Stockholm School of Economics
Department of Economics
BE511 Degree Project in Economics
Spring 2024

Gaps in Time Allocation:
Gendered Perspective on Time Use Across the Great Recession Business Cycle (2003-2019)

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Abstract

Using data from the American Time Use Survey (ATUS), this paper aims to investigate the changes in time use for women, men, mothers, fathers, and the corresponding gender gaps across the Great Recession business cycle (2003-2019). By estimating pairwise differences in market work, nonmarket work, childcare, total work and leisure between 4 periods of analysis (Pre Recession, Recession, Recovery, and Post Recovery) and for 2 samples (general population sample and married parents subsample), we explore whether pre recessionary patterns of gendered time use changed during the recession and whether the changes protracted even after the crisis. We employ weighted OLS regression with and without control variables to quantify the differences in time use, and estimate pre-existing trends to separate trend effects from the cycle effects. Our robustness check indicates that the changes attributed to the Great Recession should be interpreted with caution, however, as they are associated with great uncertainty. Results demonstrate that market work presents a U-shaped curve over the course of the business cycle, with the gap between genders narrowing during the recession and diverging after. We also find evidence of corresponding convergence of time spent on nonmarket work. Disparity in total workload and leisure seemed to narrow for the general population. In the married parents subsample, mothers increased their total workload and decreased leisure compared to fathers during the recession, while fathers worked more overall and had less leisure time in all other periods. Our study contributes to past literature on time use, highlighting the importance of understanding how events like the Great Recession affect various aspects of individuals' lives beyond the economy.

Keywords: Time use, Business Cycles, Gender Economics, Intrahousehold Allocation, Labour Market Fluctuations
JEL: D13, E32, J16, J22
Supervisor: Anna Dreber Almenberg

Date Submitted: May 13, 2024
Date Examined: May 22, 2024
Discussants: Erik Enger Karlsson and Karl Borgehammar
Examiner: Johanna Wallenius

Acknowledgments

We first want to thank our supervisor, Professor Anna Dreber Almenberg, for her constant support and enthusiasm. We extend our deepest gratitude to Professor Magnus Johannesson for his invaluable guidance throughout the entire writing process. Furthermore, we would like to acknowledge the inputs in ideas and their empirical realisations of Rickard Sandberg, Associate Professor. Finally, we are grateful to our friends and family for their continuous encouragement.

Glossary

Acronym	Meaning
AHTUS	American Harmonised Time Use Survey: a harmonised collection of time diary data from the U.S. (1930-2012).
ATUS	American Time Use Survey: a survey conducted by the U.S. BLS (see below) since 2003 to document how people in the United States allocate their time.
BLS	Bureau of Labour Statistics: a fact-finding agency of the U.S. Department of Labour, collecting, calculating, analysing, and publishing data in the field of labour economics.
CD	Conditional Difference
CPS	Current Population Survey: the primary source of labour force statistics for the population of the U.S., sponsored by the BLS and the U.S. Census Bureau.
NBER	National Bureau of Economic Research: a private, nonpartisan research organisation publishing studies in economic analyisis and policy research, including business cycles and economic indicators.
OECD	Organisation for Economic Co-operation and Development
UD	Unconditional Difference

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1. Introduction

In December 2007, announced by the National Bureau of Economic Research, the United States fell in a new crisis that soon became the most severe recession the country experienced since the Great Depression of the 1930s (NBER, 2023). Following a significant period of economic prosperity, the country underwent a recession lasting 19 months, with a full recovery that took approximately 4-5 years (Freeman, 2013). Employment rates were among the economic indicators that the Great Recession hit the hardest and for the longest period of time. They increased only by 1.2% from the Great Recession until 2012, compared to a GDP increase (which is usually almost parallel to employment recovery) of 7.5% (Freeman, 2013). The decline in overall employment in the U.S. affected men and women differently, as men were hit first due to their predominance in industry-related sectors, while women were hit later due to them working primarily in service and management related sectors (BLS, 2011). Due to these changes in the labour market, some researchers refer to the Great Recession as a "man-cession," where men suffered the most and women gained the most (Kalleberg & Von Wachter, 2017). Within households, the "man-cession" aspect of this economic downturn was even more pronounced, with previously unemployed wives compensating for their husbands' lost incomes by increasing their labour force participation (Smith & Mattingly, 2014).

As the composition of the labour market changed so considerably during the recession, it is of interest to explore whether other aspects of individuals' and households' daily lives adjusted accordingly. Did individuals who lost their jobs allocate more time to leisure, or did they spend increased hours on household tasks? Given that men and women, as well as mothers and fathers, experienced the effects of the Great Recession on their employment status differently, did these disparities extend to changes in daily activities? Finally, did mothers work more at home than their husbands despite their added participation in the labour force, having to live through a *second shift* of daily work as they compensated for their husbands' lost jobs? In this paper, we aim to address these questions by looking into gendered patterns of time use and how they develop during periods of economic crisis.

In recent decades, after the surge of theories that included time allocation as a fundamental aspect of individuals' and households' consumption and production patterns (Becker, 1965; Becker, 1981), researchers have been increasingly interested in how, and with what differences, women and men allocate their time. In the U.S., the following tendencies have been documented with regards to changes in time allocation of men and women over the course of the second half of the XX century and the first years of the XXI century. For men, between 1965 and 2005, time spent in market work dropped by around 12 hours per week, while women increased their market work time by around 3.5 hours per week; the opposite trend was displayed for nonmarket work around the same period, with women decreasing their nonmarket work time by 10.4 hours per week, and men increasing their nonmarket work time by approximately 4 hours per week (Aguiar & Hurst, 2008). For both, childcare time and leisure time increased during this period, by respectively 2 hours per week, and 5 hours per week (for men) and 3.5 hours per week (for women) (Aguiar & Hurst, 2008). Given the strong impact of the Great Recession on the labour market, we are interested in whether it altered these patterns of gendered time use. We, as well as others before us, believe it is fundamental to understand how an economic shock can affect different aspects

of individuals' and households' lives to ensure a proper assessment of the recession's costs.

Past findings related to time use during the Great Recession have established that, as individuals lost more jobs, thus spent less time on market work, they increased their unpaid working hours to raise home production rates, and at the same time increased their leisure time (Aguiar et al., 2013). Additionally, for cohabiting parents, the recessionary period corresponded with a greater parity in market work, and a corresponding narrowing of the gender time use gaps in unpaid work, as bargaining powers and responsibility sharing norms changed within households (Berik & Kongar, 2012, 2013, & 2014). During the economic crisis, women, and more specifically married mothers, appeared to work more in total (market work, nonmarket work, and childcare) than their husbands who allocated lost market work time in personal care and leisure, as well as in enriching childcare activities (Berik & Kongar, 2013). We expand on the existing literature by conducting a more comprehensive long-term analysis of gender differences in time use and their changes throughout the entire business cycle of the Great Recession, exploring pre recessionary trends and recessionary impacts on different categories of time use immediately after the recession, as well as during later periods of economic stability.

