of intertemporal analysis we aim to provide in this paper.

The JPSC was administered by the Institute for Research on Household Economics from 1993 to 2017 and has been managed by the Panel Data Research Center (PDRC) at Keiō University since 2018. It is the longest-running nationwide panel survey of individuals in Japan, conducted annually every October since 1993.[9] The survey tracks five cohorts of young and middle-aged women and their families. The initial wave in 1993 included approximately 1,500 women aged 24 to 34 (Cohort A). Over time, four additional cohorts were added: 500 women aged 24 to 27 in 1997 (Cohort B), 836 women aged 24 to 29 in 2003 (Cohort C), 636 women aged 24 to 28 in 2008 (Cohort D), and 648 women aged 24 to 28 in 2013 (Cohort E). For the present study, we use 27 years of the JPSC dataset, from 1993 to 2019. Unlike the PSID, which has interviewed families biennially since 1997 (Theloudis et al., 2025), the JPSC is run annually, with data being collected each October.

3.2 Sample Selection

The JPSC consists of three distinct questionnaires depending on the marital status of women: one for married women, one for unmarried women, and one for newly married women. For the purpose of this study, we restrict the sample to married women. Hence, households consist of a husband (whom we treat as spouse $j = 1$ hereafter) and a wife (spouse $j = 2$), with or without children.[10] We limit the sample to dual-earner couples—households in which both spouses participate in the labor market and report positive

[9]For reference, the Keiō Household Panel Survey (KHPS) and Japan Household Panel Survey (JHPS) have been available since 2004 and 2009, respectively.

[10]Same-sex marriage is not legally recognized in Japan under current law

hours of market work as well as earning positive hourly wages.[11] We acknowledge that this greatly reduces our sample size and may introduce potential selection bias, especially among Japanese women, but it is necesary to fit into the theoretical framework specified above. We also follow the standard practice in household panel surveys and restrict our sample to stable couples to avoid cofounding effects related to household formation events, such as divorce or new couple formation. Stable couples refer to households who do not change their marital status and are continuously married during the whole period 1993-2019. We exclude women in cases of marital dissolution and remarriage (i.e., a new husband enters the household due to the divorce and subsequent remarriage of a previously married woman) but *reintroduce* them into the sample as a new household unit, beginning with the first observation after the change in the woman's marital partner.[12]

Since our estimation strategy relies on first-difference equations, we restrict the sample to households observed for at least three consecutive years, in order to capture concurrent changes in leisure hours as well as changes in distribution factors in both the current and preceding periods, report non-missing (i.e., excluding nonresponses and out-of-range responses) and non-zero values for wealth and consumption, and have no missing values on key variables for our analysis. In addition, spouses' total weekly time allocation must add up to 168 hours (24 hours $\times$ 7 days per week).[13]

Applying these criteria yields a final sample of 871 distinct households (i.e., 871 husbands and 871 wives) corresponding to 7,039 household-year observations across twenty-seven waves of data from 1993 to 2019; on average, a household is observed for 8.1 periods (i.e., years). Given the use of first differences, the estimation sample is smaller and consists of 4,619 household-year observations corresponding to the same 871 households. Appendix Table B.1 summarizes basic sample selection steps and resulting sample sizes (i.e., the number of households and household-year observations) that meet each criterion.

[11] We keep only those in employment and omit the self-employed to avoid issues regarding the imputation of wages (Blundell et al., 2007, 2016; Cherchye et al., 2015, 2017; Kukk et al., 2016; Bloemen, 2019; Saelens, 2022; Krueger et al., 2024; Theloudis et al., 2025). Prior to this sample criteria, around 6.4% of women and 11% of women declare *only* business income.

[12] This aligns with Blundell et al. (2008, 2016), Browning et al. (2013), Blau and Goodstein (2016), Kubota (2021), Theloudis (2021), Hryshko and Manovskii (2022), Bredemeier et al. (2023), Arellano et al. (2024), Sala and Trivin (2024) and Theloudis et al. (2025). Results remain robust when restricting the sample to married women with *no* change in the corresponding spouse over the observation period (Blundell et al., 2008). This leads to a drop of 206 observations from 31 households.

[13] This condition has little impact on the sample as a small number of spouses report weekly time allocation totaling more/less than 168 hours, which is indicative of the quality of our time use data (Cosaert et al., 2023) in comparison to alternative datasets in Japan, such as the KHPS (Toriyabe, 2025). We additionally remove 61 observations corresponding to 3 households for whom the husband is outside the upper age range of 65 years to avoid complications from major life-cycle choices, such as education or retirement decisions (Aguiar and Hurst, 2007; Mazzocco, 2007; Blundell et al., 2008; Gimenez-Nadal and Sevilla, 2012). In the JPSC dataset for 1993-2019, no husbands are younger than 21, whereas the minimum age for women in the sample is 24.

3.3 Variable Definitions

The time use module of the JPSC collects detailed information on spouses' daily living schedules across a range of activities in hours per week. Specifically, spouses report the number of workdays and days off in a typical week, along with the hours devoted to specific activities on a typical workday and a typical day off. These activities include 1) attending school or workplace, 2) work, 3) schoolwork (studies), 4) housekeeping and child care, 5) hobby, leisure, social intercourse, etc., and 6) sleeping, meals, taking a batch, etc.[14] Although self-reported information on usual time use is less precise than diary based methods, as extensively discussed in the literature (Bonke, 2005; Kan, 2008), the latter generally provide information for only one household member on a given day (Gimenez-Nadal and Molina, 2020), making them unsuitable for the type of intertemporal/longitudinal analysis we are aiming for, which requires repeated time use data for the same individuals over a long time span.[15]

Using those questions, we can compute spouses' total weekly time allocations. Specifically, we construct weekly time use measures by multiplying the reported hours for a typical workday by the number of workdays per week, and adding the product of reported hours for a typical non-workday by the number of days off per week. For the purpose of our analysis, we aggregate information from these six categories into hours of work, hours of leisure, and hours of household chores. We categorize activities 5 and 6 as leisure hours, activity 2 as hours of work, and activity 4 as hours of household chores (Aguiar and Hurst, 2007; Kabatek et al., 2014; Lise and Yamada, 2019; Bonsang and van Soest, 2020; Hamaaki and Ibuka, 2024; Hwang and Nguyen, 2025).[16]

As is standard in the labor supply literature, we construct the hourly wage rate by dividing annual labor earnings by annual hours of work, expressed in yen per hour worked.[17] Household income is defined as the sum of both spouses' annual *labor* income, while we use household total savings and deposits, the explicitly accumulated stock of household savings and deposits, to measure household wealth.[18] Regarding consumption,

[14] 7 additional categories are available in the 1994 wave: daily shopping, movement (except attending school or workplace), private lessons or studies, playing sports, volunteer social service, social life, and other activities (e.g., watching TV programs, listening to radio programs, reading books, newspapers, magazines, rest and relaxation, etc.).

