INSTITUTE
OF ECONOMICS

Scuola Superiore
Sant'Anna

LEM | Laboratory of Economics and Management

Institute of Economics
Scuola Superiore Sant'Anna

Piazza Martiri della Libertà, 33 - 56127 Pisa, Italy
ph. +39 050 88.33.43
institute.economics@sssup.it

LEM
WORKING PAPER SERIES

Unpaid Working Time and Disproportionate Female Hazard: an Intersectionality Perspective

Caterina Manicardi [a]
Maria Enrica Virgillito [a]

[a] Institute of Economics, Scuola Superiore Sant'Anna, Pisa, Italy

2025/01 **January 2025**
ISSN(ONLINE): 2284-0400
DOI: 10.57838/sssa/0v9f-0384

Unpaid Working Time and Disproportionate Female Hazard: an Intersectionality Perspective*

Caterina Manicardi[1†] Maria Enrica Virgillito[1]

[1]Institute of Economics, Scuola Superiore Sant'Anna, Pisa (Italy)

January 7, 2025

Abstract

How has the distribution of unpaid working time between men and women evolved over the last twenty years? Does unpaid working time still disproportionately affect women, more than fifty years after the massive entry of the female labour force into formal employment? And, if so, which market and non-market factors drive this stratification and could possibly facilitate the transition out of an unequal intrahousehold division of labour? This paper leverages the most complete dataset collecting individual time diaries, the ATUS-CPS 2003-2022, to investigate the role of market variables – such as real wages, household income, industry and occupation – vis-à-vis non-market factors – such as gender, race, household type and state of residence – in explaining variations in unpaid time allocation. By exploiting both the cross-sectional and panel dimensions of the dataset, we provide novel evidence on individual time allocation and its gendered distribution, integrating an intersectional perspective that looks at the role of income classes and socio-material conditions in affecting the likelihood of escaping disproportionate exposure to unpaid work. Our results indicate that, despite clear class-based patterns, belonging to the upper income class is not enough for women to escape disproportionate burdens.

Keywords: Time use, Labour supply, Unpaid work, Gender imbalances

Jel Codes: D13, J22, J16

*The authors wish to thank Paolo Frumento, Francesca Bettio, Nancy Folbre, the Sant'Anna Gender and Labour group, the participants of the 2024 Gender, Sexuality, Work and Pay class at UMass Amherst, and attendees of the 36th EAEPE Conference (Bilbao, 2024) and the 32nd IAFFE Conference (Rome, 2024) for the fruitful comments and suggestions.

†Corresponding author: *caterina.manicardi@santannapisa.it*

1 Introduction

Time is one of the most important dimensions for understanding capitalism and its evolution. The entire history of capitalism can be traced back to the measurement and analysis of time and its allocation. Time represents a resource, an endowment, a factor of production, and, as per Thompson (1967), even industrialization is the end result of a long reconfiguration process of individual and collective time allocation:

> If the transition to mature industrial society entailed a severe restructuring of working habits – new disciplines, new incentives, and a new human nature upon which these incentives could bite effectively – how far is this related to the inward notation of time? (Thompson, 1967: 57)

From the perspective of economic history and the analysis of capitalism, working and non-working time has been understood as the collective outcome of the dynamic interplay among technological, economic and social spheres (Freeman, 2019; von Tunzelmann, 1995). In contrast, the neoclassical approach views time allocation as the result of individual choices shaped by the structure of incentives stemming from the productive sphere, largely due to the incipient Beckerian approach. Over the years, however, time use and its determinants have evolved into a domain intersecting the analysis of labour supply, welfare systems, and macroeconomic trends.

More recently, the Covid-19 pandemic highlighted the relevance of time allocation and its permeability to external factors, beyond individual choices: a reconsideration of the value of time – particularly the time spent in unsatisfying working activities – has produced unique quits rates across all U.S. census regions, a phenomenon known as Great Resignation (Amanor-Boadu, 2022). The pandemic served as a litmus test, revealing structural changes and long term tendencies, including a growing refusal of work intensity, the lack of a proper public long-term care system and adequate healthcare services, and the demographic shift toward an aging population. In fact, in the United States the old-age to working-age demographic ratio, according to OECD data, increased from 20.6% in 2003 to 29.4% in 2022, and is expected to reach 49.3% by 2075 (OECD, 2024). Population aging requires a rearticulation of the socio-economic fabric regarding care jobs, addressing a new social need. Not by chance, according to the Bureau of Labour Statistics, the fastest-growing occupation groups between 2022 and 2032 include healthcare support occupations, with a projected employment change of 15.4%, healthcare practitioners and technicals (8%), community and social service (7.8%) (Colato and Ice, 2023).

The interplay of care marketisation and a growing aging population (Freeman and Schettkat, 2005; Brennan et al., 2012; Christiansen, 2017) is expected to drive long-term transformations in individual time use, particularly on the unpaid side, encompassing housework – such as cleaning, preparing food and shopping – and care activities, which include caring for and helping both household and non-household children and adults. But, what do we know from the past? How has the distribution of unpaid labour between men and women changed over the past two decades? Which market and non market factors contribute to the unequal intrahousehold division of labour, and which, on the contrary, could help alleviate it?

This paper addresses these questions by relying on individual time diaries from the American Time Use Survey - Current Population Survey (2003-2022) to study the role of market predictors – such as real wage, household income, industry and occupation – alongside non-market predictors – such as gender,[1] race, household type and state of residence – in explaining variations in unpaid time allocation. By leveraging both the cross-sectional and panel dimensions of the dataset, we provide new evidence on individual time allocation, integrating an intersectional approach that looks at the role of classes and socio-material conditions in affecting the probability of exiting disproportionate exposure to unpaid labour.

Specifically, we use natural cubic splines to model nonlinear time effects and allow for their interaction with the covariates in order to isolate and track the evolving relative contributions of these factors over time. To achieve this, we focus the analysis on a set of individuals with selected characteristics. We then attribute a pseudo-panel structure to our data, where the new unit of analysis is defined by population groups segmented by gender, age and state of residence. Finally, using this longitudinal information, we estimate a proportional hazard Cox-Aalen duration model with time-varying covariates to explain time-to-end of disproportionate unpaid workload.

Our results offer an intersectional perspective on the factors that might explain time use and indicate that the class dimension alone does not serve as an exit mechanism from the unequal distribution of intrahousehold labour. Low-income status and being female do inflate unpaid working time, along with the presence of dependent children and part-time employment. This evidence is in line with both institutional and Marxist feminist perspectives, which argue that the regime of social reproduction is progressively commodified for those who can afford it, and privatized within the domestic sphere for those who cannot (Fraser, 2016; Small, 2023). However, when we pose the more specific question of the drivers

[1] In our analysis, individual gender and sex coincide due to data availability and the reporting design of the survey (Small, 2024).

of disproportionate (with respect to the gender-year median) unpaid workload, we find that "unequal bargaining" over time use persists even among upper income households, failing to identify family income, and related class status, as an effective predictor.

Implications of our work go beyond the analysis of time use and point at the emerging problem of care inequalities. In an era of welfare state retrenchment and marketisation of care services (Dosi et al., 2024), coupled with an aging population, income inequalities may translate into care inequalities, in terms of both access and burden on household members. Higher-income households may have the means to externally secure private caregiving services, while lower-income households tend to rely more on their own – and on their relatives' – time budgets, potentially changing their supply of waged labour due to time constraints.

The paper is organized as follows: Section 2 reviews the reference literature, covering both the neoclassical stream of New Home Economics and the institutional-feminist approaches. Section 3 details the data source, while Section 4 describes the empirical strategy for the cross-sectional analysis, the pseudo-panelization and the duration model. Section 5 presents and discusses the findings and Section 6 concludes.

2 An overview of time allocation: theoretical underpinnings

2.1 The early origins of home economics

Time allocation has been one of the topics largely addressed by Gary Becker's influential work, originating from the early contributions of Chicago scholar Hazel Kyrk and her student Margaret Reid, who first introduced household economics as an academic specialty. Starting with the use of time to study household production and consumption, it later became a useful instrument "in the areas of labor economics, demographic economics, health economics, transportation economics, and public economics" (Grossbard-Shechtman, 2001). This strand of literature, which led to Becker's Nobel Prize in 1992, came to be referred to as New Home Economics, aiming to extend "rational choice theory to intra-household decisions" (Becchio et al., 2018). Although an inspiration for the *homo oeconomicus* model of rational choice theory, Kyrk wrote her PhD thesis *A Theory of Consumption* challenging the marginalist theory of intertemporal maximization of utility, and arguing that demand for consumption goods depends on the social environment and income size, rather than their intrinsic utility (Kyrk, 1923). The 1933 book *Economic Problems of the Family* (Kyrk, 1933) traced some correspondence between homemaking/homeproduction and income, according to a class-centric perspective, positioning time use as the result of structural factors rather

than individual preferences.

Margaret Reid, building on Kyrk's foundation, developed theories and methods in both household and consumption economics. In her *Economics of Household Production*, Reid defined household production as those "unpaid activities which are carried on, by and for the members, which activities might be replaced by market goods, or paid services, if circumstances such as income, market conditions, and personal inclinations permit the service being delegated to someone outside the household group" (Reid, 1934). This definition provides a clear economic ontology to home production, which can be done in principle by someone else, in response to wages and relative prices of substitute services. Future home economists either understated or used this approach without explicit acknowledgment of Reid's work.

In light of this substitutability, she proposed four possible methods for measuring the monetary value of household production: opportunity cost, retail price, hired workers' cost and boarding service cost. The opportunity cost method, equating the cost of time spent in homemaking to potential foregone earnings, later influenced Gary Becker's 1965 theory of time allocation. Notably, Reid relied on the U.S. families empirical data available at the time to explain household tasks, and the corresponding time spent, as a function of income, geographical differences, gainful work outside the house, education, race, tastes and stages of the life cycle (Yi, 1996), including both market and non-market factors as early as 1934.