Using individual-level data from the American Time Use Survey (ATUS) from the years 2003-2019, we study how time use in five different categories – market work, nonmarket work, total work, childcare, and leisure – changes for working age men and women, married fathers and mothers, and the corresponding gaps along four periods: *Pre Recession* (2003-2007), *Recession* (2008-2010), *Recovery* (2011-2014), and *Post Recovery* (2015-2019). Our study begins with an estimation of pre recessionary trends (2003-2007) to address the concern of changes being driven by tendencies existing prior to the recession. We then obtain pairwise differences of time use for the defined periods to compare changes for men (married fathers), women (married mothers), and the gender gaps over the course of the Great Recession business cycle. Finally, we try to separate the effect of pre-existing trends from cycle effects, building a counterfactual based on the pre recessionary period and fitting it to our baseline model. Additionally, we evaluate the robustness of our results by using bootstrapping as an alternative for the cycle effects calculation.

We find that for both of our samples, the market work gap, defined as *the average weekly time use for men (fathers) - the average weekly time use for women (mothers)*, exhibits a U-shaped pattern, narrowing during the Great Recession and diverging in the following periods. The gap for childcare and nonmarket work converged during the recession for both the general population and the married parents subsample, presenting no significant divergence after (with some evidence of the convergence being smaller than it would have been absent the recession). While the total work gap decreased for both men and women, the gap displayed a U-shaped curve for mothers and fathers. Married fathers worked more in total compared to married mothers during periods of economic stability, whereas married mothers worked more relative to married fathers during economic crises, driven by their uptake of market work and fathers' limited increase in time spent on nonmarket work. Lastly, we find that the leisure time use gap for men and women converged, with both increasing their leisure time over the period of analysis. For the married parents subsample, we find that mothers enjoy more leisure time during periods of economic stability, while fathers enjoy more leisure time during the recessionary period. Our robustness check confirms the estimates obtained for the cycle effects; however, these estimates are associated with high variability, making it challenging to determine the exact effect of the

recession compared to the pre-existing trends.

The structure of our paper is as follows. Section 2 presents our background analysis, focused on the changes in the U.S. labour market as a result of the Great Recession, which guides the understanding of the origins of the differences in time use. Past research on time use during the Great Recession is discussed in the Literature Review in Section 3 along with the theoretical background on theories of time use allocation. Section 4 introduces the rationale for focusing on two separate samples, as well as provides insight on our contribution to past literature, that will lead us to formulate our research question and hypotheses. Section 5 describes the data used in our research, and Section 6 explains our methodology. Empirical results are shown in Section 7. Finally, Sections 8 and 9 are dedicated to the discussion of the results and concluding remarks.

2. Background

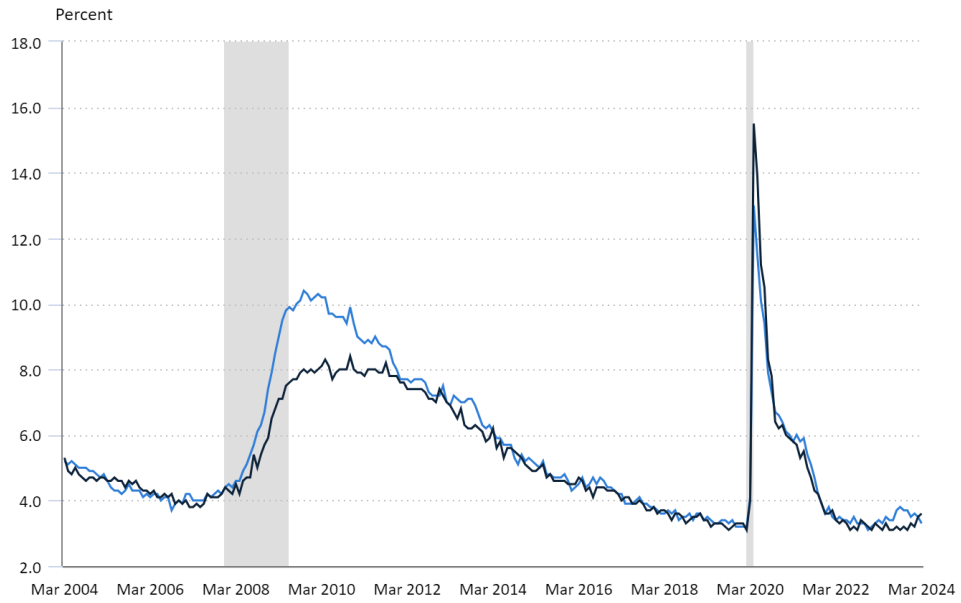
To perform a gender-aware analysis of time use changes across the Great Recession business cycle, it is essential to first understand the fluctuations experienced by the U.S. labour market and how they affected individuals and households based on their gender. This section begins with an overview of the primary outcomes observed in the U.S labour market before and during the Great Recession. We examine the effects separately for women and men, as well as married mothers and fathers. We then discuss previous research findings on demographic changes that occurred as a result of the Great Recession's employment shocks, which will inform our exploration of changes in time use in later sections.

2.1 The U.S. Labour Market During the Great Recession

Similar to previous recessions, the U.S. labour market greatly suffered during the Great Recession. What set this downturn apart from other recent crises was the dramatic surge in unemployment rates that protracted for long after the official recession's end, leading to what became known as the 'jobless recovery' period. Reaching unemployment rates similar to the pre recession levels took this time almost five years, whereas for the recessions of the 1980s - early 2000s it took around 30 to 40 months (Hoynes et al., 2012). The North American labour market experienced a deeper and longer crisis after 2007, and the question of why it reacted this way has been the concern of a great number of researchers. Pissarides (2013) argued that an increase in job vacancy rates did not correspond with a consequent decrease in the unemployment rate, but rather that the latter had become more long-term due to lengthened unemployment benefits and reduced labour mobility. GDP and employment recovery were not moving in unison, as the unemployment rate lagged behind GDP recovery for almost five years, compared to two to four quarters of lag in previous recessions (Freeman, 2013). The U.S.'s labour market had previously been characterised by significantly lower rates of long-term unemployment compared to other OECD countries, but as a result of the reduced flexibility of the labour market, long-term unemployment exploded during the Great Recession, trapping individuals in prolonged joblessness (Freeman, 2013).

Women had started to increase their labour force participation in the decades leading up to the Great Recession, with peaks happening during the 1970s and 80s and a stagnation period in the early 2000s (a similar stagnation was experienced by men) (Blau & Kahn, 2007). This changed

Figure 1: U.S. Civilian Unemployment Rates



Notes: Seasonally adjusted unemployment rates from 2004 to 2024 for women (black trendline) and men (blue trendline).
Source: U.S. Bureau of Labour Statistics.

the composition of the labour market and households with a rising proportion of dual-earner families (Kalleberg & Von Wachter, 2017). As the labour market became more gender equal, researchers began to observe distinct response patterns to economic downturns between men and women. The Great Recession is an illustrative example of how gender was an important determinant in changes in unemployment (Kalleberg & Von Wachter, 2017). The sectors that were negatively hit first were the more cyclical sectors of the economy, especially manufacturing and construction (Pissarides, 2013). They have the tendency to experience dramatic changes in accordance with the business cycle variations, as they are more volatile in nature compared to services related occupations (Pissarides, 2013). The industrial sector is connected to a higher male labour force participation (BLS, 2008), whilst the services sector is often overrepresented by female workers (BLS, 2008), which is why oftentimes the Great Recession is remembered as a "man-cession" (Kalleberg & Von Wachter, 2017).