[15] This information may be more reliable than measures calculated from retrospective questions about usual time spent per week.

[16] Unlike Aguiar and Hurst (2007), Browning and Gørtz (2012), Cherchye et al. (2012), Lise and Yamada (2019), Browning et al. (2021), Saelens (2022) or Hwang and Nguyen (2025), we do not include activity codes 1 and 3 as part of the spouses' hours of work. For 1994, our leisure hours variable also includes movement (excluding commuting and travel to school), playing sports, volunteering, social life, and other activities (Lise and Yamada, 2019).

[17] Before computing this figure, we convert weekly hours of work into annual hours by multiplying them by 365/7 (Lise and Yamada, 2019). We adopt this definition of wages rather than relying on self-reported earnings (monthly, daily, or hourly), as the latter are not consistently available for the entire observation period (Chiappori et al., 2025).

[18] Defining household wealth as the sum of net real and financial assets (Niimi, 2022) leads to a

the JPSC provides information on monthly household expenditures since 1993, covering both living expenses and other expenses.[19] In addition, the dataset contains a detailed breakdown of the savings within the household during the previous month in a beneficiary format, based on the recommended measures for "who gets what" as per Bonke and Browning (2009), which allows to define monthly *private* savings for the wife and the husband in September.[20] Finally, we define several variables to capture demographic characteristics, including spouses' age and maximum educational attainment, as well as the number of household members, number of children, and prefecture of residence.[21] To make data of different survey waves comparable, all monetary variables (e.g., hourly wages, income, savings, consumption) are inflation-adjusted and expressed in real terms, with the base year of 2019.

3.4 Summary Statistics

Table 1 presents summary statistics for the key variables used in the analysis at the spouse level, as well as household characteristics. On average, husbands in our sample work 54.43 hours per week, whereas the wives work on average 34.13 hours per week. For leisure, men and women tend to spend a similar amount of time on leisure, which is a consistent finding in the time use literature. Specifically, husbands devote about 99.01 hours per week, on average, to such activities, compared to 94.96 hours for wives. We also report additional time use categories to provide a complete view of spouses' weekly time allocation and find that the average hours of household chores among husbands and wives in our sample are 6.84 and 34.26 hours per week. On the other hand, the average husband spends 6.10 and 1.62 hours per week commuting and in schoolwork, whereas the averages for wives are 3.48 and 1.17 hours, respectively.

Hourly earnings also exhibit notable gender differences; husbands earn an average of ¥2,150.21 per hour, whereas wives earn ¥1,186.94 per hour. Regarding individual savings,

substantial drop in the sample size available for analysis. Income data in the JPSC are retrospective, referring to earnings from the previous calendar year. Hence, we use, for example, 2020 data to measure wages in the 2019 calendar year.

[19] Since 1998, the JPSC dataset has also included additional information on expenditures for 15 categories of nondurable goods. However, our measure of household consumption is based on the consumption module which is available throughout the *entire* observation period. This module collects data on the breakdown of total household expenditures by household member over the past month (Lise and Yamada, 2019; Kubota, 2021; Hamaaki and Ibuka, 2024). To obtain an annual measure, we multiply the reported monthly expenditure by 12.

[20] The questionnaire structure does not allow respondents to answer this question with a negative value, so it does not capture withdrawal and refers to the accumulation of financial assets.

[21] The JPSC provides information on respondents' place of residence into eight regions for undergraduate students (Hokkaido, Tohoku, Kanto, Chubu, Kinki, Chugoku, Shikoku, and Kyushu). We obtained specific permission to access the JPSC dataset with information on respondents' prefecture codes (i.e., administrative units analogous to states, of which there are up to 47). In this paper, we use the most detailed region categories and include these 47 prefectural codes for precision. The results remain unchanged to this choice.

husbands and wives save approximately ¥206,886 and ¥170,324 per year, respectively. As for demographics, both spouses are on average in their early 40s; husbands are 42.41 years old and wives are 40. Hence, women are, on average, about two years younger than men. The average years of education are also similar across genders, with husbands having 13.76 years of schooling and wives 13.42.

At the household level, average annual household consumption amounts to ¥3,320,683, while average annual household income and total savings are ¥8,019,635 and ¥6,193,794, respectively. The average household in the sample comprises four members, including two children. Most of these figures are consistent with findings from previous studies using the JPSC data (Lise and Yamada, 2019; Hamaaki and Ibuka, 2024; Fukuda, 2024; Chiappori et al., 2025; Hwang and Nguyen, 2025; Sakamoto and Kohara, 2025).

Table 1: Summary statistics

	Husbands		Wives		Difference	
	Mean	Std. Dev.	Mean	Std. Dev.	Diff.	p-value
Time use variables						
Work hours (weekly)	54.433	11.776	34.126	13.043	20.306	<0.01
ΔWork hours (weekly)	-0.005	0.185	0.009	0.228	-0.014	<0.01
Leisure hours (weekly)	99.010	13.972	94.962	17.015	4.048	<0.01
ΔLeisure hours (weekly)	0.003	0.114	0.007	0.153	-0.004	0.078
Household chores (weekly)	6.836	8.459	34.259	16.687	-27.423	<0.01
Schoolwork hours (weekly)	1.621	3.900	1.173	3.097	0.448	<0.01
Commuting (weekly)	6.101	4.463	3.480	3.168	2.620	<0.01
Income, assets and demographics						
Hourly wage	2,150.207	1,315.081	1,186.944	806.544	963.263	<0.01
ΔHourly wage	0.015	0.276	0.037	0.363	-0.021	<0.01
Savings (annual)	206.886	369.761	170.324	300.986	36.562	<0.01
Age	42.405	8.061	40.000	7.403	2.405	<0.01
Years of education	13.757	2.163	13.417	1.533	0.340	<0.01
			Households			
			Mean	Std. Dev.		
Household variables						
Consumption (annual)			3,320.683	1,497.698		
Family income (annual)			8,019.635	3,167.362		
Savings			6,193.794	8,638.891		
Household size			4.124	1.471		
Number of children			1.719	0.956		
Total observations			**7,039**			
Number of households			**871**			

Notes: Data come from the Japanese Panel Survey of Consumers, 1993–2019. Sample is rectricted to married working couples observed for at least three consecutive periods. All time use variables are measured in hours per week, and monetary amounts in 2019 Japanese yen (¥1,000 per year).