2.2 The New Home Economics

Discarding the institutional dimension and socio-economic status, Becker assimilated the problem of time allocation in the household, either as leisure or housework, to consumption time as opposed to market work: for both activities people forego wages and no positive monetary value is acknowledged. Coherently, he tackles the issue of intrahousehold division of labour as an efficiency problem, rewarding more the individual with higher-comparative advantage: "members who are relatively more efficient at market activities would use less of their time at consumption activities than would other members" (Becker, 1965). In *A Theory of the Allocation of Time* (Becker, 1965), Becker incorporates into the household utility function the production of *more basic commodities* – such as the seeing of a play or sleeping – which combine market goods and (non-market) time inputs. The household becomes a unit of both production and consumption: the optimal combination of these commodities is obtained by maximising the utility function subject to i) the budget constraint, which accounts for expenditures on market goods and non-market time (through foregone earnings),

and ii) the time constraint. He then distinguishes between market work and non-market activities, viewing the latter as a mere cost. Moreover, hours spent in non-market activities react to changes in income, earnings and market prices, where the usual mechanisms of income and substitution effects apply (Becker, 1965). The gender dimension does not play any particular role, apart from a comparative advantage in home activities due to reduced labour market opportunities, and therefore self-selection for women into that.

In *Labor Force Participation of Married Women: A Study of Labor Supply* (Mincer, 1962), Mincer distinguishes between work at home and leisure and acknowledges that the backward-bending labour supply curve – that is the inverse relation between income and labour force participation – did not apply to women: despite a secular growth in U.S. real incomes from 1890 to 1960, female activity rates, especially for married women, increased steadily. To address this result, Mincer theorises that studying labour supply through the theory of demand for leisure might be misleading, especially for women, who spend a relevant amount of time in home production. Using data from the 1950 Survey of Consumer Expenditures data on white husband-wife families to estimate an econometric model for married women's quantity of labour supplied to the market, he finds that the labour force participation of married women is greater when their potential earnings are higher, the permanent income of the husband is small, and the current income is lower relative to the permanent income. Specifically, the positive influence exerted by the rise in female wages offset the negative effect of historical income growth.

Finally, Gronau (1977) is among the first theorists of intra-couple time allocation to search for the determinants of work at home. Thanks to the increasing availability of time-budget data, he empirically estimates the coefficients of "Mincerian" determinants (wage, income, education and presence of children) on the three time-use aggregates separately and then rationalises the findings through a Becker-like theoretical model. Leisure and home production react differently to income and wage incentives, as well as to the presence of children; in this way, Gronau contributed to overcoming the labour-leisure analysis as a framework for studying individual time allocation and labour supply over the business cycle – even among his fellow rational choice theorists.

Over the years, the framework of New Home Economics, with its core of "maximising behavior, market equilibrium, and stable preferences" (Becker, 1976), has been applied in both macroeconomic contexts to study long-run trends and cyclicality of time-use categories (Aguiar et al. (2013); Ngai et al. (2024); Cacciatore et al. (2024)), and in microeconomic settings to explain patterns of life-cycle household behavior (see Aguiar et al. (2012) for

a review). Within this scholarship, differences in tastes and preferences for job content and amenities, such as time flexibility, remain key to interpreting women labour supply, occupational segregation and household production (Goldin, 2021).

2.3 Beyond Becker - Institutions and intersectionality

Although home economics represents the problem of time allocation as an individual choice, the same research question can be addressed by focusing on the institutional setting in which individuals operate, either independently of or alongside their preferences and tastes, which are to be considered as endogenously determined. This is the route taken by institutional-feminist approaches to the problem of time allocation.

Evidence on the positive impact of public childcare services on individual time allocation and intra-couple gaps in care activities has been documented for industrialised countries (Sen, 2023; Erhel and Guergoat-Larivière, 2013). Studies on care regimes broaden this perspective, considering the interplay of economic, political and demographic processes, as well as institutions influencing the organisation of waged and unpaid labour, welfare state and fertility. The mix of leave arrangements, social services and labour market conditions is used to categorise national care strategies for children and elderly, and for sustaining women's labour supply (Olivetti and Petrongolo, 2017). For instance, Bettio and Plantenga (2004) compare parental leaves, the share of children enrolled in formal childcare arrangements as well as pensions, residential and community care for elderly and overall role of private versus public in service provision to classify European countries according to their care model. Migration policies and trends in job segregation are also often added to the picture since 'the migrant in the family' (Bettio et al., 2006; Van Hooren, 2012) is now the prevalent pattern of care work in Mediterranean societies and is an emerging phenomenon in Asia and North America (Michel and Peng, 2012). Lastly, Gálvez-Muñoz et al. (2011) make evident the link between welfare policies and time allocation, with clusters of EU countries based on time spent by men and women in specific activities mirroring groupings deriving from similarities in welfare regimes.

Not only time use but also time poverty – intended as the right to control when and how to engage in caregiving or housework – has been studied as an aspect of life quality (Vickery, 1977). The Levy Institute's Measure of Time and Income Poverty (LIMTIP) underscores the negative impact of time deficits on living standards (Zacharias et al., 2012), asserting that "unpaid work time can be as restrictive as paid work time in determining the time deficit/wealth of people" (Antonopoulos and Memis, 2010).

The problem of time allocation, however, cannot be fully addressed without adopting an intersectional perspective, meant at eliciting the interaction and stratification of inequalities (Darity Jr et al., 2015). Feminist economics has called for explicit attention to what are usually termed "control variables" included in models of time allocation – such as income, education, occupation, and industry. These factors should be examined from a perspective of structural inequalities shaped by unequal bargaining power, rather than as outcomes of individual choices driven by preferences (Folbre, 2020, 2021a; Gautham et al., 2023). Invariant demographics, such as gender, race and birthplace function as *social signifiers* that impact material opportunities – including access to education, job opportunities, healthcare and mobility – and, as a consequence, individual choices (Acker, 2006; Davis, 1983). Race and ethnicity remain in fact major lenses for understanding differences in child poverty, underemployment or unemployment patterns in the United States, highlighting systemic racial disparities and institutional arrangements that contribute to residential segregation in jobless inner-cities and limited access to quality education (Grusky and Hill, 2018), with few opportunities for individuals to change predetermined paths (Massey, 1990). As such, racial disparities interact with unequal bargaining positions. Gender asymmetries, rooted in patriarchal power relations and embraced by institutions (Folbre, 2021b), in turn shape paid and unpaid working patterns, including earnings, time schemes, and occupational segregation (Levanon and Grusky, 2016). Contributions from intersectional political economy highlight that subordination on the workplace and socio-economic hierarchies interact with gender and racial diversity, producing stratified inequalities (Williams, 2021; Cetrulo et al., 2024). While there is no single mechanism of creation of inequalities, these sources intersect in non-trivial ways.

In this respect, an intersectional perspective – where the dynamics of oppression, exploitation and privilege are not simply additive – becomes a necessary step to inform the empirical analysis. In the following sections, alongside incorporating standard Mincerian predictors, we assess how the interplay of class and intra-class inequalities, based on gender and race, manifests within the reproductive sphere of the U.S. economy. Interestingly, when interrogated about the drivers effectively help women balance housework and care chores, our model predicts that almost all factors proposed by New Home Economists fade away.

3 Data

The American Time Use Survey (ATUS) is a nationally representative survey conducted monthly by the U.S. Bureau of Labor Statistics, interviewing individuals over the age of 15

from the existing sample of the Current Population Survey (CPS). Besides employment and demographic information, individuals are asked to fill in a daily diary detailing time spent on various activities, which ATUS officials ex-post categorise into one of over 400 detailed time categories. The first wave of the ATUS in 2003 included about 20,000 respondents, while the 2004-2022 waves involved approximately 13,000 individuals each year. ATUS stands as one of the most comprehensive repositories of time budget data, albeit cross-sectional. Offering significantly longer series than the harmonised European time use surveys, it also provides the opportunity to link individual time allocation with detailed information available from the official household survey (CPS).

We merge the multi-year ATUS-CPS-Respondent files for the period 2003-2022. Data for 2020 represent the days before and after the pandemic-related shutdown in data collection, and a specific weighting variable is made available by the Bureau of Labour Statistics to allow for the combination of 2020 data with other years.

We restrict our sample to individuals aged 16-64 who were employed during the week the survey was conducted and reported at least one minute of paid work and one minute of unpaid work on the survey day. This selection aims to capture a realistic routine of working individuals. Work activities include time spent on main and secondary jobs, excluding commuting, while unpaid work sums housework activities –such as cleaning, cooking and shopping activities– to caregiving responsibilities, encompassing care as a primary activity for both household and non-household children and adults (see Table A1 for detailed activity codes). Missing values in the earnings variable are imputed by assigning the hourly wage value of an individual sampled in the same year with equal gender, working time scheme, occupation, and industry (3,484 imputations, representing 6% of the final sample). Real wages are deflated using the annual Chain-type Price Index (2017 = 100, seasonally adjusted), and observations with wages below the legal minimum of the state of residence, or with a reported race/ethnicity different from White, Black, Asian, or Hispanic, have been excluded. The final sample includes 58,797 observations and Table 1 collects descriptive statistics for selected variables in 2003 and 2022.

Figure 1 shows the average time allocation by employment status, grouping activities into care work, housework, paid work and relax and leisure for the total sample, i.e. before our filtering procedure. Notably, time use appears more volatile for unemployed individuals, reflecting cyclical phases, while remaining relatively stable for those who are employed. When distinguishing by gender, the distribution of care and housework responsibilities displays a persistent gap over the study period. Hours of unpaid work, which combine care and

housework activities, exhibit persistent "sticky" behaviour, making the analysis of potential sources of variation over time an interesting and non-trivial challenge.

A major caveat is that white individuals from higher income classes tend to be overrepresented in the survey, as suggested by Figure 2. This overrepresentation, which carries over into our sample, may cause the coefficients associated with race/ethnicity dummy variables in the following sections to underestimate the true population-level effects, especially for lower-income and non-white groups. In the absence of alternative time-use data sources for robustness checks, we remain mindful of this limitation throughout the interpretation of the results.