However, the workers most immediately affected by the Great Recession were not the ones that necessarily suffered the consequences most. As the economy started to recover, men regained more jobs than women did (5.5 million compared to 3.6 million) (Kalleberg & Von Wachter, 2017), due to the industrial sectors' cyclical nature which led to faster recovery (Pissarides, 2013). Figure 1 illustrates how men's unemployment rate started to decline in 2010, after its peak of 11.2% in October 2009, while women's unemployment rate did not start decreasing until it peaked at 9% one year later, in November 2010 (BLS, n.d.-c). Rather than a "man-cession", some researchers discuss the asymmetric patterns of unemployment rates as "men's recession" and "women's recession". Women experienced an unemployment loss which began later and lasted longer than men's did. State and local government budget cuts following the decline in tax revenues caused by the economic downturn led to an increase in unemployment in the services sector, which mostly affected women's unemployment (Hartmann et al., 2014). As such, the Great Recession presented similar trends to previous recessions. However, what distinguished

this crisis was its length, attributed to the macroeconomic flexibility versus microeconomic inflexibility experienced by the US labour market this time (Freeman, 2013), which led to a rise in long-term unemployment (Hoynes et al., 2012).

Prior to the Great Recession, women had for a long period experienced lower market work participation compared to men (Solis & Hall, 2009). Therefore, driven largely by the initial increased loss of male employment, labour market participation rates between men and women started equalising, as they also did for married mothers and fathers, for them driven by a large increase in married mothers' labour force participation. Although mothers had also increased their labour force participation rates in the late 1970s and 1980s, the data on early 2000s period still showed that married mothers had higher unemployment rates compared to married fathers prior to the recession (BLS, 2008). The Great Recession inflated married fathers' unemployment rates that peaked in 2010 at 6.8%, compared to married mothers' peak in 2010 at 6.3% (BLS, 2011), an evidence of a changed pattern. In fact, in 2007, right before the start of the recession, married mothers (with at least one own child under 18 years of age) were experiencing an unemployment rate of 4.7%, while their male spouses were experiencing an unemployment rate of 2.8% (BLS, 2008).

The U.S. Great Recession triggered an added-worker effect, where to compensate for lost family income mothers strengthened their labour force participation (Sahin et al., 2010). This phenomenon has been thought to potentially be able to affect a changing structure of the sharing of responsibilities within households. With married mothers joining the labour force at increased rates, a disparity is created between men and women's workload if all else remains equal. During the recession, the percentage of families in which married mothers were the only ones engaging in market work increased from 6.6% (BLS, 2008) to 8.6% (BLS, 2011), while the percentage of families with husbands being the only earners decreased very slightly from 19.8% (BLS, 2008) to 19.7% (BLS, 2011), representing a decline in the dual-earner family. As long-term unemployment rates increased in the US, concurrent changes took place in other individual-level characteristics, such as family structures. Financial hardships created a higher barrier to both marriage and divorce, meaning that divorce rates were decreasing during this period, and cohabitation was preferred to marriage. To further lessen the negative economic impacts, a more conscious use and understanding of contraception dropped fertility rates (Kalleberg & Von Wachter, 2017). These changes in demographic characteristics as a result of increased economic hardship and unemployment among households will later be discussed in terms of their effect on time use.

3. Literature Review

Recently, more researchers have started to analyse the potential effects that a recessionary period like that of 2007-2009 has on time use, and even more specifically on gendered time use (Aguiar et al., 2013; Berik & Kongar, 2012, 2013, & 2014). These analyses are made on the basis of various theories of household time division (Becker, 1965; Becker, 1981) and household responsibility sharing (Hochschild & Machung, 1989; Burda & Hamermesh, 2012), seeking to understand whether the economic state of a country has any influence on the two.

This section starts with an explanation of the theoretical framework behind gendered time use. After that, we explore evidence on pre recessionary trends of four time use categories (market

work, nonmarket work, childcare and leisure), which will be the basis of our empirical analysis. Finally, we discuss the main findings of past literature on the effects of the Great Recession on different time use categories for women, men, mothers and fathers.

3.1 Theoretical Framework

Modern interpretations of time use date back to Gary Becker's theory of time allocation (Becker, 1965) and Becker's Treatise of the Family (1981). Assuming that households worked as a singular rational utility maximising agent that consumed commodities, Becker concluded that as the relative cost of time in a certain activity increased, households would decrease the ratio of time market inputs in production, and rather allocate their remaining time in more rewarding activities. His underlying assumption was, however, that households worked as one individual agent, and his first discussion of time substitution effects appears to be simplistic for all. In 1981, Becker remarked that the allocation of resources within a household is determined by bargaining among household members. A division of labour between husband and wife would lead to economic efficiency if the highest earner (usually the husband) allocated most of his time in market work to financially provide for his wife, who would allocate most of her time in home production and childcare activities. Changing family structures of the 1970s resulted from higher female earning power, which increased women's and households' relative gain of allocating time in market work activities, and reduced the economic necessities of marriages. At the same time, since women still held higher responsibilities in nonmarket work and childcare, they would have lower available energy to invest in their paid jobs, returning to the previous idea of efficiency where men spent more time in market work and women spent more time in nonmarket work.

Becker's understanding of different time use activities affecting consumption and household labour choices differently, a step forward in economic thinking, was criticised by feminist economists as an incorrect simplification of women's time use. Mothers' time use cannot be placed in a meaningful economic perspective, as there is not a designated time for market work, for nonmarket work, and for leisure, for these three all intersect with childcare and possibly each other (Mi-Hye, 2006). The trend of women's increased participation in the labour force is thus an added responsibility to mothers and women to the work they already perform, causing women to perceive or effectively live in more strenuous conditions compared to their male partners. It is important therefore to carefully consider how work may be defined, and thus understand the impact that gender inequalities have on total work.

We incorporate the concept of total work in our analysis to understand how women and men choose to substitute one time use activity for another and why, asking if women suffered an increased burden on total work during any of the four defined periods of time, and why. These two questions stem from two opposing theories of gendered time use previously discussed by economists: the theory of the *second shift* and the theory of *iso-work*. Hochschild and Machung (1989, reissued in 2012) discussed the responsibilities that dual working families, i.e. mothers and fathers who both spend some of their time in market work, share in the household, concluding through the interviewing of 50 dual working couples from the UK that on average, women still took most care of nonmarket work and childcare, even as they increased their labour force participation. The existence of a *second shift* for women could potentially have an impact on the result of our analysis, as we know that during the recessionary period (2008-2010), women increased

their labour market participation compared to men in earlier periods. If the responsibilities at home are - as Hochschild and Machung theorise - not as shared as those in the employment sphere, a convergence in the gap of time use in market work during the Great Recession would not relate to increased gender equality, but rather would increase the gap in total work, with women working disproportionately more than men. Burda and Hamermesh (2012) reached different conclusions by studying gender trends in total work of 27 different countries, finding that developed countries presented statistically insignificant differences in total work, reaching a phenomenon defined as *iso-work* (i.e. an equality in total work). The reasons for *iso-work* appearing was not apparent to them, although they tried to give explanations of social norms shifting in richer countries, but their findings are still very relevant to our study. If the theory of *iso-work* holds, then there should be no apparent change in the gender gap in total work throughout any of the four periods of time studied, since any change within different categories of time use in work would be counteracted by a balancing of responsibilities in other categories of work, keeping the total time endowment that men and women spend on work activities equal.