4 Empirical specification

We estimate Equation (9) using Ordinary Least Squares (OLS). To do so, we follow a two-stage approach where we first construct residuals for the growth rate of both leisure hours and wages eliminating the effect of observable characteristics, cohort effects and aggregate time effects that may affect their leisure and income, i.e., unexplained growth in leisure and wages, and we then estimate Equation (9) using these residualized variables.

We assume that the unanticipated growth in hourly wages (i.e., the wage shock) is the only part that induces bargaining between the spouses (Blundell et al., 2016; Theloudis et al., 2025). In doing so, we use the residual of a first-stage estimation for the change in hourly wages between periods t and $t-1$ based on a Mincer-style equation to account for the deterministic profile of wages (Mincer, 1974). Specifically, the first-stage regression for the first difference in log of wages is defined as $\Delta \log w_{jt} = \boldsymbol{x}_{jt}^{w'} \pi_j^w + \omega_{jt}$, where $\boldsymbol{x}_{jt}^{w'}$ is a vector of observable time-varying worker demographics known at time t which includes year of birth dummies, household size (and its change over time), number of children (and its change over time), education dummies, and prefecture dummies (Blundell et al., 2016). We allow the effect of some demographic characteristics to vary over time and add interaction terms of year dummies with education and prefecture characteristics. Except for household size and number of children, the other variables are treated as categorical.[22] The second step estimates Equation (9) using the wage shock ω_{jt}.

In the analysis, we introduce an additional time-varying distribution factor, z_{2t}, defined as the ratio of the wife's individual savings to the total household savings from the savings module of the survey, as savings are assignable in the JPSC. Separate property has been the default, and mandatory, marital property regime in Japan since the enactment of the Civil Code in 1898. This system emphasizes the individual ownership of each spouse's assets, including savings, in the event of divorce. Consequently, unless a specific prenuptial agreement is agreed before or during mariage, savings held in the name of a particular spouse and accumulated during marriage, which is common given the absence of joint bank accounts in Japan (Niimi, 2022), belong exclusively to that spouse and are not subject to equal division upon divorce.[23] In other words, each spouse retains full ownership of their savings, including any returns, and takes them in the event

[22]This is a standard practice in the literature on income dynamics, and the underlying idea is to ensure that the identified income shocks represent unexpected changes unrelated to these factors. This is in similar vein to Meghir and Pistaferri (2004), Blundell et al. (2008, 2016, 2024), Browning et al. (2010), Heathcote et al. (2014), Kaplan et al. (2014), Zhang (2014), Arellano et al. (2017, 2024), Daminato and Pistaferri (2020), Song (2020), Theloudis (2021), Commault (2022), Hryshko and Manovskii (2022), Bredemeier et al. (2023), Krueger et al. (2024), Jappelli and Pistaferri (2025), or Jeong et al. (2025), among others, in their respective analyses of the impact of income dynamics on consumption. Meghir and Pistaferri (2011) and Crawley and Theloudis (2024) provide a survey of this literature of income changes on consumption. The wage regressions have an R-squared of about 24-26%. We similarly construct a residual for the change in leisure hours $\Delta \log l_{jt}$ by regressing it on inverse past leisure hours plus the same set of observable characteristics and aggregate time effects.

[23]While legally valid and enforceable under Japanese law, prenuptial agreements remain infrequent.

the marriage ends.

This can be interpreted as a distribution factor that improves the outside option of a given spouse and raises her/his bargaining power and decreases her/his spouse's bargaining power by the same amount, as the Pareto weight is relative inside the household ($\mu_{2t} = \text{constant} - \mu_{1t}$). The intuition for the bargaining effect is as follows: holding household savings constant (i.e., the budget constraint only depends on *total* savings which we account for), the higher the share of the wife's private savings into household savings, the higher her Pareto weight within the household. In particular, if leisure is a normal good, one would expect an increase in the wife's hours of leisure, and vice versa for the husband who should reduce his hours of leisure.[24]

Finally, for the indicator of the bargaining power at the time of marriage and household formation, θ_{10}, we consider the age gap between spouses and define a dummy variable that takes the value of 1 if the husband is *substantially* younger than the wife, and 0 otherwise, as age differences are traditionally used as a distribution factor (Browning et al., 1994, 2014), and the younger spouse is typically considered more attractive in the marriage market (Lise and Yamada, 2019; Theloudis et al., 2025).[25]

5 Results

5.1 Reduced-Form Specification

Table 2 shows the results of estimating (9) for husbands and wives.[26] Columns (1) and (2) show estimates without the additional time-varying distribution factor (i.e., the ratio of wife's savings to the household total savings), mimicking the main estimates of Theloudis et al. (2025), whereas Columns (3) and (4) show similar estimates when we further include changes in that additional time-variant distribution factor. We also report p-values for the FC and NC test.

We find that own wage shocks at t have strong positive effects on leisure time for both husbands and wives. This suggests that spouses respond to favorable (unfavorable) shocks by increasing (reducing) their leisure time. On the other hand, spousal wage shocks at t ($\beta_{j[\omega_{-jt}]}$) enter negatively in the wife's leisure time equation, which means that favorable shocks to their husbands significantly reduce their leisure time. The current spousal wage shocks should not matter under FC, so this finding indicates *non*-FC. In contrast, partner wage shocks at t do not display statistically significant signs in the husband's equation.

[24]Prior to taking the log of the wife's savings ratio, we add a constant value equal to 0.001 if the wife's savings were 0. Similar results are found if we replace this constant by 0.01. For couples who do not save any amount in September, we set the ratio equal to 0.5. The JPSC questionnaire is answered by women, which means that women's savings are less subject to measurement error and bias.

[25]We also examine educational differences between spouses; however, the empirical resuls for this variable do not support the predictions of the distribution factor theory.

[26]Full estimates are available in Appendix Table B.2

However, past wage shocks should be incorporated to distinguish between non-FC alternatives (i.e., NC and LC). In this context, we find that shocks to own wages at $t-1$ ($\beta_{j[\omega_{jt-1}]}$) enter positively in both equations. This indicates that history matters, as past own wage shocks display the signs predicted by LC and have lasting bargaining effects disciplined in spouses' leisure time. On the other hand, past spousal wage shocks at $t-1$ do not display statistically significant signs.