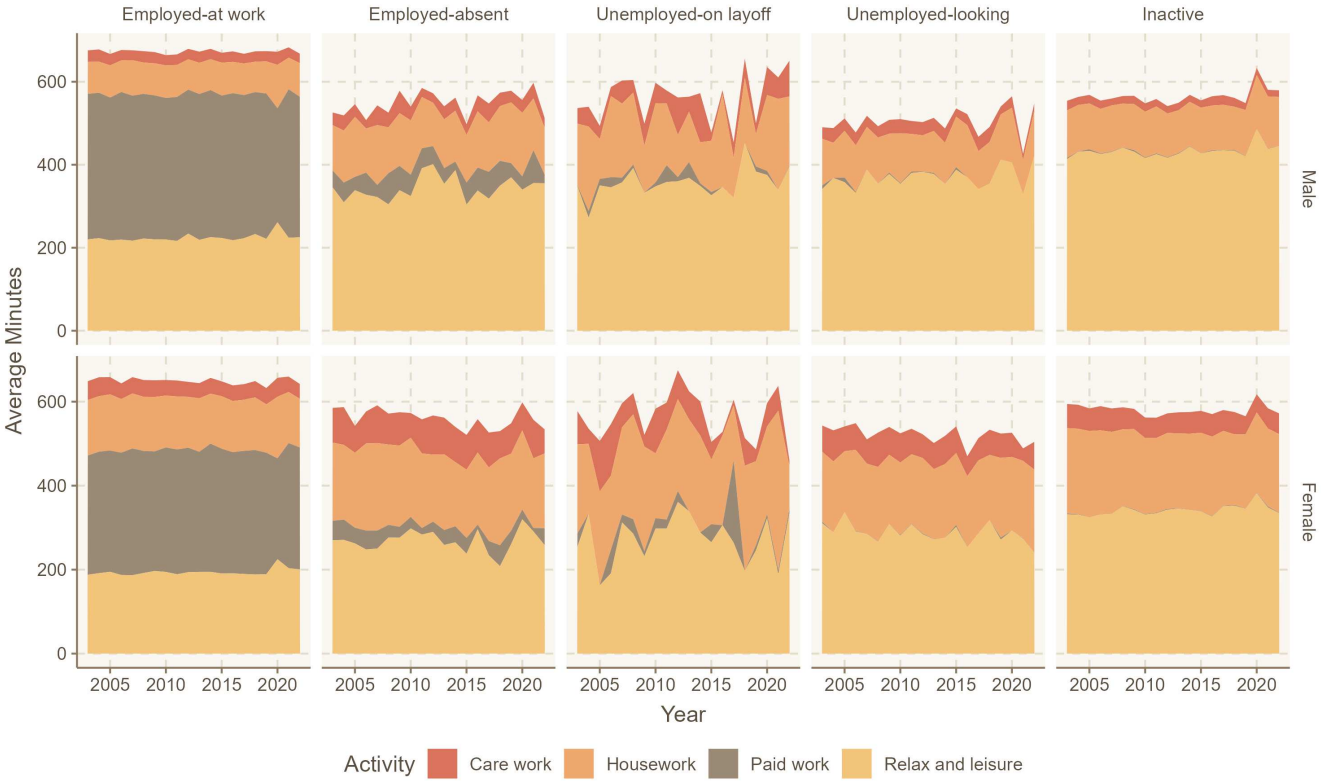
Figure 3, instead, presents the sample composition by income class, gender and labour status. Inactivity is higher among women and, not surprisingly, the higher the incidence of individuals in working activity, the higher their income class. The majority of employed individuals were at work on the day of the survey, which, together with the evidence in Figure 1, justifies our choice of ruling out employed individuals who reported being absent from work. Finally, Figure 4 shows the distribution of time allocation by income class in our final sample. Women perform more unpaid work, while men allocate more time to leisure and work activities. While men's involvement in household production increases with income class, the pattern for women is less straightforward, suggesting more complex dynamics at play.

Table 1: Distribution of Selected Variables for the Initial and Final Years of the Sample

Variable	Mean		SD		90%		50%		10%	
	M	F	M	F	M	F	M	F	M	F
Hours of unpaid work - 2003	1.61	2.32	1.89	2.13	4.25	5.50	1.28	2.00	0.20	0.36
Hours of unpaid work - 2022	1.45	2.00	1.75	2.09	4.00	4.87	1.08	1.66	0.17	0.33
Hours of paid work - 2003	7.90	7.16	3.32	3.00	11.00	9.91	8.00	7.58	2.00	2.00
Hours of paid work - 2022	7.82	7.37	2.98	2.96	10.50	10.16	8.00	7.75	2.52	2.00
Real hourly earnings - 2003	26.03	19.87	16.47	13.28	51.35	37.03	23.11	16.69	10.91	8.99
Real hourly earnings - 2022	27.56	24.52	15.48	14.78	53.86	49.72	25.85	21.54	13.33	12.06

Notes: Earnings are CPI-adjusted to 2017. Table reports summary statistics for females and males in the final sample computed using the ATUS individual weight.

Figure 1: Time Use by Gender and Labour Status



Notes: Average minutes in main time use aggregates by labour status and gender in the total sample. Computation using the ATUS individual weights. Refer to Table A1 in the Appendix for detailed activity codes and aggregation.

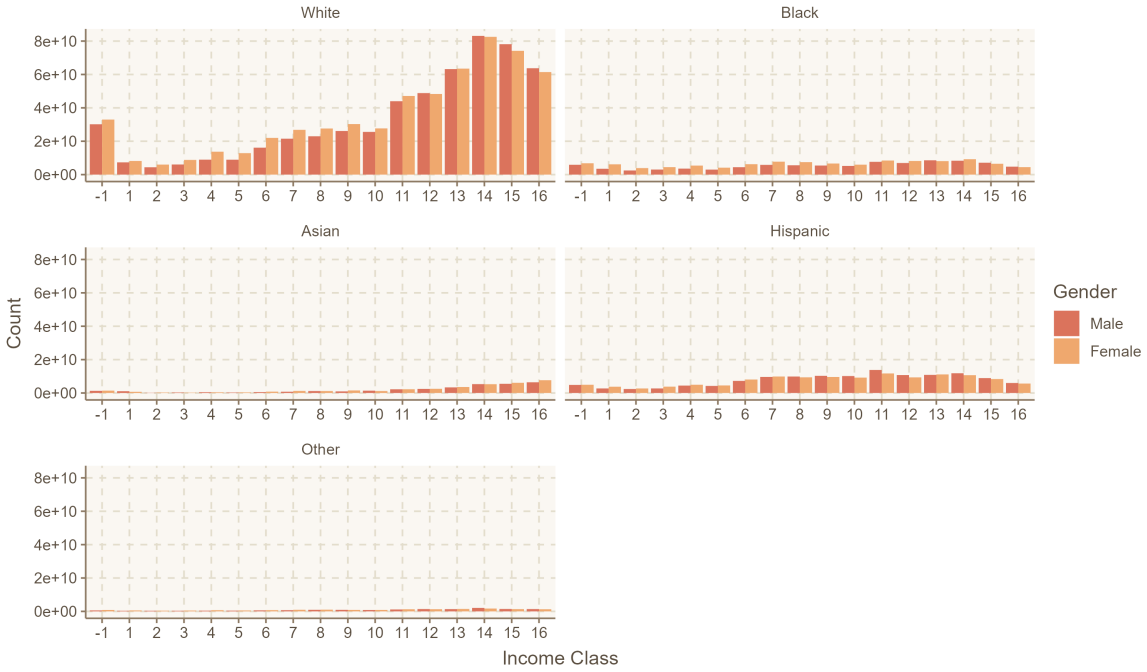
4 Empirical strategy

4.1 Spline functions for non-linear time effects

First, to reconcile cross-sectional evidence with the aim of evaluating the contribution over the years of market and non-market factors, we use restricted (natural) cubic splines to model time effects and allow for their interaction with the covariates. Regression splines represent an extension of polynomials and step functions, providing greater flexibility by dividing the supporting range of X (in our case, time measured in years) into N distinct regions and fitting a polynomial (cubic) function to the data within each region. These polynomials are constrained to meet smoothly at the boundaries, or knots, resulting in a continuous fit across the data range (Witten and James, 2013).

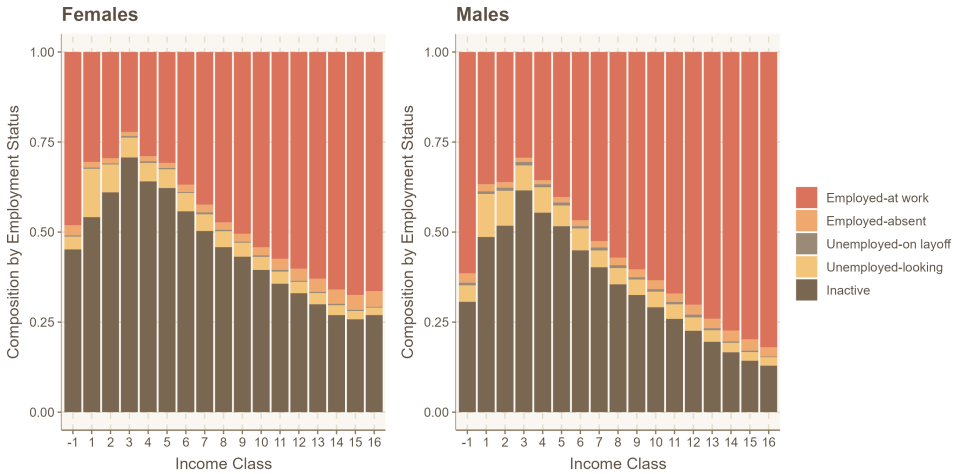
The number of degrees of freedom was chosen according to the Akaike Information Criterion, which in turn determines the number of knots distributed at uniform quantiles of the support of X (at $t = (2003, 2008, 2014, 2022)$). The vector of basis of natural cubic spline $S(t)$ allows to model a potential deviation from linearity and robustness tests for the