3.2 U.S. Time Use Trends

The theories previously described are useful for a better understanding of why certain time use trends existed in the U.S. before and during the Great Recession. Aguiar and Hurst (2007) present data on changes in time use in the US between 1965 and 2003, separately for men and women. Market work decreased for men by 6.6 hours per week between 1965 and 2003 and increased for women by 3.8 hours per week before stabilising. Both stabilised in the early 2000s. Between 1965 and 1993, nonmarket work experienced the opposite trend, where it increased for men by 3.8 hours per week, and fell for women by 10.3 hours per week. Both men and women increased childcare by 2.4 hours per week (for the general population) or 5 hours per week (for parents) between 1993 and 2003, and total work started equalising between them by decreasing for both by approximately 6 hours before 2003. Lastly, leisure time increased by 6.2 hours per week for men and 4.9 hours per week for women between 1965 and 2003. The pre recessionary period (2003-2008) presented extensions of time use trends started in the 1960s (Robinson & Godbey, 1999). Between 2003 and 2008, women decreased their nonmarket work by nearly 2 hours per week, while men did by 1 hour per week. In contrast, leisure time was higher for men than for women, but both experienced an upwards trend in leisure time during the pre recessionary period. Market work remained stable over this period (Aguiar et al., 2013).

Demographic changes in the labour force's composition reflected changes in other time use categories, especially nonmarket work and childcare. In the case of married mothers specifically, who experience a higher burden of nonmarket work compared to unmarried women (Mi-hye, 2006), a higher similarity in mothers' and fathers' employment previous to the 2000s reflected some convergence in nonmarket work time use as well as childcare time use. Mothers increased their market work from 8 to 23 weekly hours between 1965 and 1995, experiencing a period of stagnation at around 20 weekly hours from 2003 to 2008 (Bianchi, 2011), and although fathers decreased their market work during 1965-1995, they still continued to work longer hours than mothers (Bianchi, 2011). At the same time, mothers' nonmarket work declined from 32 hours per week in 1965 to on average 17 hours per week in 2003-2008, while fathers' nonmarket work more than doubled from 4 to 10 hours per week between 1965 and 1985, stabilising after that

(Bianchi, 2011). With increased rates of cohabitation emerging during the Great Recession due to the higher relative costs of divorce (Kalleberg & Von Wachter, 2017), it becomes even more relevant to discuss if changed time use trends for married cohabiting couples were short lived during the recession or if they protracted until later.

Due to more mothers entering the labour force in the 1970s and 1980s, and 60% of mothers with young children (<6 years old) participating in the labour force in the early 2000s, it can be argued that women prior to the Great Recession had already began experiencing conflicts between employment and family responsibilities (Kimmel & Connelly, 2007). Potentially, these conflicts could have shown a convergence in childcare time use between men and women during pre recessionary periods. Bianchi (2011) argues that mothers' childcare increased between 1985 and 2000 from 8.5 hours per week to 12.6 hours per week on average, fluctuating around 14 hours during the 2003-2008 period, and fathers had increased their childcare time from 2.5 hours per week in 1965 to about 7 hours in 2000, remaining stable around that number until 2008. Bianchi (2011) also explains that although on average, mothers' childcare time increased, employed mothers were spending disproportionately less time with their children than unemployed mothers. Kimmel and Connelly (2007) concluded that most responsibility sharing in childcare activities between members of a household of the early 2000s (2003 and 2004) were driven by income. If married fathers earned more compared to married mothers, mothers' time spent in employment decreased, and they allocated the foregone market work hours in caregiving activities. However, married mothers were able to spend less time on weekday childcare as married fathers were also available to help, and married fathers who gained higher income had started spending more time on childcare during the weekends, suggesting that although income differences between genders were still an important determinant of time use allocation, during the years previous to the recession childcare time use started to converge. As previously mentioned, the Great Recession brought a drop in fertility rates (Kalleberg & Von Wachter, 2017), and as studied by Sayer et al. (2004) through the analysis of four sets of time use diaries in the US, each additional child is associated with an increase in mothers' childcare time by 6 daily minutes, and associated with no additional childcare time from fathers. This means that we would expect mothers' childcare time to decrease, and fathers' to remain unaffected - and if changed, for reasons other than having less children.

Due to the pre recessionary trends of nonmarket work and childcare converging both in the case of unmarried and married men and women, it can be presumed that leisure time, which is the remaining time individuals would have to themselves, converged as well during this period. Bittman and Wajcman (2000) show through the time use analysis in various OECD countries that market and nonmarket work added together produced very similar amounts for both men and women, suggesting once again that the time available for leisure time during the pre recessionary period must have been equal for the two genders. However, they added that even if the total leisure time for men and women was remarkably similar, what differed was that men enjoyed more hours of undisturbed leisure time, while women often coupled leisure time with other activities or other members of the household, suggesting that gender equality in time use is not only reflected in the absolute hours men and women spend in a certain activity, but also in the quality of the activities.

3.3 Time Use During the Great Recession

By analysing the changes in the time use of American households between 2003-2010, Aguiar et al. (2013) try to answer the question of where individuals allocate their foregone market work lost during the recession. Using data from the American Time Use Survey for the sample of individuals 18 to 65 years old, they document how time use evolves during the Great Recession, filling the literature gap of providing a systematic analysis of time use substitution over the course of a business cycle. Using state-level variations of business cycles to account for the difficulty to detrend low frequency variation from cyclical effects brought by the Great Recession (2008-2010), they regress the changes in several time use categories on changes in market work to obtain the fraction of foregone market work time use allocated to other time use categories when a business cycle event like the Great Recession affects substantial changes in the labour market. They find that roughly 30% of the foregone market hours were allocated to nonmarket work and 50% to leisure, suggesting that the market production is replaced for income compensating purposes by nonmarket production (high elasticity of substitution at business cycles), as well as that individuals highly value marginal time spent in leisurely activities. Aguiar et al. show that this responsiveness is relatively stable across genders, but noticeably different between married and unmarried couples, where married individuals allocate around 42% of their foregone market work in childcare and nonmarket work, while unmarried individuals only do so for 15% of their foregone market work. However, they do not go further in the explanation of possible gender or intra-familial differences in allocation of time use, and maintain a general analysis for the US adult population.

As discussed before, the Great Recession brought an initial disproportionate increase in the male unemployment rate, which resulted in married women and especially married mothers entering the labour force at faster rates to supplement their husbands' job losses. Berik and Kongar (2012, 2013, & 2014) perform the first gender-aware analysis on time use over the course of business cycles, exploring whether changed trends in the US labour market reflected in declined gender disparity in other time use categories (nonmarket work, leisure time, and personal care), hypothesising that as fathers lost jobs and mothers took up jobs at a higher rate, fathers would have increased their time allocation in nonmarket work and childcare. The study and its conclusions also connect to the theories of iso-work, as the authors explore whether gender disparity declines not only for specific time use categories, but also for total work. The study focuses specifically on adult married mothers and fathers (living together and with at least one child under 18) whose time use data was collected from the 2003-2010 ATUS.