Table 2: Commitment test

	(1) Male ($j=1$)	(2) Female ($j=2$)	(3) Male ($j=1$)	(4) Female ($j=2$)
$\beta_{j[\omega_{jt}]}$	19.994***	6.255***	20.003***	6.251***
	(1.271)	(0.697)	(1.272)	(0.701)
$\beta_{j[\omega_{-jt}]}$	0.144	-2.383***	0.191	-2.371***
	(0.490)	(0.816)	(0.491)	(0.816)
$\beta_{j[\omega_{jt-1}]}$	1.354**	1.249**	1.406**	1.242**
	(0.644)	(0.567)	(0.640)	(0.566)
$\beta_{j[\omega_{-jt-1}]}$	0.192	-0.208	0.172	-0.209
	(0.427)	(0.684)	(0.423)	(0.685)
$\beta_{j[\Delta z_{2t}]}$	–	–	-0.089*	-0.084
			(0.047)	(0.064)
$\beta_{j[\Delta z_{2t-1}]}$	–	–	0.064	-0.095
			(0.045)	(0.070)
$\beta_{j[\theta_{10}]}$	0.484	-1.055*	0.491	-1.039*
	(0.596)	(0.606)	(0.592)	(0.604)
p-value for $\mathcal{H}_0^{FC}$	0.259	0.033	0.029	0.004
p-value for $\mathcal{H}_0^{NC}$	0.154	0.049	0.117	0.047
Observations	4,619		4,619	
Households	871		871	

Notes: Data come from the Japanese Panel Survey of Consumers, 1993–2019. Sample is restricted to married working couples followed for at least three consecutive periods. Robust standard errors, clustered at the household level, are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 3 shows the estimates if we further include history and account for older wage shocks at $t-2$, meaning that we are restricting the sample to households observed for at least *four* consecutive years.[27] We find that the extra period does not significantly modify our main estimates, and the results concerning current wage shocks at t and past wage shocks at $t-1$ appear to influence family leisure time consistently. Specifically, own current and past wage shocks at $t-1$ enter positive in leisure time, whereas spousal wage shocks at t significantly reduce the leisure time of wives. By contrast, older wage shocks at $t-2$ do not display any statistically significant signs.[28]

So far, we have focused on wage shocks at t and $t-1$ to test for intra-household

[27] We do not use the whole history of shocks as we run into small samples.

[28] Results remain robust when commuting time is included in the measure of market work (Browning and Gørtz, 2012; Lise and Yamada, 2019; Browning et al., 2021; Hwang and Nguyen, 2025). Further details are provided in Appendix Tables B.3 and B.4.

commitment, resembling the strategy of Theloudis et al. (2025). Finding suitable distribution factors is a challenging task, especially in a dynamic rather than static setting. For example, distribution factors enter into our specification log-transformed, which means that our test requires *continuous* distribution factors that vary over time. As a result, dichotomic measures (e.g., inheritances receipt) are not suitable in this setting. On the other hand, the sex ratio is unlikely to change vastly over time (Chiappori and Meghir, 2015).

However, we further test for commitment and include the wife's private savings ratio, considering the prevalent matrimonial property regime existing in Japan that emphasizes individual ownership of assets. Specifically, the savings module in the survey asks for the breakdown of savings by each household member, which enables us to account for the savings of husbands and wives.

We find that the estimates for the ratio of wife's savings yield results in line with the sign predicted by LC in the husband's leisure equation. Specifically, positive changes to the savings ratio of the wife at t and $t-2$ enter negatively into the husband's leisure time equation, consistent with LC.

5.2 Structural Specification

As shown in Equation (9), β's coefficients have an underlying structure which can be used to calculate a number of interesting parameters, such as the elasticity of each spouse's Pareto weight with respect to its arguments. For instance, the coefficient estimated for ω_{jt} captures both bargaining and substitution effects, whereas the rest of β's coefficients can be properly interpreted as reduced-form estimates concerning bargaining effects, and serve to test for commitment in the reduced-form setting.

We go beyond these reduced-form results and further estimate the underlying structure of our estimates to get the elasticity of the Pareto weight, by definition unobservable, with respect to these variables. This only requires imposing a specific value concerning the progressivity of the fiscal system, κ_t, which we set equal to 0.185 (Heathcote et al., 2014; Blundell et al., 2016).[29]

We estimate the underlying parameters by the Generalized Method of Moments (GMM). Table 4 reports the results for the elasticity of the Pareto weight with respect to wage shocks $\omega_{jt-\tau}$, wife's private savings ratio $z_{2t-\tau}$, and age differences θ_{10} for $j \in \{1, 2\}$ and $\tau = 0, ..., 2$. Although statistical significance is difficult to achieve in this context (Lacroix and Radtchenko, 2011), none of the statistically significant elasticities concerning the spouses' Pareto weights contradict the bargaining intuition.

We find that positive own current wage shocks empower oneself, which aligns with the

[29]Different values for this term give rise to different tax systems. We also use a value equal to 0.1327, as done in Wu and Krueger (2021), and find similar results, available upon request.

Table 3: Commitment test (4 or more periods)

	(1) Male ($j=1$)	(2) Female ($j=2$)	(3) Male ($j=1$)	(4) Female ($j=2$)
$\beta_{j[\omega_{jt}]}$	21.948***	7.453***	21.888***	7.484***
	(1.371)	(0.889)	(1.365)	(0.898)
$\beta_{j[\omega_{-jt}]}$	0.604	-1.847*	0.628	-1.825*
	(0.618)	(1.042)	(0.622)	(1.040)
$\beta_{j[\omega_{jt-1}]}$	1.747**	1.536**	1.734**	1.560**
	(0.755)	(0.716)	(0.751)	(0.714)
$\beta_{j[\omega_{-jt-1}]}$	0.121	0.374	0.086	0.378
	(0.510)	(0.815)	(0.503)	(0.810)
$\beta_{j[\omega_{jt-2}]}$	-0.719	0.941	-0.823	0.939
	(0.637)	(0.641)	(0.626)	(0.639)
$\beta_{j[\omega_{-jt-2}]}$	0.494	0.861	0.611	0.896
	(0.505)	(0.868)	(0.501)	(0.863)
$\beta_{j[\Delta z_{2t}]}$	–	–	-0.167***	-0.055
			(0.058)	(0.084)
$\beta_{j[\Delta z_{2t-1}]}$	–	–	-0.025	-0.046
			(0.062)	(0.094)
$\beta_{j[\Delta z_{2t-2}]}$	–	–	-0.124**	0.107
			(0.062)	(0.078)
$\beta_{j[\theta_{10}]}$	0.191	-1.480*	0.223	-1.465*
	(0.686)	(0.799)	(0.687)	(0.800)
p-value for $\mathcal{H}_0^{FC}$	0.081	0.026	0.004	0.026
p-value for $\mathcal{H}_0^{NC}$	0.061	0.061	0.030	0.043
Observations	3,409		3,409	
Households	670		670	