Figure 2: Total Sample Composition by Income Class, Gender and Race



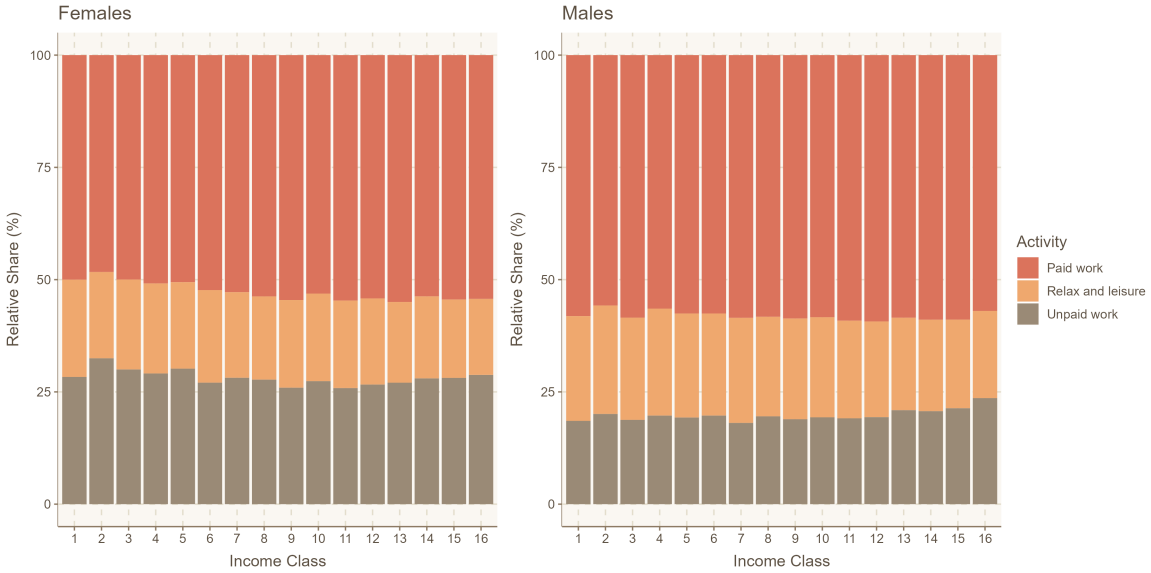
Notes: Barplots show the number of individuals by gender and race/ethnicity within each family income class in the total sample. The ATUS income categories correspond to yearly USD income levels, defined as follows: 1 = Less than $5,000, 2 = $5,000 to $7,499, 3 = $7,500 t$9,999, 4 = $10,000 to $12,499, 5 = $12,500 to $14,999, 6 = $15,000 to $19,999, 7 = $20,000 to $24,999, 8 = $25,000 to $29,999, 9 = $30,000 to $34,999, 10 = $35,000 to $39,999, 11 = $40,000 to $49,999, 12 = $50,000 to $59,999, 13 = $60,000 to $74,999, 14 = $75,000 to $99,999, 15 = $100,000 to $149,999, 16 = $150,000 and over. Individual ATUS weights are applied.

Figure 3: Total Sample Composition by Income Class, Gender and Labour Status



Notes: The stacked barplots show the intra-income class composition by labour status in the total sample. Computation using the ATUS individual weights. Refer to Table A1 in the Appendix for detailed activity codes and aggregation.

Figure 4: Time Use by Gender and Income Class



Notes: The stacked barplots show the relative share of time spent on main activities by gender and income class in the final sample (100 = sum of minutes spent on main activities). Computation using the ATUS individual weights. Refer to Table A1 in the Appendix for detailed activity codes and aggregation.

non-linear specification and the interaction term between time and the vector of covariates are available in the Appendix (Table A4 and A5). The estimated model is the following:

$$\log(y_{it}) = \beta_0 + \boldsymbol{\beta_1}^T \boldsymbol{S}(t) + \sum_{k=1}^{K} X_{kit} \cdot \left(\gamma_k + \boldsymbol{\delta_k}^T \boldsymbol{S}(t)\right) + \epsilon_{it} \tag{1}$$

where

$$\boldsymbol{\beta_1} = \begin{pmatrix} \beta_{11} \\ \beta_{12} \\ \beta_{13} \end{pmatrix}, \quad \boldsymbol{S}(t) = \begin{pmatrix} t - t_0 \\ S_1(t) \\ S_2(t) \end{pmatrix}, \quad \boldsymbol{\delta_k} = \begin{pmatrix} \delta_{k1} \\ \delta_{k2} \\ \delta_{k3} \end{pmatrix}$$

with $t = [2003 : 2022]$ and $t_0 = 2003$.

The dependent variable y is hours of unpaid work and the K covariates include demographic and employment characteristics, such as age, number of children in the household and wage, as well as information related to the industry and occupation in which the individual is employed. Binary information on individual's gender, race, income class, education, region of residence, employment status of the partner and time scheme of employment are included. Table 3 in Section 5 summarizes the main effect of the predictors in model (1). Variance inflation factors to test for multicollinearity among covariates are available in Table A6 of the Appendix.

We then calculate predictions (corresponding to conditional means) for a variety of

typical individuals, and show how these predictions change over time. The information sets used to obtain the results in Section 5 correspond to six different *typified* individuals with chosen characteristics (see Table 2). This enables us to investigate the effect of relevant covariates, with their relevance determined by evidence from the estimation of model (1), and how they affect temporal trends. For example, to analyse the contribution of gender, we predict model (1) using two separate data frames that differ solely by the value of the *gender* dummy variable (for both Type A and Type B in Table 2), while keeping all other covariates constant. The resulting fitted values of unpaid working time, $\hat{y}$, for males and females are then plotted to visualise and analyse the time evolution of unpaid working time.

Each type, from A to F, is defined to represent a distinct profile according to the covariate whose contribution through time is under study. For instance, we focus on white individuals with tertiary education, one child, an unemployed partner, employed full-time in a not particularly racialised or feminised occupation (and industry), from the upper-income class (Type A) and lower-income class (Type B) to study the impact of gender on unpaid work, as well as on Hispanic women from the lower class with two children, secondary education, and employed in a racialised and feminised industry and occupation to study the impact of partner's employment status (Type E). Virtually, the information set can be adjusted to reflect specific characteristics of any category to evaluate the stratified impact of different combination of gender, race, class, household type and working conditions on unpaid work, thus enabling an intersectional perspective.

4.2 Duration model for transitioning out disproportionate unpaid work

After evaluating the contribution over time of well-established factors in the time-use literature, we examine whether these factors can effectively help reduce disproportionate burdens of unpaid work, where disproportion is defined relative to the gender-year median. To address this, we use an Andersen-Gill duration model –a proportional-hazard survival model that accommodates recurrent events and time-varying covariates– to study the time for individuals to transitioning out above-median hours spent on unpaid housework and caregiving.

The persistence of unpaid work hours emphasized in both Figure 1 and 4 suggest, indeed, that individuals may frequently shift into and out of high levels of unpaid work over the 2003-2022 period, rather than experiencing a one-time shift. An Andersen-Gill model can analyse these repeated transitions, capturing the dynamics of when individuals' unpaid work exceeds a threshold, drops below it, and possibly returns above it again. We interpret

Table 2: Information Sets by Type of Individual

	Type A	*Type B*	*Type C*	*Type D*	*Type E*	*Type F*
Gender	–	–	Female	Male	Female	Female
Age	40	40	40	40	40	40
Race/ethnicity	White	White	White	White	Hispanic	White
Education	Tertiary	Tertiary	Tertiary	Tertiary	Secondary	Secondary
N. of household children	1	1	1	1	2	2
Partner labour status	Unemployed	Unemployed	Employed	Employed	–	Employed
Region	Northeast	Northeast	Northeast	Northeast	Northeast	South
Income class	Upper	Lower	–	–	Lower	Medium-upper
Real hourly wage	20	20	20	20	20	20
Ratio of non-white in industry	1/3	1/3	1/3	1/3	1	1
Ratio of non-white in occupation	1/3	1/3	1/3	1/3	1	1
Ratio of female in industry	1/2	1/2	1/2	1/2	1	1
Ratio of female in occupation	1/2	1/2	1/2	1/2	1	1
On part-time scheme	No	No	No	No	No	–
Diary in the weekend	No	No	No	No	No	No

Notes: Information sets used to predict values of the outcome variable based on selected dummy variables. For each type from A to F, a dash (−) indicates the variable whose contribution is under study.

exposure to high levels of unpaid work as an indicator of marginalised socio-economic status (Addati et al., 2018): disproportionate unpaid working time can signal lower bargaining power within the household (intra-household subordination) (Himmelweit et al., 2013) and is often associated with increased sectoral and occupational segregation in the labour market (extra-household division of labour) (Maani and Cruickshank, 2010).

In order to extract a longitudinal information, we transform the pooled individual cross-sectional observations into a pseudo-panel structure, with 306 cohorts, i.e. stable groups of individuals, over 20 years. The cohort is created by combining three categorical variables: gender (2 types), state of residence (51 types), and age class (3 types). The criteria to form a cohort must correspond to characteristics of the individuals that enable a one-to-one partition and that do not change over time (Deaton, 1985). Grouping by age class –based on year of birth– is a standard procedure in pseudo-panel construction due to its time-invariant nature, and this choice is also apt to our setting since it allows to exploit the variability in unpaid work across age groups. The state of residence allows to increase panel size, and to account for different geographical patterns that might emerge at the state level. Finally, as testified by the results discussed in Section 5, gender is emerging as the most relevant

attribute in explaining variability in the distribution of unpaid working time.

The categorisation into age classes is based on the year of birth, where the first class refers to those born in the period 1939-1961, the second to the period 1962-1983, and the third between 1984 and 2004. In the newly generated cohorts, the aggregate values are weighted means of the original values of the individuals belonging to that cohort; as a consequence, those variables qualified as dummy variables in the cross-section become continuous in the pseudo-panel. For instance, the new cohort-specific variables *Black* or *Upper income class* are computed as the weighted mean of the values reported by all individuals belonging to a specific cohort, and read, respectively, as the share of black individuals and the share of individuals of the upper income class in that cohort. However, dummies related to gender and region of residence maintain their status of dichotomous variables also in the pseudo panel, since they can assume either value 100% or 0. Finally, since within each age class there can be individuals with different ages, the variable *Age* is included as continuous predictor in the specification of the duration model.

The counting process model of Andersen-Gill (AG), also known as the Cox-Aalen model or the extended Cox model, generalizes the Cox proportional hazards with the purpose of analyzing time-to-event data where individuals can experience multiple events over time. As already specified, the Andersen-Gill model is useful when dealing with time-varying covariates and recurrent events since it allows for the analysis of the hazard of experiencing an event, while accounting for previous events that an individual may have experienced (Andersen and Gill, 1982; Amorim and Cai, 2015).

The hazard of cohort i to experience an event at time t is modeled as

$$\lambda_i(t) = \lambda_0(t) exp(\boldsymbol{\beta} X_i(t))$$

where $\lambda_0(t)$ refers to a common baseline hazard. The vector of coefficients $\boldsymbol{\beta}$ is estimated by maximising the partial likelihood-function

$$L(\boldsymbol{\beta}) = \prod_{i=1}^{n} \left(\frac{exp(\boldsymbol{\beta} X_i(t))}{\sum_{l \in R^{AG}(T_i)} exp(\boldsymbol{\beta} X_l)} \right)^{\delta_i}$$

where T_i are the cohort-specific event times, δ_i is the event indicator (1 or 0), the risk set R^{AG} indicates the number of cohorts at risk for the event just prior to time t.