Looking at the behaviour of mothers and fathers across several categories of time (paid work, unpaid work that includes housework and childcare, personal care, and leisure), the authors fit a linear trend for each time use category for mothers and fathers for the prerecessionary period defined by them as going from January 2003 to November 2007, and extrapolate the effects of the Great Recession (December 2007 - December 2010) based on these trends to isolate trend effects and cycle effects for the recessionary period and extended unemployment period (past June 2009), by calculating the difference between observed values of time use during those periods and trend values, which then is attributed to effects of the Great Recession. They conclude that, had the pre recessionary trends continued as they were, no change in time allocation would have happened, while during the recession paid and unpaid work converged for mothers and fathers, where the

convergence in paid work was driven by a loss of jobs for fathers and increased rate of employment for mothers, while the convergence in unpaid work was driven by an increased update in childcare for fathers and a slight decrease in certain housework activities - like shopping - for mothers. The unpaid work uptake by fathers happened at a slower rate compared to the paid work uptake by mothers, which resulted in a disparity in total work (mothers-fathers) by approximately 4.5 hours per week, rejecting the *iso-work* hypothesis and concluding that mothers took more total work during periods of economic crisis. This change was additionally determined to be short lived, as the disparity in unpaid work declined only up to June 2009, and was described by the authors to follow a U-shaped curve, converging during the Great Recession, and diverging right after 2009. In 2014, a follow-up study by Berik and Kongar that followed the same methodology and included ATUS data from 2003 to 2012 confirmed the two main conclusions from the original paper: the disparity between paid and unpaid work narrowed during the Great Recession, but followed a U-shaped curve especially for the case of unpaid work; and mothers took up more total work during the Great Recession, as a consequence of fathers' limited compensation (one fifth) of their lost paid work time in unpaid work activities, once again refuting the hypothesis that *iso-work* held during the period.

The question of whether fathers picked up more nonmarket work and childcare as a result of their lost employment has been proved to be only partially right by Aguiar et al. (2012) and Berik and Kongar (2012, 2013, & 2014). It was hypothesised that fathers could have either not increased their share of responsibilities due to believing the Great Recession to be temporary, or that the necessity of their wives to engage in increased market work activities may have led to a more equal sharing of responsibilities. While a small fraction of fathers' foregone market hours were allocated to nonmarket work and childcare (Aguiar et al., 2013), this increase was disproportionate to the increase in market work that mothers took (Berik & Kongar, 2013) and thus resulted in mothers being comparatively overworked during the crisis period. Additionally, while mothers slightly decreased their time use in nonmarket work, they did not do so in childcare, and comparatively fathers only increased their time use in childcare for enriching activities such as playing and socialising (Morrill & Pabilonia, 2012), which, coupled with an increase in their leisure and personal care (higher compared to mothers), exacerbated gender differences during the recession (Berik & Kongar, 2012, 2013, & 2014). At last, this increase in nonmarket work - even though by us contested later - was not proven to be long-lasting by Berik and Kongar (2012, 2013, & 2014), who demonstrated that a gender asymmetric recovery in the labour market after the end of the Great Recession resulted in a return to prerecessionary norms to be prevailing, as mothers took a higher share of nonmarket work and childcare again compared to fathers.

4. Research Design

Having reviewed past literature on time use across business cycles, we now proceed to develop our own research question. We achieve this by examining the methodologies and conclusions of previous studies, which will guide us in formulating our research question and hypotheses. In this section, we aim to justify why we intend to focus on two samples (men versus women and married fathers versus married mothers), and verbalise our critiques and challenges with conclusions reached by past literature. We will then formulate a concise research question and three hypotheses we aim to analyse.

4.1 Rationale for a Dual Sample Approach

Our paper aims to explore the differences in allocation of time between men and women at business-cycle frequencies by examining data from the general population, as well as a subset of married and cohabiting mothers and fathers with at least one child under the age of 18, following Berik and Kongar (2012, 2013, and 2014). Cohabitation is used as a selection parameter to investigate the gender division of household labour. Since the CPS (the survey from which ATUS respondents are drawn) only distinguishes cohabitation within marriage, respondents in the subsample are automatically considered married. We begin our analysis with the general population sample, based on the background that explains how women and men, regardless of their demographic status, were affected differently in terms of employment by the Great Recession. The further subsampling serves several purposes. Firstly, it enables us to accurately capture changes in childcare time, as the general sample includes individuals without children or those who spend time with others' children, leading to substantially lower overall estimates for this time category compared to the parent subset. Secondly, it allows us to analyse shifts in household-level division of labour and compare them to changes observed in the general population, exploring the theory of the second shift versus iso-work. Burda and Hamermesh (2012) found evidence for the emergence of *iso-work* in the past decades for the overall population, while Berik and Kongar (2013) refuted this conclusion specifically for married mothers and fathers during the crisis. By examining the evolving structure of total work between the general population sample and the subsample, we can gain further insight into whether the *second shift* is a theory only applicable to dual households, or whether gender asymmetries are present along the entire US population. Our analysis is separate for men (fathers), women (mothers), and the gap in time use between genders, as gaps alone would not reveal changing time trends for men (fathers) and women (mothers) if they moved in the same direction.

4.2 Contribution, Research Question, and Hypotheses

Our paper builds on Aguiar et al.'s and Berik and Kongar's studies, filling the gaps and expanding on their research. Aguiar et al. (2013) emphasise the novelty and importance of the analysis of time use pattern changes over the course of a business cycle in future research. Their and Berik and Kongar's contributions start the discussion, yet include little to no years following an economic shock. Their conclusions apply to the pre recessionary and recessionary periods (up to 2010), thus how time use differs from a period of relative economic stability to a period of economic shock. However, due to the lack of data available at the time, they do not focus on the post recessionary periods. Although Berik and Kongar advanced the conclusion of nonmarket work gender gaps following a U-shaped curve, their studies only extended to 2012 (Berik and Kongar, 2014), which, given the prolonged effects of the Great Recession on the labor market, does not allow for a clear answer on the behavior of gender time use differences over time. With the availability of ATUS data up to 2019 (10 more years after the official end of the Great Recession), we are able to discuss whether the cycle effects on time use for men, women, mothers, fathers, and corresponding gaps protracted throughout a period in which the labour market was still suffering from the Great Recession's damages (up until 2014), as well as discover what happened to gender differences in time use once the economy had fully stabilised again (2015-2019).

Methodologically, we are improving on Berik and Kongar's analysis by not limiting ourselves to a comparison of differences in time use between period t and $t-1$, but rather performing it between all pairwise periods. Berik and Kongar (2012, 2013, & 2014) only compared each period to the subsequent one, and from that concluded that nonmarket work gaps behave as a U-shaped curve and that the hypothesis of *iso-work* did not apply in periods of economic shock. Such an approach is misleading if the first period is not compared to the last one, a shortcoming addressed in our work. Their lack of pairwise analyses brings us to challenge the clarity of their conclusions, and we aim to explore the changes in time use once all periods are compared between each other.

Given the equalising effect of the Great Recession on time use patterns due to disproportionate labour market losses for men established by the previous research, we aim to answer a question of whether such effects were short-lived, or whether they transformed the time allocation structure and remained in place even after men's employment picked up again. More broadly, we define our research question as:

How did the time allocation in various categories of time use (market work, nonmarket work, childcare, total work, and leisure) change for men, women, married fathers, married mothers, and the corresponding gender gaps, over the course of the Great Recession's business cycle?

Consistent with the conclusions provided by the previous literature, we formulate the following hypotheses:

Hypothesis 1:

During the Great Recession, as the gender difference in time use in market work converged more than in the previous periods, men's and women's bargaining powers changed, and with them responsibility sharing patterns. As a result, gender disparity in unpaid work (nonmarket work and childcare) narrowed. During the Great Recession, men and women equally increased their leisure time, but married fathers increased time spent in leisure more relative to married mothers.