Notes: Data come from the Japanese Panel Survey of Consumers, 1993–2019. Sample is restricted to married working couples followed for at least four consecutive periods. Robust standard errors, clustered at the household level, are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

bargaining intuition that receiving a favorable wage shock increases one's Pareto weight. On the other hand, the partner's current wage shocks have a negative effect on the wife's Pareto weight, which suggests that the positive current wage shock of the partner worsens the wife's Pareto weight. These effects should be zero under FC. Besides, positive own past shocks from $t-1$ also empower the wife, consistent with LC. In the case of husbands, we find that the elasticity of the Pareto weight with respect to current and older changes to the wife's savings ratio is negative and statistically significant, which means that current and historical increases in the wife's savings ratio worsen the husband's Pareto weight, consistent with LC too.

Table 4: Structural results

	(1) Male ($j=1$)	(2) Female ($j=2$)	(3) Male ($j=1$)	(4) Female ($j=2$)
$\eta_{j0}^{\omega_j}$	1.079***	1.023***	1.099***	1.017***
	(0.027)	(0.010)	(0.035)	(0.009)
$\eta_{j0}^{\omega_{-j}}$	0.002	-0.022***	0.008	-0.011
	(0.005)	(0.008)	(0.007)	(0.007)
$\eta_{j1}^{\omega_j}$	0.010	0.012**	0.014*	0.011**
	(0.007)	(0.006)	(0.008)	(0.005)
$\eta_{j1}^{\omega_{-j}}$	0.003	-0.003	0.003	0.000
	(0.004)	(0.006)	(0.005)	(0.006)
$\eta_{j2}^{\omega_j}$	–	–	-0.008	0.005
			(0.007)	(0.005)
$\eta_{j2}^{\omega_{-j}}$	–	–	0.006	0.004
			(0.005)	(0.006)
$\eta_{j0}^{z_2}$	-0.001*	-0.001	-0.002**	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
$\eta_{j1}^{z_2}$	0.001	-0.001	0.000	0.000
	(0.000)	(0.001)	(0.001)	(0.001)
$\eta_{j2}^{z_2}$	–	–	-0.001*	0.001
			(0.001)	(0.001)
$\eta_{jt}^{\theta_1}$	0.005	-0.009	0.002	-0.010*
	(0.006)	(0.006)	(0.007)	(0.006)
Observations	4,619		3,409	
Households	871		670	

Notes: Data come from the Japanese Panel Survey of Consumers, 1993-2019. Sample is restricted to married working couples followed for at least three consecutive periods in Columns (1) and (2), and four consecutive periods in Columns (3) and (4). Robust standard errors, clustered at the household level, are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

6 Conclusions

This paper investigates the extent of dynamic intra-household commitment in Japan by analyzing how spouses adjust their leisure time in response to shocks in the household economic environment within a dynamic setting. To so, we use a life-cycle collective model of consumption and leisure. Intertemporal household behavior critically depends on the degree of commitment characterizing households, and this paper empirically distinguishes between three intertemporal collective models characterizing household behavior: full commitment, no commitment, and limited commitment. We improve upon previous tests for full-commitment and *non*-full commitment in Japan and allow for limited commitment within the household (Lise and Yamada, 2019; Toriyabe, 2025).

Using panel data from the JPSC (1993-2019), we find strong empirical evidence consistent with limited commitment. Specifically, positive own past wage shocks positively affect current leisure time for both spouses, indicating that history matters, while positive current husband wage shocks have a negative impact on the wife's leisure time. Moreover, positive saving changes exhibit long-lasting effects on the intra-household allocation of resources, as reflected in a negative impact on the leisure hours among husbands. Together, these results underscore the importance of modeling dynamic intra-household interactions when analyzing economic behavior and suggest that bargaining power within marriage evolves over time in response to current, as in Mazzocco (2007) and Lise and Yamada (2019), but also past economic shocks, in line with the recent findings of Theloudis et al. (2025).

Our results contribute to the growing literature in household economics that aims to understand the intertemporal dynamics of household decision-making. They are particularly relevant because any model seeking to analyze intertemporal household behavior, as well as any targeted policy influencing the distribution of household resources, critically depends on the degree of commitment between spouses. Overall, our findings support the view that limited commitment models are well-suited to capturing household behavior in a dynamic context and the intra-household allocation of household resources.

However, several limitations of the data should be noted. The JPSC focuses on young women, meaning that the sample is not representative of all married couples in Japan. In addition, only the woman responds to the survey, which implies that variables related to the husband are more likely to be subject to measurement error. Nevertheless, the dataset has its own advantages, as it provides sufficient information to estimate our life-cycle collective model of consumption and leisure, which entails substantial data requirements.

While our findings contribute to a clearer understanding of intertemporal household behavior in general, and intra-household commitment in particular, they also highlight the need for further research in diverse contexts, such as developing countries where divorce laws severely restrict the ability of spouses to exit marriage unilaterally. In addition, our analysis has focused on household time allocation decisions, whereas much of the existing research on consumption dynamics has been conducted within a unitary framework. Within this context, the unique panel data on household consumption available in the JPSC provide an excellent opportunity to study consumption dynamics from a collective approach. This is a natural extension which we leave to our future work.

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Appendix

A Mathematical details

We consider a household composed by a male ($j = 1$) and a female ($j = 2$) spouse, with or wihout non-decision making children, who get married at $t = 0$ and live for T periods. The utility function of spouses comprises consumption and private and joint leisure. Specifically, i each period $t = 0, ..., T$, each spouse $j \in \{1, 2\}$ enjoys utility u_j from three primary arguments: household total consumption q_t, private leisure l_{jt}, and the time spent together on leisure with the spouse (joint leisure, hereafter togetherness) L_t, as per individual 'egoistic' gender-type preferences $u_j(q_t, l_{jt}, L_t; \boldsymbol{x}_{jt})$. Consequently, we extend the dynamic collective model of Theloudis et al. (2025) by allowing for leisure and togetherness. We assume a well-behaved utility function $u_j(.)$ that is twice differentiable in all its arguments, with $u_{j[q]} > 0$, $u_{j[l]} > 0$, $u_{j[L]} > 0$ (first derivatives) and $u_{j[qq]} < 0$, $u_{j[ll]} < 0$, $u_{j[LL]} < 0$ (second derivatives).