The event we are interested in is the ending of disproportionate exposure to unpaid work, and it may in principle occur multiple times over the period for the same cohort. To be more specific, each cohort at each point in time is assigned a value of 1 to the event dummy

if the daily minutes of unpaid work are less to the yearly median value of the same gender cohorts. Therefore, median values used as a benchmark for the specification of the event are gender- and year-specific. Synthetically:

$$\begin{cases} y_{itg} < \text{med}(y_{gt}) \longrightarrow \text{event} = 1, & \text{where } g \in \{\text{female, male}\} \text{ and } t \in [2003 : 2022] \\ y_{itg} \geq \text{med}(y_{gt}) \longrightarrow \text{event} = 0. \end{cases}$$

The Andersen-Gill duration model uses the same time-varying covariates of the cross-sectional estimates, albeit the interpretation of their coefficients slightly changed, as disclaimed before. In what follows, the sample used to fit the duration model is restricted to female observations and a summary of the number and duration of events experienced by our new female-only sample by income class is available in Table A3. The assumption of hazard proportionality, to employ the AG model, is checked through the Schoenfeld test: for each covariate and globally for the whole model, the correlation between the corresponding Schoenfeld residuals and time is non-significant, supporting the assumption that there is no time-dependency in the probability of an event occurring.

5 Results

The estimates of the coefficients γ_k for model (1) are summarized in Table 3. Race/ethnicity does not seem to exert key effects: with respect to the benchmark variable *white* only the dummy *black* coefficient is significantly different, and pointing at a lighter household production. This result is in line with recent evidence (Hess et al., 2020), but can also in part be attributable to the structure of data collection, shown in Figure 2, where it is visible the under-representation of non-white individuals.

Individuals residing in the Midwest or Northeast states appear to spend more hours on household activities compared to those in Western U.S., although coefficients are weakly significant. This result is at odd with studies that indicate a strong and persistent link between national welfare state systems, even among U.S. states, and individual time use patterns (Razavi, 2007; Sen, 2023), pointing at the insufficiency for regional dummies to capture this effect. The penalty associated to tertiary education (the omitted category for education in Table 3), is, instead, in line with recent U.S. data (Hess et al., 2020), pointing out that many low-wage workers juggle more than one job to make ends meet, leaving limited time for household responsibilities and family care. Furthermore, low-wage jobs often lack paid time off (U.S. Department of Labor, Bureau of Labor Statistics, 2019), which restricts

workers' ability to address family members' needs.

In line with expectations, non-market factors such as gender and household type play a major role. Being in a couple –whether one's partner is employed or not – is associated with a boosting effect for hours of unpaid work compared to single individuals, all else being equal, as well as each additional child increases the caregiving burden.

Among market factors, working part-time reflects higher non-market work. While the data do not allow us to disentangle between voluntary and involuntary part-time employment, this result underscores the close relationship between part-time work and household responsibilities (Budig et al., 2012; Goldin and Katz, 2016). In line with findings on higher outcome values for individuals with higher education levels, Table 3 shows that higher wages, possibly associated with greater job flexibility, lead to more time spent on household tasks. In neoclassical terms, such result can be rationalised as the prevalence of the income effect over the substitution effect: once hourly wages exceed a certain threshold, individuals tend to spend less hours in paid activities and to possibly reallocate some of this time to household activities. But the most interesting result concerns income classes, where higher income levels reflect the ability to purchase housework and care services on the market. Thus, it is not surprising that individuals from middle- to upper-income households report lower unpaid burdens than those in the lower-income reference category. What is more, this effect is progressive across income levels, with upper-income households experiencing the greatest reduction in unpaid labour – a trend consistent with recent evidence on the privilege of outsourcing household work among the upper class (Small, 2023; Fields et al., 2024).

To understand the influence of gender, family income class, working time scheme, and partner's occupational status on unpaid time allocation, and its evolution through time, Figures 5, 6, 7, 8 display the fitted values of model (1) for different types of individuals. Type A and Type B are used to assess the contribution of gender and its interaction with class in Figure 5. As outlined in Table 2, these types describe 40-year-old, white, degree-holding individuals earning an average salary, with one child, an unemployed partner and a full-time job in not particularly racialised nor feminised industries and occupations (one-third non-white workers and half women workers). The presence of a child and the unemployed partner allows us to evaluate the supply of unpaid work among working individuals exposed to high dependency factors.

In Figure 5 we see that for both income classes, the predicted mean of log hours of unpaid work shows a strong and persistent gender gap in time use. Class dimension, as expected, influences time allocation: the predicted mean of log unpaid work hours for

Table 3: Main Effects from Model (1)

	Coefficient (γ)
Age	0.009^{***}
	(0.002)
Log(real hourly wage)	0.166^{***}
	(0.037)
Number of children < 12	0.357^{***}
	(0.015)
Female	0.527^{***}
	(0.043)
Black	-0.124^{*}
	(0.059)
Asian	0.031
	(0.091)
Hispanic	0.052
	(0.055)
Middle lower income class	-0.146^{**}
	(0.051)
Middle upper income class	-0.187^{***}
	(0.044)
Upper income class	-0.334^{***}
	(0.067)
Midwest	0.106^{*}
	(0.046)
South	0.031
	(0.044)
Northeast	0.121^{*}
	(0.050)
Employed partner	0.344^{***}
	(0.038)
Unemployed partner	0.169^{**}
	(0.053)
Survey in the weekend	0.361^{***}
	(0.046)
Non-white share in the industry of employment	0.153
	(0.120)
Non-white share in the occupation of employment	0.165 .
	(0.100)
Female share in the industry of employment	0.069
	(0.078)
Female share in the occupation of employment	-0.064
	(0.069)
Primary education	-0.290^{***}
	(0.065)
Secondary education	-0.069 .
	(0.037)
Part-time	0.242^{***}
	(0.046)
Adjusted $R^2 = 0.141$	

Notes: The table summarizes the average impact of each predictor on log hours of unpaid work, with standard errors in parentheses. The reference categories are: *White* for race, *Lower income class* for income, *West* for region, *Single* for relationship status, and *Tertiary education* for education level. Income classes are defined with respect to the yearly family income: Upper income class (>$100,000), Middle upper income class ($40,000–$100,000), Middle lower income class ($20,000–$40,000), Lower income class (<$20,000). Significance levels: *** at 0.1%, ** at 1%, * at 5%, and . at 10%. Observations are weighted using ATUS weights.

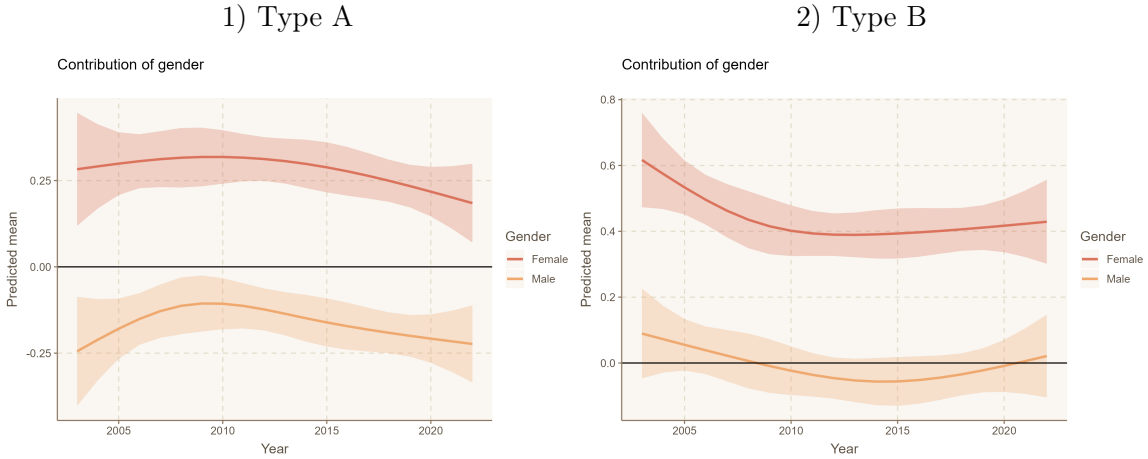
lower-income women ranges between 0.6 and 0.4, corresponding to approximately 4 to 2.5 hours per day, while it ranges around 0.25, or roughly 1.7 hours, for upper-class women. This evidence confirms that unpaid work time correlates strongly with economic status, with stratification by income reflecting economic necessity rather than individual preferences. Over time, for higher-income individuals the spline function describing the predicted mean is hump-shaped (Figure 5 subfigure 1), pointing at a reduction starting around 2010, while for poorer individuals the predicted mean shows a slight U-shaped trend over time (Figure 5 subfigure 2). Non-trivial interactions with the macroeconomic context of the 2007-2009 Great Recession and subsequent austerity measures targeting childcare services (Urban Institute, 2020) could be driving the increased burden on individuals unable to outsource household duties. However, testing this hypothesis falls outside the scope of our research.

Type C and D share the same characteristics of Type A and B, except now being in a couple with an employed partner. They are chosen for evaluating the contribution of the entire income class structure, as shown in Figure 6, now split into four categories. Type C represents females, while Type D represents males: again, level differences in y by gender are stark (compare the y-axis range between subfigure 1 and 2) despite similar dynamics. Women in the medium-lower class have experienced a plateau in household production after 2010 (blue line), while for lower classes the U-shaped pattern and overall higher involvement in unpaid household activities is confirmed, across both genders.

Next, we focus on the relative impact of the labour status of the partner. Type E represents Hispanic females with two dependent children, a high school diploma, employed in a racialised and feminised occupation and industry, belonging to the lower class, aiming to capture characteristics of marginalised individuals. Figure 7 plots the regressive effect of being in a couple versus being single for these women. Despite a decrease through time in hours of unpaid work, having another adult in the household implies a greater total work burden, *ceteris paribus*.