Hypothesis 2:

Shortly after the recovery period started, as market work patterns began to resemble pre recessionary patterns, gender differences in other time use categories also reverted to pre recessionary trends. Market work and unpaid work (nonmarket work and childcare) present a U-shaped curve (inverted for unpaid work) pattern throughout the business cycle. The U-shaped curve is more pronounced for married parents, due to bargaining power being more crucial in shared responsibility households.

Hypothesis 3:

The theory of *iso-work* holds during periods of economic stability for the general population sample, but not during periods of economic instability. While *iso-work* held during pre recessionary periods for married mothers and fathers, during and after the Great Recession the gap in total work widened.

5. Data

Time use data for our research was retrieved from the American Time Use Survey (ATUS). This section is dedicated to introducing the survey, listing the time use categories chosen and how they are defined and collected from ATUS, and justifying our choice of dividing the Great Recession business cycle in four periods of study. We also present descriptive statistics for the time use categories of choice, divided by period and sample (general population and married parents subsample).

5.1 The American Time Use Survey (ATUS)

We use data from the 2003-2019 waves of the The American Time Use Survey (ATUS). ATUS is a nationally representative and continuous survey sponsored by the Bureau of Labor Statistics and conducted by the U.S. Census Bureau, that documents how individuals divide their time among different activities based on 24-hour time diaries of the respondents. Activities reported in the diaries are then categorised by survey personnel in more than 400 detailed time use categories. The sample of individuals is randomly drawn from the existing Current Population Survey (CPS) sample, which allows us to link ATUS and CPS files to obtain employment information, demographic and household characteristics of the respondents, such as marital status, age, or number of kids (BLS & U.S. Census Bureau, 2023).

Our base sample comprises 162,918 individuals between the age of 18 and 65 over the period of the analysis (2003-2019). Our subsample includes married mothers and fathers residing in the same household with at least one child under the age of 18, and it includes 59,323 respondents. The unit of the analysis is weekly hours spent on a certain time use category. To reduce bias in the estimates, for all subsequent analysis observations are weighted by the harmonised across years ATUS sampling weights. These weights help to ensure that each group of the population is correctly represented despite differing response rates and/or oversampling of some demographics (ATUS User Guide). Additionally, the days of the week are not equally represented in ATUS samples (50% of the sample is assigned to report on weekdays and 50% on weekends, meaning that unweighted calculations overestimate time spent on activities typically performed on weekends and underestimate time spent on activities typically performed on weekdays), which is why, following Aguiar et al. (2013), we adjusted the weights based on frequencies of the days of the week each respondent was interviewed.

5.2 Time Use Categories

For the scope of our research, we have categorised time use into four mutually exclusive segments. Even though these four categories do not represent the entire time endowment - as they exclude time spent on things like education, civic duties, medical assistance - they do represent the majority of an individuals' weekly time (Aguiar et al., 2013).

Market work refers to all time spent in activities related to, directly and not, an individual's job (main and not), i.e. the time spent actually working at that job, but also the time spent commuting to and from the workplace, as well as spending additional time with colleagues.

Nonmarket work refers to all time spent in activities that one could pay a third party to perform,

but for which one is not paid, thus all activities related to home production and care of the house, excluding childcare, as well as shopping goods for the house and taking care of pets, the garden, and other adults in the house.

Childcare refers to all time spent in activities related to taking care of, educating, or playing with one's or others' children. Past research (among others, Guryan et al. 2008) suggests that childcare should be a time use category separate from nonmarket work, even though in some instances it follows its same third party principle, because of how differently childcare moves across demographic groups compared to nonmarket work. Aguiar et al. (2013) describe this difference in terms of income elasticity: for time spent on childcare it is large and positive, and it is large and negative for time spent on nonmarket work.

Total work refers to the sum of hours spent on paid and unpaid work. This includes time dedicated to market work, nonmarket work, and childcare activities.

Leisure refers to all the time individuals spend not working or conducting any work-related activity. Some examples of what is included in leisure is time spent on sleeping, sports, eating, watching TV, and socialising. Following Aguiar et al. (2013) we include personal care activities in leisure (such as sleep or grooming oneself), contrarily to other authors (Berik and Kongar 2012, 2013, & 2014) that have chosen to distinguish between personal care and leisure. For the scope of our research, investigating the specific components of leisure that change across the business cycle is not relevant. Rather, we try to answer the question of how the gender gaps in the time use categories presented, in general, change along the business cycle.

The classification process in different time use categories performed by ATUS - the ATUS Activity Code Lexicon - uses a standardised three tier coding methodology, where each activity is assigned a certain three tier code (x-y-z, where x is the one of the 17 first tier categories the activity fits in, for example the category "Travelling", and y-z are more specific categories within that). Appendix I shows and explains in detail the codes selected for each time use category. The selection was done in accordance with Aguiar et al. (2013), with minimal modifications done due to code changes over time.

5.3 Identifying the Timeline of the Great Recession in the U.S.

According to the National Bureau of Economic Research (NBER), the Great Recession in the U.S. lasted from December 2007 — after the country had passed two consecutive quarters of economic downturn — to June 2009, the end of the economic contraction period in the country. However, this definition does not imply that all macroeconomic indicators started recovering after this period, and this is especially untrue for unemployment for both men and women, as we can see from Figure 1. The depth of the recession both in terns of time and industry caused unemployment to have a much slower recovery than what is usually expected during periods of economic downturn: in fact, the U.S. did not see pre recession levels of unemployment up until the beginning of 2015, where the aggregate level was able to hit around 5% again.

Due to the longevity of recessionary effects on unemployment in the U.S., in the context of time use research, researchers often decide on extending or slightly modifying the period they define as recessionary to better fit their research questions. Because inherently time use is greatly correlated with the state of the labour market — as working in one's job is integrating part of

one's day and determines many choices about one's time allocation — oftentimes authors prefer to consider recessionary the period of extended unemployment, rather than merely the period of economic contraction. Berik and Kongar (2012) separate the "official" definition of the Great Recession (December 2007—June 2009) from what they call *jobless recovery*, the period going from July 2009 to 2010. They studied the effects of the Great Recession on the mothers' and fathers' market and nonmarket work time use, comparing both the NBER's definition of Great Recession and the *extended unemployment* period (December 2007—December 2010). Their findings when considering the extended unemployment period are that while the recession narrowed the gap in market working hours between mothers and fathers, the same could not be said for the gap in nonmarket working hours (Berik and Kongar, 2012). Similarly, Aguiar et al. justify their definition of the Great Recession being between 2008 and 2010 by discussing that it is the period with highest fall — by 7% — in aggregate market work in the U.S. according to the BLS.

Our final decision was similarly dictated by an analysis of unemployment trends studied by the BLS over the course of the period, and has led to the definition of four periods of study:

Pre Recession, 2003 to 2007: since ATUS has begun its surveys starting from 2003, the pre recessionary period goes from the first possible year of study until 2007 included. Given that the Great Recession was defined by the NBER to have started only in December 2007, and that the highest drop in aggregate employment was perceived between 2008 and 2010 (Aguiar et al. 2013), it is sensible to include 2007 in the pre recessionary period.

Recession, 2008 to 2010: the period that Berik and Kongar defined as *extended unemployment* and that Aguiar et al. defined as their recessionary period of interest is what we have decided to define as the Great Recession. There are several ways one can justify different periodisations of such economic downturn, but we chose to focus on the period that better reflects the instability of the U.S. labour market, given that it has previously provided insightful information in the trends of gendered time use differences.