The standard household's budget constraint is:

$$(1 + r)a_t + y_t^D = q_t + a_{t+1}, \quad t = 0, \dots, T, \tag{A.1}$$

where r is the deterministic interest rate, a_t is common financial assets at the start of the period and y_t^D denotes disposable household income. The function $\tau(y_t)$ maps gross household labor income into disposable household income, and we assume the following general formulation $\tau(y_t) \approx (1 - \chi_t)y_t^{(1-\kappa_t)}$ (Heathcote et al., 2014; Blundell et al., 2016), where $y_t = w_{1t}(1 - l_{1t}) + w_{2t}(1 - l_{2t})$ is gross household income, as the sum of labor earnings of each spouse, and χ_t and κ_t are two parameters governing the proportionality and progressivity of the tax and benefit systems, respectively. w_{jt} is the wage rate and $W_t = \{w_{1t}, w_{2t}\}$ is the set of wages in the couple. Both τ and individual utility u_j depend on a vector of observable taste shifters $\boldsymbol{x}_{jt}$ (individual and household characteristics such as age, education, or the presence of children, among other characteristics).

Limited commitment

This section illustrates the life-cycle collective model under limited commitment, which is the most general household problem, and all the rest commitment regimes are nested within it (Theloudis et al., 2025).

Under limited commitment, the set of household choices $C_t = \{q_t, l_{jt}, L_t, a_{t+1}\}$ at time t are determined by the following weighted maximization problem of individual utilities at $t = 0$:

$$V_0^{LC}(\Omega_0) = \max_{\{C_t\}_{0\leq t\leq T}} \sum_{j=1,2} \left\{ \mu_j(\Theta_0)\, \mathbb{E}_0 \sum_{t=0}^{T} \beta^t u_{jt}(q_t, l_{jt}, L_t; \boldsymbol{x}_{jt}) \right\} \tag{A.2}$$

subject to the budget constraint (A.1) for all t and the participation constraints

$$\nu_{jt}: \quad \underbrace{\mathbb{E}_t \sum_{\tau=t}^{T} \beta^{\tau-t} u_{jt}(q_t, l_{jt}, L_t; \boldsymbol{x}_{jt})}_{\text{individual inside value from marriage at } t} \quad \geq \quad \underbrace{\tilde{V}_{jt}(\Omega_{jt})}_{\substack{\text{individual outside value} \\ \text{at } t \text{ (e.g., single/divorced)}}} \quad , \quad j \in \{1,2\},\ t > 1 \tag{A.3}$$

Here $\tilde{V}_{jt}(\Omega_{jt})$ is the reservation utility of spouse j at t. $\Omega_{jt} = \{W_t, a_t, \mu_{jt}\}$ is the household's information set at t (i.e., a given set of state variables), that contains both spouses' wage rates, marital assets, and relative bargaining power, and ensures that each spouse enjoys as much as value inside marriage as they can get from their outside option. The Pareto weights μ_1 and μ_2 are the utility weights the household places on each person's preferences at marriage (i.e., the relative bargaining power of member j within the household, relative to member $-j$) and Θ_0 denotes the set of variables that affect the Pareto weights. We normalize the sum of the Pareto weights to 1.

Following Marcet and Marimon (2019), this program can be written recursively as

$$V_t(\Omega_t) = \max_{C_t} \left\{ \sum_{j=1,2} (\mu_{jt} u_{jt}(q_t, l_{jt}, L_t; \boldsymbol{x}_{jt})) + g_t(a_t) + \beta \mathbb{E}_t V_{t+1}(\Omega_{t+1}) \right\} \tag{A.4}$$

subject to the budget constraint (A.1) for all t and the participation constraints and the restrictions of the Pareto weight. The additional term $g_t(a_t)$ aggregates outside options of each spouse from (A.3). In limited commitment, the restrictions on the Pareto weight are

$$\mu_{j0} = \mu_j(\Theta_0), \quad j \in \{1,2\}$$
$$\mu_{jt} = \mu_{jt-1} + \nu_{jt}, \quad j \in \{1,2\},\ t > 0$$

where ν_{jt} is the lagrangian multiplier on the participation constraint of spouse j. The problem can be summarized in the following Lagrangian function

$$\mathcal{L} = \mathbb{E}_0 \sum_{t=0}^{T} \left\{ \sum_{j=1,2} \left[\mu_{jt} u_{jt} + g_t(a_t) + \lambda_t \big((1+r) a_t + (1-\chi_t) y_t^{1-\kappa_t} - q_t - a_{t+1} \big) \right] \right\} \tag{A.5}$$

where λ_t is the Lagrange multiplier on the household budget constraint (the marginal utility of wealth). The first-order condition for leisure is

$$\frac{\partial \mathcal{L}}{\partial l_{jt}} = 0 \Rightarrow \mu_{jt} u_{jt[l_j]} + \lambda_t \big[- w_{jt}(1-\chi_t) y_t^{-\kappa_t}(1-\kappa_t) \big] = 0$$
$$\Rightarrow \mu_{jt} u_{jt[l_j]} = \lambda_t w_{jt}(1-\chi_t)(1-\kappa_t) y_t^{-\kappa_t}.$$

where $u_{jt[l_j]}$ is the first order partial derivative of u_{jt} with respect to l_j, $u_{jt[l_j]} = \partial u_{jt}/\partial l_j$, the marginal utility of leisure. Mimicking Blundell et al. (2016), we carry out a standard log-linearization of $u_{jt[l]}$, which gives:

$$\Delta \log \mu_{jt} + \Delta \log u_{jt[l_j]} - \boldsymbol{\pi}_j^{l'} \boldsymbol{\Delta x}_{jt} = \Delta \log \lambda_t + \Delta \log w_{jt} + \Delta \log(1-\chi_t)(1-\kappa_t) - \kappa_t \Delta \log y_t$$

where Δ is the first-difference operator between t and $t-1$. Estimation of this expression is impossible outside of a parametrized model because $u_{jt[l]}$ is unknown. We follow Blundell et al. (2016) and expand $u_{jt[l_j]}$ around its arguments one period ago. In doing so, a first order Taylor approximation of $\log u_{jt[l_j]}$ around q_{t-1}, l_{jt-1} and L_{t-1} yields:

$$\Delta \log u_{jt[l_j]} \approx A q_{t-1} \Delta \log q_t + B l_{jt-1} \Delta \log l_{jt} + C L_{t-1} \Delta \log L_t, \text{where}$$
$$A = \frac{u_{jt[lq]}}{u_{jt[l]}} e^{-\boldsymbol{\pi}_j^{q'} x_{jt}}, B = \frac{u_{jt[ll]}}{u_{jt[l]}} e^{-\boldsymbol{\pi}_j^{l'} x_{jt}}, C = \frac{u_{jt[lL]}}{u_{jt[l]}} e^{-\boldsymbol{\pi}_j^{L'} x_{jt}}.$$