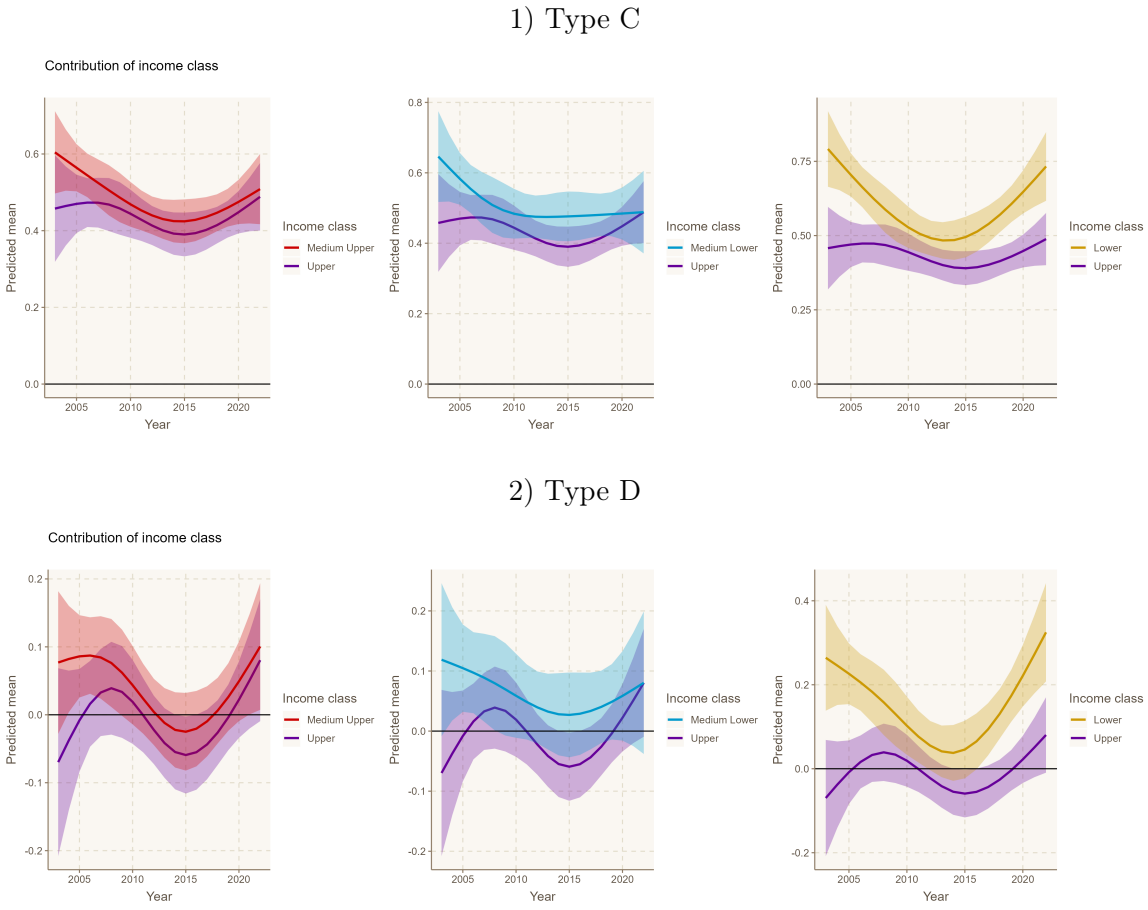
Finally, the information set of Type F is used for studying the contribution of working time schemes. Type F represents a white woman from the medium-upper class living in the Southern U.S., with secondary education and two children. This profile aims to match someone who might ask voluntarily for a part-time contract, given her class status and family responsibilities. Figure 8 shows that household production for those in part-time work had little variations over the years, whereas full-time workers of Type F experienced an upward trend prior to 2007 and after 2015. In this respect, part-time and full-time status appear to progressively correlate more similarly with unpaid working activities.

Figure 5: Mean Differences in Log Hours of Unpaid Work by Gender and Income Class



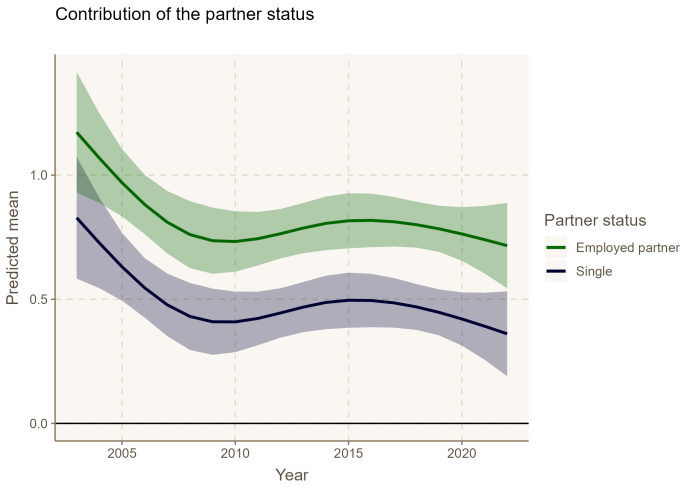
Notes: Predicted mean of log hours of unpaid work for chosen individual types that differ by income class only. Refer to Table 2 for details. Observations are weighted using ATUS weights.

Figure 6: Mean Differences in Log Hours of Unpaid Work by Gender and Detailed Income Class



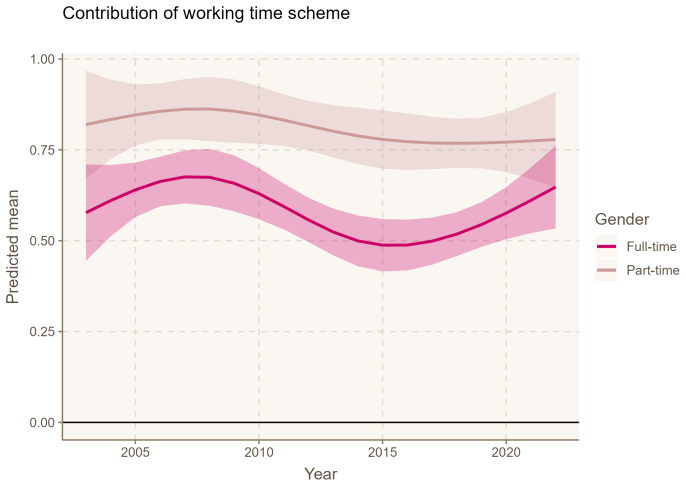
Notes: Predicted mean of log hours of unpaid work for chosen individual types that differ by gender only. Refer to Table 2 for details. Observations are weighted using ATUS weights.

Figure 7: Mean Differences in Log Hours of Unpaid Work by Partner's Employment Status



Notes: Predicted mean of log hours of unpaid work for Type E. Refer to Table 2 for details. Observations are weighted using ATUS weights.

Figure 8: Mean Differences in Log Hours of Unpaid Work by Working Time Scheme



Notes: Predicted mean of log hours of unpaid work for Type F. Refer to Table 2 for details. Observations are weighted using ATUS weights.

Referring now to the panel exercise detailed in Section 4.2, Table 4 presents the results of the Andersen-Gill model, estimated with the same set of predictors as model (1) and where the event is defined as exiting above-median hours of unpaid work. Most regressors that exerted a positive influence (i.e. reducing effect) on hours of unpaid work in model (1), seem to be ineffective in facilitating women's transition out of disproportionate household activities. Household dependence relationships, such as having dependent children and a partner employed, negatively influence the probability of transitioning out. Working full-time, representing the baseline for the hazard ratio of the part-time scheme dummy, increases the probability of rebalancing unpaid work, being the part-time coefficient weakly significantly

negative.

Consistent with the cross-sectional findings, hourly wages exert a negative influence on the exit probability, due to their positive relation with unpaid labour supply. However, the coefficient is not statistically significant. Even belonging to the higher income class is not enough to exit from disproportionate exposure: all income-related variables report non-significant coefficients, although from the estimation of model (1) we know that higher the income class the lower the incidence of unpaid work. The sole positive association with exit probability is residing in the Southern region; all else being equal, women in the South face a higher likelihood of transitioning out. Although this result may look unexpected, given that Southern states generally have lower GDP per capita, lower minimum wages, and less developed social policies, it aligns with the hourly real wage and the primary education coefficients: lower hourly earnings and low education might incentivise more hours spent in the labour market, consequently leading to fewer hours spent in household activities.

Overall, the findings from both empirical exercises reaffirm the disproportionate burden of unpaid household labour borne by low-income women compared to their higher-income counterparts. However, socio-economic status alone is insufficient to fully mitigate the gender penalty, nor are there market or non-market mechanisms within our analysis currently capable of effectively counterbalancing it, with the sole exception being full-time employment.

Table 4: Survival Model on the Pseudo-Panel of Employed Women

	Andersen-Gill model	
	Estimate	Hazard Ratio
Age	-0.003	0.997
	(0.003)	
Log(real hourly wage)	-0.129	0.879
	(0.121)	
Number of children	−0.497***	0.609
	(0.066)	
Black	-0.254	0.776
	(0.207)	
Asian	0.107	1.113
	(0.381)	
Hispanic	0.092	1.096
	(0.022)	
Middle lower income class	0.210	1.234
	(0.203)	
Middle upper income class	−0.068	0.934
	(0.171)	
Upper income class	0.021	1.021
	(0.211)	
Midwest	0.105	1.110
	(0.088)	
South	0.243**	1.276
	(0.089)	
Northeast	0.002	1.002
	(0.100)	
Employed partner	−0.380**	0.684
	(0.141)	
Unemployed partner	-0.147	0.863
	(0.271)	
Survey in the weekend	−0.552***	0.576
	(0.159)	
Non-white share in the industry of employment	0.682 .	1.978
	(0.397)	
Non-white share in the occupation of employment	−0.839*	0.432
	(0.372)	
Female share in the industry of employment	−0.145	0.865
	(0.312)	
Female share in the occupation of employment	0.177	1.193
	(0.269)	
Primary education	−0.000	1.000
	(0.200)	
Secondary education	−0.108	0.897
	(0.137)	
Part-time	−0.385*	0.681
	(0.152)	
Observations	3060	
Method	Efron	
Cluster (cohort)	Yes	
Concordance	0.628	
LR test	104.7***	

Notes: This table summarizes the average impact of each predictor on the log of hours spent on unpaid work, with standard errors reported in parentheses. A hazard ratio greater than 1 indicates that the predictor positively contributes to the likelihood of experiencing the event, i.e. exiting disproportionate household production. Observations are weighted using ATUS weights.

6 Concluding remarks

Time allocation has gained the interest of the economic discipline primarily as a problem of rational choice and individual preferences. However, how the 24 hours are allocated between paid work, leisure, caregiving, and domestic responsibilities can be more fruitfully understood as the outcome of the stratification of socio-economic drivers; primarily the intra-household division of labour, which is largely affected by the presence of dependent individuals (partners, children and parents) and shaped by context-dependent social norms, but also the market division of labour along gender and race lines.