Recovery, 2011 to 2014: the years after the recession have been characterised by a slower than usual job growth, compared to previous periods of crisis. As discussed earlier, the cyclical nature of male dominated jobs meant that job recovery for men was faster in the first year of recovery (2011), but a growth of the private service sector gave women increased access to jobs. By June 2014, men had regained 90.1% of the jobs they lost during the recession, while women had gained 136.3% of lost positions (Hartmann et al., 2014).

Post recovery, 2015 to 2019: the last period of interest starts after most positions had been regained aggregately by both men and women, and ends right before a new recession, caused by the global eruption of COVID-19, started. Here we explore the question of whether there are prolonged trends and effects in gendered time use that started during the Great Recession and continued even after the economy recovered back to a state comparable to the pre recession.

Table 1 reports the summary statistics of the average hours per week spent on each time use category in the time periods of interest for the general population of men and women, as well as the difference between the genders, defined as:

$$Gap_{jt} = \overline{TimeMen_{jt}} - \overline{TimeWomen_{jt}}, \tag{1}$$

where Gap_{jt} is the gender time use gap for activity j in year t, $\overline{TimeMen_{jt}}$ is the number of weighted average hours per week spent by men on an activity j in year t in our sample, and $\overline{TimeWomen_{jt}}$ is the same measure for women. Table 2 presents corresponding estimates for the married parents subsample.

Table 1: Time Use by Period and Gender *(General sample)*

Time Use Category	Men				Women				Gap (Men-Women)			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Market work	36.68	34.86	34.75	36	25.34	24.61	24.47	25.28	11.34	10.25	10.28	10.72
Nonmarket work	14.45	13.97	13.46	13.54	22.85	21.41	20.77	20.82	-8.4	-7.44	-7.31	-7.28
Childcare	2.86	3.02	2.91	2.76	6.71	6.42	6.27	6.2	-3.85	-3.4	-3.35	-3.44
Leisure	108.04	109.33	110.14	109.55	106.03	107.26	108.44	107.83	2.01	2.07	1.71	1.72
Total work	54	51.84	51.12	52.3	54.9	52.43	51.51	52.3	-0.91	-0.6	-0.38	0

Notes: Authors' calculations from ATUS 2003-2019 data files. Columns show following periods: (1) Pre recession, (2) Recession, (3) Recovery, (4) Post recovery. All observations are weighted by adjusted ATUS weights.

Table 2: Time Use by Period and Gender *(Married Parents)*

Time Use Category	Fathers				Mothers				Gap (Fathers-Mothers)			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Market work	42.82	40.07	41.66	42.85	21.47	22.96	21.84	23.15	21.35	17.11	19.81	19.69
Nonmarket work	14.68	14.32	13.76	13.92	26.74	24.83	24.81	24.61	-12.05	-10.51	-11.05	-10.68
Childcare	6.8	7.4	7.42	7.43	14.27	14.18	14.33	14.84	-7.47	-6.78	-6.92	-7.41
Leisure	98.98	100.36	100	99.09	99.47	99.22	100.1	99.37	-0.49	1.14	-0.01	-0.28
Total work	64.31	61.79	62.83	64.2	62.48	61.97	60.98	62.6	1.83	-0.18	1.85	1.6

Notes: Authors' calculations from ATUS 2003-2019 data files. Columns show following periods: (1) Pre recession, (2) Recession, (3) Recovery, (4) Post recovery. All observations are weighted by adjusted ATUS weights.

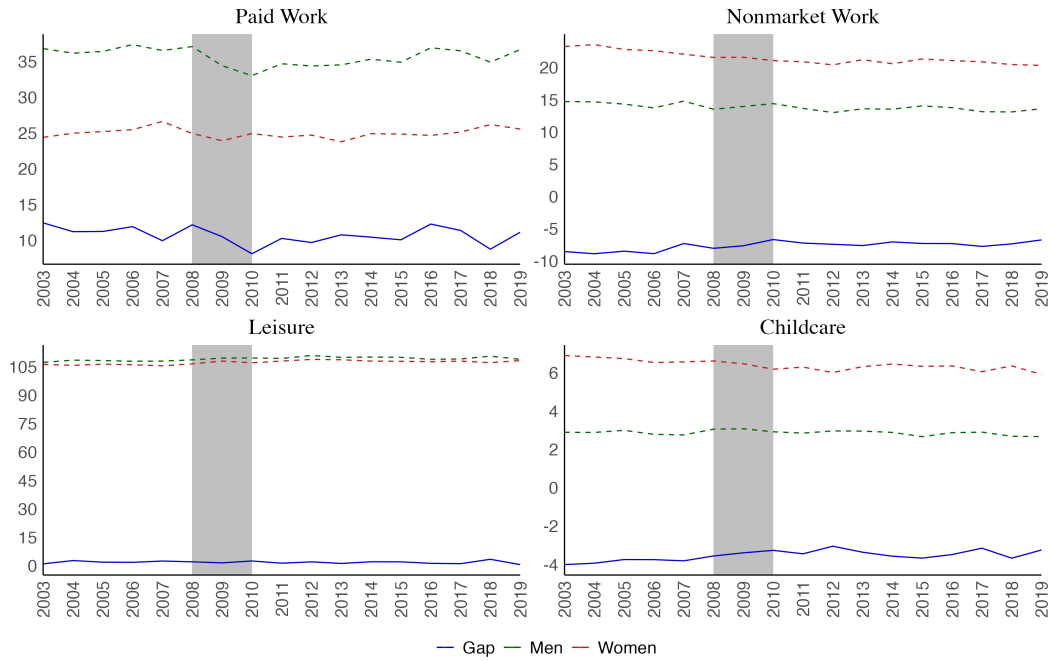
In both samples, the market work gap is positive, while the nonmarket work and childcare gaps are negative regardless of the period. This indicates that men generally tend to spend more time working in the labour market, while women spend more time working outside the labour market relative to men. However, gaps for parents in these categories are much larger, reflecting the division of household responsibilities.

Figures 2 and 3 show the time series evolution of the time use categories over the whole period of analysis. Notably, the average number of hours spent on market work largely decreased during the recession for men in general (more so than for women) as well as for fathers. Consistent with the changes in the labour market discussed earlier, hours of market work increased for mothers during the Great Recession, and after the recession, men experienced a larger increase in market work hours compared to women.

During the recession, the gap between genders narrowed for market work, nonmarket work, and childcare In the subsequent periods, the gap, however, did not revert to the pre recession averages in the nonmarket work and childcare, even though men reclaimed their lost working hours during the recession, as shown by the green dashed line on the market work graph. Regarding total work displayed in Figures 4 and 5, the gap decreased for both samples during the recession.