Plugging this into the log differenced optimality condition and rearranging terms yields:

$$\Delta \log \mu_{jt} + A q_{t-1} \Delta \log q_t + B l_{jt-1} \Delta \log l_{jt} + C L_{t-1} \Delta \log L_t - \boldsymbol{\pi}_j^{l'} \boldsymbol{\Delta x_{jt}} =$$
$$= \Delta \log \lambda_t + \Delta \log w_{jt} + \Delta \log(1-\chi_t)(1-\kappa_t) - \kappa_t \Delta \log y_t,$$

writing $-\kappa_t \Delta \log y_t \approx -\kappa_t (s_{jt-1} \Delta \log y_{jt} + s_{-jt-1} \Delta \log y_{-jt})$, where $\Delta \log y_{jt}$ is the growth rate of spouse j's earnings and $s_{jt-1} \geq 0$ is the j's share of family earnings.

Replacing own earnings with $y_{jt} = w_{jt}(1-l_{jt})$, now the expression is

$$\Delta \log y_{jt} = \Delta \log w_{jt} + \Delta \log(1-l_{jt}) \approx \Delta \log w_{jt} - (1-l_{jt-1})^{-1} \Delta \log l_{jt} \Rightarrow$$
$$\Rightarrow \Delta \log y_{jt} \approx \Delta \log w_{jt} - h_{jt}^{-1} \Delta \log l_{jt}.$$

Assembling everything delivers the following closed-form expression for the growth rate of male and female leisure hours in terms of changes in the Pareto weight and other variables:

$$\begin{aligned}\Delta \log l_{jt} = l_{jt-1}^{-1}\left(B - l_{jt-1}^{-1}h_{jt-1}^{-1}\kappa_t s_{jt-1}\right)^{-1} \times \Big\{ & \boldsymbol{\pi}_j^{l\prime}\Delta \boldsymbol{x}_{jt} + \Delta \log(1-\chi_t) \\ & + \Delta \log \lambda_t - \kappa_t s_{-jt-1}\Delta \log y_{-jt} \\ & - A q_{t-1}\Delta \log q_t - C L_{t-1}\Delta \log L_t \\ & + (1-\kappa_t s_{jt-1})\Delta \log w_{jt} - \Delta \log \mu_{jt}\Big\}.\end{aligned} \tag{A.6}$$

As the growth in intra-family bargaining power $\Delta \log \mu_{jt}$ is unobserved by definition, we rely on the assumption that spousal Pareto weights in limited commitment are related to wages, distribution factors, assets, and past Pareto weight (Theloudis et al., 2025) and model μ_{jt} as $\mu_{jt} = \mu_l(w_{1t}, w_{2t}, Z_t, a_t, \mu_{jt-1})$, with $\mu_{j0} = \mu_j(\Theta_0), j \in \{1, 2\}$.

The log-linearization of the Pareto weight, under the assumption that μ_{jt} depends only on one stochastic distribution factor $z_t \in Z_t$ and the past Pareto weight only, gives the following expression for the growth in μ_{jt} as $\Delta \log \mu_{jt} \approx e_{u_j,z}\Delta \log z_t + e_{\mu_j,\mu_{jL}}\Delta \log \mu_{jt-1}$. If we set $\Delta \log \mu_{j0} = e_{\mu j,0}\theta_0$, we get the following reduced-form expression for the dynamics in the Pareto weight

$$\Delta \log \mu_{jt} \approx \sum_{\tau=0}^{t-1} \eta_{j\tau}^{z}\Delta \log z_{t-\tau} + \eta_{jt}^{\theta}\theta_0. \tag{A.7}$$

Finally, as the growth in the marginal utility of wealth $\Delta \log \lambda_t$ is unobserved, we approach this by applying a polinomial in assets and income (Theloudis et al., 2025)

$$\Delta \log \lambda_t \approx \ell_{\Delta y}\Delta \log y_t + \ell_{\Delta a}\Delta \log a_t + \ell_y \log y_{t-1} + \ell_a \log a_{t-1}.$$

Plugging all these approximations into the equation for the growth rate of leisure hours in (A.6) we get:

$$\begin{aligned}\Delta \log l_{jt} = l_{jt-1}^{-1}\left(B - l_{jt-1}^{-1}h_{jt-1}^{-1}\kappa_t s_{jt-1}\right)^{-1} \times \Big\{ & \boldsymbol{\pi}_j^{l\prime}\Delta \boldsymbol{x}_{jt} + \Delta \log(1-\chi_t) + \ell_{\Delta y}\Delta \log y_t + \ell_{\Delta a}\Delta \log a_t \\ & + \ell_y \log y_{t-1} + \ell_a \log a_{t-1} - \kappa_t s_{-jt-1}\Delta \log y_{-jt} \\ & - A q_{t-1}\Delta \log q_t - C L_{t-1}\Delta \log L_t \\ & + (1-\kappa_t s_{jt-1} - \eta_{j0}^{w_j})\Delta \log w_{jt} - \eta_{j0}^{w_{-j}}\Delta \log w_{-jt} \\ & - \sum_{\tau=1}^{t-1} \eta_{j\tau}^{w_j}\Delta \log w_{jt-\tau} - \sum_{\tau=1}^{t-1} \eta_{j\tau}^{w_{-j}}\Delta \log w_{-jt-\tau} \\ & - \sum_{\tau=0}^{t-1} \eta_{j\tau}^{z}\Delta \log z_{t-\tau} - \sum_{\tau=0}^{t-1} \eta_{j\tau}^{a}\Delta \log a_{t-\tau} \\ & - \eta_{jt}^{\theta_j}\theta_{j0} - \eta_{jt}^{\theta_{-j}}\theta_{-j0}\Big\}.\end{aligned} \tag{A.8}$$

B Additional tables

Table B.1: Sample selection

	Households $\times$ years	Households
Starting with	52,144	4,120
Married couples	35,657	2,910
Stable couples	35,516	3,010
Remove 2020 year	34,208	2,990
Remove husbands over 65 years	34,147	2,987
No missing data for analysis	12,713	1,945
Complete weekly time allocation	12,075	1,902
Dual-earner couples	9,951	1,686
At least three consecutive periods	7,039	871

Notes: Data come from the Japanese Panel Survey of Consumers, 1993-2019.