In this study, we aimed to address the problem of time allocation in the U.S. by focusing on the aggregate of unpaid work. Our interest lies in understanding the influence of both market and non-market variables on the supply of housework and care work over time. By subsampling the ATUS-CPS 2003-2022 to include only employed individuals, we estimate a model where the covariates interact with time effects through restricted cubic splines. This approach allows us to assess the evolving contributions of each specific factor while accounting for structural changes occurring over two decades, mostly due to demographic shifts, marketisation of care services and economic crises.

In line with an intersectional perspective accounting for gender and class status, the evidence suggests an increasing relevance of the class dimension in explaining individual provision of house- and carework, particularly for those in the lowest income class, who face more time constraints than those in upper echelons, especially after the 2008 recession.

The second question we address is more restrictive and pertains to the factors that facilitate the exit from conditions of excessive hours spent on unpaid working activities for women. We create a pseudo-panel dataset and use an Andersen-Gill regression to model the time to the end of disproportionate unpaid work at the individual level. Interestingly, the set of important predictors is reduced: even high class status is insufficient for women to correct such imbalance, and the detrimental effects of household type (number of children and partner employment) and part-time work exacerbate time constraints, reducing the probability of exit.

Our work has implications for feminist, labour and macroeconomics. By drawing on the most extensive dataset on the use of time, we provide empirical support for the importance of an intersectional perspective which integrates over-exposure to the risk of time poverty with socio-material deprivation and intra-household division of labour. This perspective is, indeed, fruitful for linking gender and class studies. In addition, we mobilise at our best the information on race, and do find evidence of over-exposure to the risk of time poverty for

women working part-time in segregated, racialised occupations.

In terms of labour economics, we advance beyond the standard rational choice theory framework and propose a flexible model to study the provision of unpaid work for different types of individuals with a given set of market and non market attributes. Intra-employment status variability, such as that based on gender, income class and working time scheme, proves to be key to disentangling the shaping forces at play.

Macroeconomic implications derive from the failure to account for unpaid working time as a potential driver for job creation, and for the general undervaluation of the importance of care jobs (Cresti and Virgillito, 2022). Given that much of care work is still silently performed within households, the actual needs and prospective demands for care jobs are underestimated. Plus, given the stratification by income class, it becomes evident that access to professional figures of the care sector is more an exception for high-income households rather than a norm for the whole population. This evidence calls for a deep reconsideration of the role of the welfare state as a provider of care jobs (Nelli and Virgillito, 2023), and also of the role of social spending as a channel to reduce time and care burdens, allowing for a redistribution of time to other activities.

References

Acker, J. (2006). Inequality regimes: Gender, class, and race in organizations. *Gender & society*, 20(4):441–464.

Addati, L., Cattaneo, U., Esquivel, V., and Valarino, I. (2018). *Care work and care jobs for the future of decent work*. International Labour Organisation (ILO).

Aguiar, M., Hurst, E., and Karabarbounis, L. (2012). Recent developments in the economics of time use. *Annu. Rev. Econ.*, 4(1):373–397.

Aguiar, M., Hurst, E., and Karabarbounis, L. (2013). Time use during the great recession. *American Economic Review*, 103(5):1664–1696.

Amanor-Boadu, V. (2022). Empirical evidence for the "great resignation". *Monthly Labor Review*.

Amorim, L. D. and Cai, J. (2015). Modelling recurrent events: a tutorial for analysis in epidemiology. *International journal of epidemiology*, 44(1):324–333.

Andersen, P. K. and Gill, R. D. (1982). Cox's regression model for counting processes: a large sample study. *The annals of statistics*, pages 1100–1120.

Antonopoulos, R. and Memis, E. (2010). Time and poverty from a developing country perspective. *Levy Economics Institute Working Paper*.

Becchio, G. et al. (2018). Gender, feminist and heterodox economics: Interconnections and differences in a historical perspective. *Economic Alternatives*, 12(1):5–24.

Becker, G. S. (1965). A theory of the allocation of time. *The economic journal*, 75(299):493–517.

Becker, G. S. (1976). *The economic approach to human behavior*, volume 803. University of Chicago press.

Bettio, F. and Plantenga, J. (2004). Comparing care regimes in europe. *Feminist economics*, 10(1):85–113.

Bettio, F., Simonazzi, A., and Villa, P. (2006). Change in care regimes and female migration: the 'care drain'in the mediterranean. *Journal of European social policy*, 16(3):271–285.

Brennan, D., Cass, B., Himmelweit, S., and Szebehely, M. (2012). The marketisation of care: Rationales and consequences in nordic and liberal care regimes. *Journal of European social policy*, 22(4):377–391.

Budig, M. J., Misra, J., and Boeckmann, I. (2012). The motherhood penalty in cross-national perspective: The importance of work–family policies and cultural attitudes. *Social Politics*, 19(2):163–193.

Cacciatore, M., Gnocchi, S., and Hauser, D. (2024). Time use and macroeconomic uncertainty. *Review of Economics and Statistics*, pages 1–36.

Cetrulo, A., Guarascio, D., and Virgillito, M. E. (2024). Two neglected origins of inequality: hierarchical power and care work. Technical report, LEM Working Paper Series.

Christiansen, I. (2017). Commodification of healthcare and its consequences. *World Review of Political Economy*, 8(1):82–103.

Colato, J. and Ice, L. (2023). Industry and occupational employment projections overview and highlights, 2022–32. *Monthly Labor Review*.

Cresti, L. and Virgillito, M. E. (2022). Strategic sectors and essential jobs: a new taxonomy based on employment multipliers. *Available at SSRN 4215798*.

Darity Jr, W. A., Hamilton, D., and Stewart, J. B. (2015). A tour de force in understanding intergroup inequality: An introduction to stratification economics. *The Review of Black Political Economy*, 42(1-2):1–6.

Davis, A. (1983). *Women, Race & Class*. Vintage.

Deaton, A. (1985). Panel data from time series of cross-sections. *Journal of econometrics*, 30(1-2):109–126.

Dosi, G., Fanti, L., and Virgillito, M. E. (2024). Attributes and trends of rentified capitalism. *Italian Economic Journal*, pages 1–23.

Erhel, C. and Guergoat-Larivière, M. (2013). Labor market regimes, family policies, and women's behavior in the eu. *Feminist Economics*, 19(4):76–109.

Fields, D. M., Strenio, J., Mackett, O., and Buder, I. (2024). For whom does one toil? time use differentials, social reproduction, and occupational prestige. In *Forum for Social Economics*, pages 1–22. Taylor & Francis.

OECD (2024). Old-age dependency ratio. data retrieved from OECD Data Explorer, https://data-explorer.oecd.org/?lc=en.

Folbre, N. (2020). Manifold exploitations: toward an intersectional political economy. *Review of Social Economy*, 78(4):451–472.

Folbre, N. (2021a). Gender inequality and bargaining in the us labor market. *Economic Policy Institute*.

Folbre, N. (2021b). *The rise and decline of patriarchal systems: An intersectional political economy*. Verso Books.

Fraser, N. (2016). Contradictions of capital and care. *New Left Review*, 100.

Freeman, C. (2019). History, co-evolution and economic growth. *Industrial and Corporate Change*, 28(1):1–44.

Freeman, R. B. and Schettkat, R. (2005). Marketization of household production and the eu–us gap in work. *Economic policy*, 20(41):6–50.

Gálvez-Muñoz, L., Rodríguez-Modroño, P., and Domínguez-Serrano, M. (2011). Work and time use by gender: a new clustering of european welfare systems. *Feminist Economics*, 17(4):125–157.

Gautham, L., Folbre, N., and Smith, K. (2023). Earnings inequality and the expansion of care services in the united states, 1985–2019. *Industrial Relations Journal*.

Goldin, C. (2021). *Career and family: Women's century-long journey toward equity*. Princeton University Press.

Goldin, C. and Katz, L. F. (2016). A most egalitarian profession: pharmacy and the evolution of a family-friendly occupation. *Journal of Labor Economics*, 34(3):705–746.

Gronau, R. (1977). Leisure, home production, and work–the theory of the allocation of time revisited. *Journal of political economy*, 85(6):1099–1123.

Grossbard-Shechtman, S. (2001). The new home economics at colombia and chicago. *Feminist Economics*, 7(3):103–130.

Grusky, D. and Hill, J. (2018). *Inequality in the 21st century: A reader*. Routledge.

Hess, C., Ahmed, T., and Hayes, J. (2020). Providing unpaid household and care work in the united states: Uncovering inequality. *Institute for Women's Policy Research. January*.

Himmelweit, S., Santos, C., Sevilla, A., and Sofer, C. (2013). Sharing of resources within the family and the economics of household decision making. *Journal of Marriage and Family*, 75(3):625–639.

Kyrk, H. (1923). *A theory of consumption*, volume 25. Boston: Houghton Mifflin, Company.

Kyrk, H. (1933). *Economic problems of the family*. Harper brothers.

Levanon, A. and Grusky, D. B. (2016). The persistence of extreme gender segregation in the twenty-first century. *American Journal of Sociology*, 122(2):573–619.

Maani, S. A. and Cruickshank, A. A. (2010). What is the effect of housework on the market wage, and can it explain the gender wage gap? *Journal of Economic Surveys*, 24(3):402–427.

Massey, D. S. (1990). American apartheid: Segregation and the making of the underclass. *American journal of sociology*, 96(2):329–357.

Michel, S. and Peng, I. (2012). All in the family? migrants, nationhood, and care regimes in asia and north america. *Journal of European Social Policy*, 22(4):406–418.

Mincer, J. (1962). Labor force participation of married women: A study of labor supply. In *Aspects of labor economics*, pages 63–105. Princeton University Press.

Nelli, L. and Virgillito, M. E. (2023). More than a she-recession. long-term feminization and short-term pandemic effects. *SINAPPSI*, pages 25–60.

Ngai, L. R., Olivetti, C., and Petrongolo, B. (2024). Gendered change: 150 years of transformation in us hours. Technical report, National Bureau of Economic Research.

Olivetti, C. and Petrongolo, B. (2017). The economic consequences of family policies: lessons from a century of legislation in high-income countries. *Journal of Economic Perspectives*, 31(1):205–230.

Razavi, S. (2007). The political and social economy of care in a development context: Conceptual issues, research questions and policy options. *United Nations Research Institute for Social Development*.

Reid, M. G. (1934). *Economics of household production*. New York: John Wiley sons, Inc.

Sen, A. (2023). The impact of austerity on gender inequality in time allocation in the united states. *Washington Center for Equitable Growth*.