Table B.2: Reduced-form results in detail

	(1) Male ($j=1$)	(2) Female ($j=2$)	(3) Male ($j=1$)	(4) Female ($j=2$)
$\beta_{j[\omega_{jt}]}$	19.994***	6.255***	20.003***	6.251***
	(1.271)	(0.697)	(1.272)	(0.701)
$\beta_{j[\omega_{-jt}]}$	0.144	-2.383***	0.191	-2.371***
	(0.490)	(0.816)	(0.491)	(0.816)
$\beta_{j[\omega_{jt-1}]}$	1.354**	1.249**	1.406**	1.242**
	(0.644)	(0.567)	(0.640)	(0.566)
$\beta_{j[\omega_{-jt-1}]}$	0.192	-0.208	0.172	-0.209
	(0.427)	(0.684)	(0.423)	(0.685)
$\beta_{j[\Delta z_{2t}]}$	–	–	-0.089*	-0.084
			(0.047)	(0.064)
$\beta_{j[\Delta z_{2t-1}]}$	–	–	0.064	-0.095
			(0.045)	(0.070)
$\beta_{j[\theta_{10}]}$	0.484	-1.055*	0.491	-1.039*
	(0.596)	(0.606)	(0.592)	(0.604)
$b_{j[\Delta y_{-jt}]}$	17.877***	15.243***	17.740***	15.301***
	(2.376)	(2.870)	(2.376)	(2.857)
$b_{j[\Delta y_{t}]}$	-21.170***	-13.342***	-21.207***	-13.404***
	(1.896)	(2.667)	(1.898)	(2.671)
$b_{j[y_{t-1}]}$	0.068	0.229	0.069	0.232
	(0.110)	(0.142)	(0.111)	(0.142)
$b_{j[\Delta a_{t}]}$	-0.010	0.131	-0.010	0.123
	(0.191)	(0.255)	(0.189)	(0.253)
$b_{j[\Delta a_{t-1}]}$	-0.107	0.372	-0.100	0.371
	(0.182)	(0.238)	(0.181)	(0.238)
$b_{j[a_{t-1}]}$	-0.064	-0.231	-0.066	-0.233
	(0.121)	(0.154)	(0.122)	(0.154)
$b_{j[\Delta q_{t}]}$	-0.000*	0.000	-0.000*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
$b_{j[\Delta l_{-jt}]}$	0.086***	0.157***	0.085***	0.157***
	(0.011)	(0.018)	(0.011)	(0.018)
Observations	4,619		4,619	
Households	871		871	

Notes: Data come from the Japanese Panel Survey of Consumers, 1993-2019. Sample is restricted to married working couples followed for at least three consecutive periods. Robust standard errors, clustered at the household level, are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B.3: Commitment test, including commuting time in hours of work

	(1) Male ($j=1$)	(2) Female ($j=2$)	(3) Male ($j=1$)	(4) Female ($j=2$)
$\beta_{j[\omega_{jt}]}$	21.624***	6.548***	21.630***	6.541***
	(1.280)	(0.744)	(1.282)	(0.749)
$\beta_{j[\omega_{-jt}]}$	0.329	-2.544***	0.380	-2.526***
	(0.523)	(0.864)	(0.524)	(0.865)
$\beta_{j[\omega_{jt-1}]}$	1.645***	1.270**	1.695***	1.258**
	(0.601)	(0.550)	(0.596)	(0.550)
$\beta_{j[\omega_{-jt-1}]}$	0.267	-0.188	0.245	-0.189
	(0.423)	(0.699)	(0.419)	(0.698)
$\beta_{j[\Delta z_{2t}]}$	–	–	-0.093**	-0.083
			(0.047)	(0.063)
$\beta_{j[\Delta z_{2t-1}]}$	–	–	0.056	-0.091
			(0.045)	(0.070)
$\beta_{j[\theta_{10}]}$	0.528	-1.040*	0.536	-1.025*
	(0.595)	(0.607)	(0.591)	(0.606)
p-value for $\mathcal{H}_0^{FC}$	0.065	0.003	0.007	0.003
p-value for $\mathcal{H}_0^{NC}$	0.034	0.041	0.033	0.044
Observations	4,619		4,619	
Households	871		871	

Notes: Data come from the Japanese Panel Survey of Consumers, 1993-2019. Sample is restricted to married working couples followed for at least three consecutive periods. Robust standard errors, clustered at the household level, are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B.4: Commitment test, including commuting time in hours of work

	(1) Male ($j=1$)	(2) Female ($j=2$)	(3) Male ($j=1$)	(4) Female ($j=2$)
$\beta_{j[\omega_{jt}]}$	22.919***	7.996***	22.858***	8.011***
	(1.599)	(0.944)	(1.593)	(0.953)
$\beta_{j[\omega_{-jt}]}$	0.611	-1.861*	0.634	-1.848*
	(0.640)	(1.035)	(0.642)	(1.033)
$\beta_{j[\omega_{jt-1}]}$	1.933***	1.689**	1.931***	1.714**
	(0.747)	(0.699)	(0.742)	(0.696)
$\beta_{j[\omega_{-jt-1}]}$	0.077	0.383	0.037	0.383
	(0.513)	(0.828)	(0.507)	(0.824)
$\beta_{j[\omega_{jt-2}]}$	-0.650	1.126*	-0.745	1.127*
	(0.645)	(0.655)	(0.633)	(0.655)
$\beta_{j[\omega_{-jt-2}]}$	0.449	0.593	0.566	0.624
	(0.488)	(0.879)	(0.482)	(0.877)
$\beta_{j[\Delta z_{2t}]}$	–	–	-0.166***	-0.051
			(0.057)	(0.084)
$\beta_{j[\Delta z_{2t-1}]}$	–	–	-0.035	-0.040
			(0.061)	(0.093)
$\beta_{j[\Delta z_{2t-2}]}$	–	–	-0.134**	0.104
			(0.061)	(0.078)
$\beta_{j[\theta_{10}]}$	0.216	-1.475*	0.247	-1.461*
	(0.675)	(0.806)	(0.676)	(0.806)
p-value for $\mathcal{H}_0^{FC}$	0.054	0.016	0.002	0.020
p-value for $\mathcal{H}_0^{NC}$	0.042	0.039	0.018	0.035
Observations	3,409		3,409	
Households	670		670	

Notes: Data come from the Japanese Panel Survey of Consumers, 1993-2019. Sample is restricted to married working couples followed for at least four consecutive periods. Robust standard errors, clustered at the household level, are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.