Small, S. F. (2023). The political economy of hegemonic masculinity: Race, income, and housework in the united states. *Review of Radical Political Economics*, 55(1):26–46.

Small, S. F. (2024). What is a feminist quantitative method? opportunities for feminist econometrics. *Feminist Economics*, pages 1–22.

Thompson, E. P. (1967). Time, work-discipline, and industrial capitalism. *Past and Present*, (38):56–97.

Urban Institute (2020). The great recession's lessons on state and local aid's importance in combating an economic downturn and supporting children.

U.S. Department of Labor, Bureau of Labor Statistics (2019). Employee benefits survey. Accessed November 27, 2019.

Van Hooren, F. J. (2012). Varieties of migrant care work: Comparing patterns of migrant labour in social care. *Journal of European Social Policy*, 22(2):133–147.

Vickery, C. (1977). The time-poor: A new look at poverty. *Journal of human Resources*, pages 27–48.

von Tunzelmann, G. N. (1995). Time-saving technical change: the cotton industry in the english industrial revolution. *Explorations in Economic History*, 32(1):1–27.

Williams, F. (2021). *Social policy: A critical and intersectional analysis*. John Wiley & Sons.

Witten, D. and James, G. (2013). *An introduction to statistical learning with applications in R*. springer publication.

Yi, Y.-A. (1996). Margaret g. reid: life and achievements. *Feminist Economics*, 2(3):17–36.

Zacharias, A., Antonopoulos, R., and Masterson, T. (2012). Why time deficits matter: Implications for the measurement of poverty. *Informe de Proyecto de Investigación. Programa de las Naciones Unidas para el Desarrollo (UNDP)/Levy Economics Institute of Bard College*.

Appendix

.1 Detailed activity codes and additional descriptive statistics

Table A1: Summary of the 2-digit, 4-digit, and 6-digit ATUS 2003-2022 Activity Codes included in the analysis. Unpaid work (02, 07, 03, 04), housework (02, 07), care work (03, 04), paid work (05), relax and leisure (1203)

02 Household Activities	
Code	**Activity**
0201	Housework
	020101 Interior cleaning
	020102 Laundry
	020103 Sewing, repairing, maintaining textiles
	020104 Storing interior household items, including food
0202	Food and Drink Preparation, Presentation, and Clean-up
	020201 Food and drink preparation
	020102 Food presentation
	020103 Kitchen and food clean-up
	020199 Food and drink preparation, presentation, and clean-up n.e.c.
0203	Interior Maintenance, Repair, and Decoration
	020301 Interior arrangement, decoration, and repairs
	020302 Building and repairing furniture
	020303 Heating and cooling
	020399 Interior maintenance, repair, and decoration n.e.c.
0204	Exterior Maintenance, Repair, and Decoration
	020401 Exterior cleaning
	020402 Exterior repair, improvements, and decoration
	020499 Exterior maintenance, repair, and decoration n.e.c.
0205	Lawn, Garden, and Houseplants
	020501 Lawn, garden, and houseplant care
	020502 Ponds, pools, and hot tubs
	020599 Lawn and garden n.e.c.
0209	Household Management
	020901 Financial management
	020902 Household and personal organization and planning
	020903 Household and personal mail and messages (except e-mail)
	020904 Household and personal e-mail and messages
	020905 Home security
	020999 Household management n.e.c.
07 Consumer Purchases	
0701	Shopping (Store, Telephone, Internet)
	070101 Grocery shopping
	070102 Purchasing gas
	070103 Purchasing food (not groceries)
	070104 Shopping, except groceries, food, and gas
	070105 Waiting associated with shopping
	070199 Shopping n.e.c.
03 Caring For and Helping Household Members	
0301	Caring For and Helping Household Children
	030101 Physical care for household children
	030102 Reading to/with household children

	030103 Playing with household children, not sports
	030104 Arts and crafts with household children
	030105 Playing sports with household children
	030106 Talking with/listening to household children
	030108 Organization and planning for household children
	030109 Looking after household children (primary activity)
	030110 Attending household children's events
	030111 Waiting for/with household children
	030112 Picking up/dropping off household children
	030199 Caring for and helping household children n.e.c.
	030301 Providing medical care to household children
0302	Activities Related to Household Children's Education
	030201 Homework (household children)
	030202 Meetings and school references (household children)
	030203 Home schooling of household children
	030204 Waiting associated with household children's education
	030299 Education-related activities for household child n.e.c.
0303	Activities Related to Household Children's Health
	030302 Obtaining medical care for household children
	030303 Waiting associated with household children's health
	030399 Health-related activities for household child n.e.c.

04 Caring For and Helping Nonhousehold Members

0401	Caring For and Helping Nonhousehold Children
	040101 Physical care for nonhousehold children
	040102 Reading to/with nonhousehold children
	040103 Playing with nonhousehold children, not sports
	040104 Arts and crafts with nonhousehold children
	040105 Playing sports with nonhousehold children
	040106 Talking with/listening to nonhousehold children
	040108 Organization and planning for nonhousehold children
	040109 Looking after nonhousehold children (primary activity)
	040110 Attending nonhousehold children's events
	040111 Waiting for/with nonhousehold children
	040112 Picking up/dropping off nonhousehold children
	040199 Caring for and helping nonhousehold children n.e.c.
0402	Activities Related to Nonhousehold Children's Education
	040201 Homework (nonhousehold children)
	040202 Meetings and school references (nonhousehold children)
	040203 Home schooling of nonhousehold children
	040204 Waiting associated with nonhousehold children's education
	040299 Education-related activities for nonhousehold child n.e.c.
0403	Activities Related to Nonhousehold Children's Health
	040301 Providing medical care to nonhousehold children
	040302 Obtaining medical care for nonhousehold children
	040303 Waiting associated with nonhousehold children's health
	040399 Health-related activities for nonhousehold child n.e.c.

05 Work and Work-Related Activities

0501	Working
	050101 Work, main job
	050102 Work, other job(s)
	050103 Security procedures related to work
	050189 Working n.e.c.

12 Socializing, Relaxing, and Leisure	
1203	Relaxing and Leisure
	120301 Relaxing, thinking
	120302 Tobacco and drug use
	120303 Television and movies (non-religious)
	120304 Religious television
	120305 Listening to the radio
	120306 Listening to/playing music (not radio)
	120307 Playing games
	120308 Computer use for leisure (excluding games)
	120309 Arts and crafts as a hobby
	120310 Collecting as a hobby
	120311 Reading for personal interest
	120312 Writing for personal interest
	120313 Relaxing and leisure n.e.c.

Table A2: Total Sample Percentage Composition by Gender and Race/Ethnicity (Gender = 100%)

	White	*Black*	*Asian*	*Hispanic*	*Other*
Female	67.14	12.41	4.15	14.44	1.86
	(63.72 - 72.66)	(11.78 - 16.36)	(2.22 - 5.15)	(10.90 - 15.25)	(1.433 - 2.20)
Male	67.34	11.00	4.05	15.74	1.86
	(65.10 - 74.54)	(8.90 - 13.70)	(2.66 - 5.96)	(11.35 - 16.24)	(1.37 - 2.16)

Notes: Percentage composition of the total sample. Range of variation over the years in parenthesis.

Table A3: Incidence and Duration of The Event (= End of Disproportionate Unpaid Hours) by Income Class in the Female-Only Pseudo-Panel Sample

	Mean(# events)	*SD(# events)*	*Weighted.mean(duration)*	*Weighted.sd(duration)*
Upper income	2	2	1.92	1.83
Medium upper income	3	2.65	1.79	2.25
Medium lower income	3.33	0.58	1.82	0.74
Lower income	3.33	1.53	1.25	0.83

Notes: Mean and standard deviation of the number of events and duration by income class. The female-only pseudo panel sample represents 153 cohorts (or individuals). Duration is expressed in years.

.2 Robustness checks

Table A4: Anova Test For Non-Linearity in Time for Model (1)

	Res.Df	*RSS*	*Df*	*F*	*Pr(>F)*
1	58676	6.41e+11			
2	58628	6.39e+11	48	2.60	1.00e-08***

Notes: Anova test comparing model (1) with a model where $\beta_{12} = \beta_{13} = 0 \ \wedge \ \delta_{k2} = \delta_{k3} = 0 \ \forall k$ (null hypothesis), meaning linear in time. Significance levels: *** at 0.1%, ** at 1%, * at 5%, and . at 10%.

Table A5: Anova Test for the Interaction Term in Model (1)

	Res.Df	*RSS*	*Df*	*F*	*Pr(>F)*
1	58697	6.41e+11			
2	58628	6.39e+11	69	2.64	4.26e-12***

Notes: Anova test comparing model (1) with a model where $\delta_{k1} = \delta_{k2} = \delta_{k3} = 0 \ \forall k$ (null hypothesis), that is without interaction effects of time (both linear and nonlinear) with the predictors. Significance levels: *** at 0.1%, ** at 1%, * at 5%, and . at 10%.

Table A6: Tolerance and Variance Inflation Factors for Covariates in Model (1)

	Tolerance	VIF
Age	0.8508359	1.175315
Log(real hourly wage)	0.5317229	1.880679
Number of children	0.8031148	1.245152
Female	0.5669798	1.763731
Black	0.8269473	1.209267
Asian	0.9181969	1.089091
Hispanic	0.7582933	1.318751
Middle lower income class	0.6850457	1.459757
Middle upper income class	0.4718678	2.119238
Upper income class	0.3763067	2.657407
Midwest	0.5879174	1.700919
South	0.5650844	1.769647
Northeast	0.6634824	1.507199
Employed partner	0.6536741	1.529814
Unemployed partner	0.7368347	1.357157
Weekend	0.9926992	1.007355
Non-white share in the industry of employment	0.8518550	1.173909
Non-white share in the occupation of employment	0.7554537	1.323708
Female share in the industry of employment	0.6163225	1.622527
Female share in the occupation of employment	0.5135776	1.947125
Primary education	0.7266263	1.376223
Secondary education	0.7368886	1.357057
Part-time	0.8794201	1.137113

Notes: The table reports the values of two measures of multicollinearity among predictors in model (1). Tolerance is defined as $1 - R^2_{predictors}$ where $R^2_{predictors}$ is the R^2 obtained by regressing a given regressor on all the other regressors of the model. Values close to 0 indicate high multicollinearity while values close to 1 point to low multicollinearity. The Variance Inflation Factor is defined as $\frac{1}{Tolerance}$, where values above 1 suggest some multicollinearity and values below 5 are generally considered acceptable.