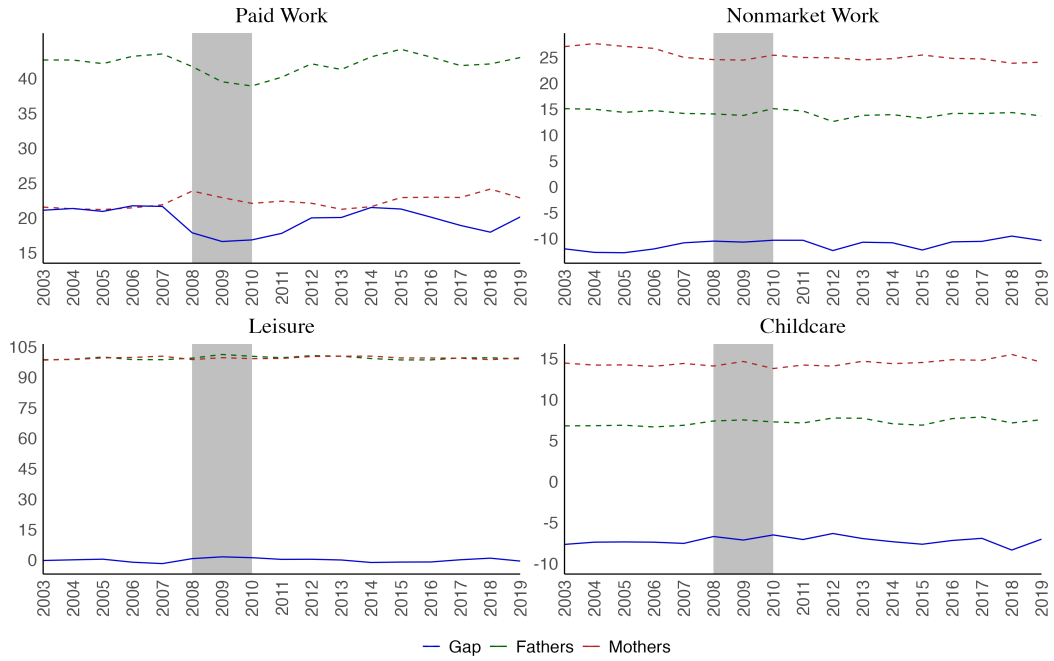
As noted by Aguiar et al. (2013) and confirmed by our graphs, both men and women seem to

Figure 2: Time Use 2003-2019 *(All sample)*



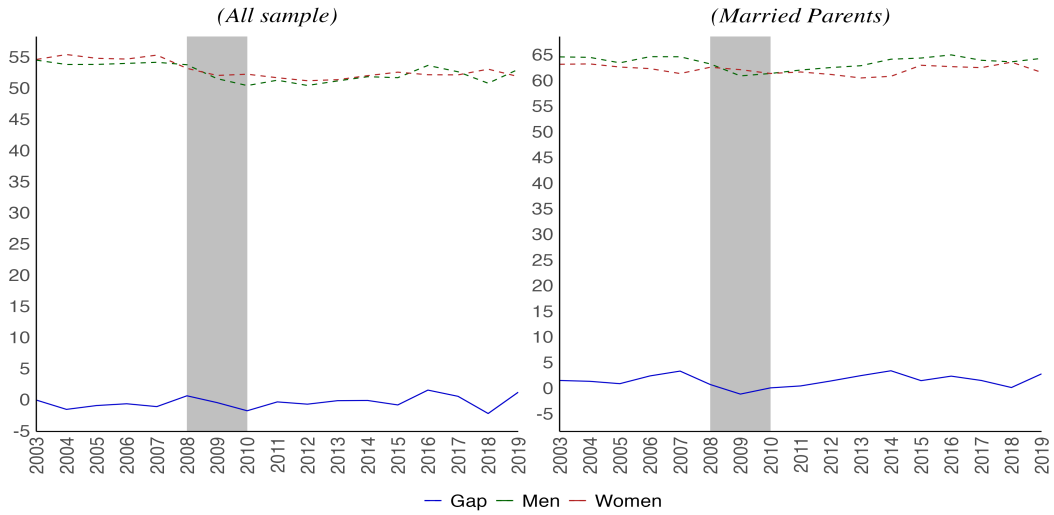
Notes: Annual estimates for the average time spent on a time use category per week, with our dating of Great Recession highlighted in grey. All observations are weighted by adjusted ATUS weights. Data: ATUS (2003-2019).

Figure 3: Time Use 2003-2019 *(Married parents)*



Notes: Annual estimates for the average time spent on a time use category per week, with our dating of Great Recession highlighted in grey. All observations are weighted by adjusted ATUS weights. Data: ATUS (2003-2019).

Figure 4: Total Work 2003-2019



Notes: Annual estimates for the average time of total work per week, with our dating of Great Recession highlighted in grey. All observations are weighted by adjusted ATUS weights. Data: ATUS (2003-2019).

have experienced an increase in leisure time and a decrease in nonmarket work between 2003 and 2007, reflecting the broader tendencies of the pre recessionary period (Aguiar and Hurst, 2007). Based on the graphs, other categories might have also exhibited certain patterns prior to the recession, such as a decrease in the hours spent on childcare for women. Pre-existing trends pose challenges for interpreting the effects of the Great Recession on time use, especially in the absence of the proper counterfactual time series. As mentioned before, previous research has separated the trend effect from the cycle effect using either cross-state variation (Aguiar et al., 2013) or extrapolation of existing trends onto subsequent periods (Berik and Kongar, 2012, 2013, & 2014). We will address this concern further in Section 6.4.

6. Methodology

In this section, we introduce our study design, as well as checks and different specifications implemented to ensure the robustness of the analysis and validity of the interpretations. Alongside presenting the main model, we address the potential concern of pre-existing trends and make an attempt of separating them from the effects of the recession, building a counterfactual based on the pre recessionary period.

6.1 Specifications and Control Variables

Generally, for all the models, we use four specifications, based on the general sample, married parents subsample, with and without demographic controls. The specification with no controls aims to show the absolute changes or differences in the population (or in the subsample), whereas the second specification is used to control for the changes of the sample composition of the ATUS over the period of the analysis to separate period effects from demographic effects. As discussed before, economic downturns can affect personal characteristics and family structures, which in turn affect time use. Our choice of the control variables follows Aguiar et al. (2013). We

split continuous or categorical variables into several levels to avoid the assumption of the linear relationship between the controls and the dependent variable. To avoid perfect multicollinearity, or a situation when a dummy variable could be perfectly predicted by the other variables, we leave out one level from the regressions as a reference category.

Overall, for the base sample we include:

- Age of the individual via four year age dummies: *Age2* (age between 28 and 37), *Age3* (age between 38 and 47), *Age4* (age between 48 and 57), and *Age5* (age between 58 and 65), with *Age1* (age between 18 and 27) being a reference category;
- Education of the individual via three education dummies: *Educ2* (high school), *Educ3* (above a high school diploma but below a bachelor's degree, for example an associate degree), and *Educ4* (bachelor's degree and higher), with *Educ1* (below high school) being a reference category;
- *Married*, a marital status dummy that is equal to 1 if the respondent is married, and 0 otherwise;
- *Hv_child*, an indicator of having one child or more that equals 1 if the respondent has a child, and 0 otherwise.

Since the subsample includes married cohabiting parents with children, *Married* and *Hv_child* control variables are omitted for the corresponding regressions. Instead, we introduce a different control variable for the family size: *Child_3more*, a dummy that equals 1 if a respondent has 3 or more children, and 0 otherwise. The variable aims to capture the difference in proportion of smaller and larger families, and is an important addition since the number of children was found to be a strong predictor of caregiving time (Kimmel & Connelly, 2007).

The descriptive statistics of the average shares of respondents by demographic groups in the outlined periods for the general sample and married parents subsample are presented in Appendices II and III. In fact, there are changes in the shares of different groups in the sample (for example, as anticipated, the share of respondents who have kids or are married decreased over time), supporting our functional form specification.

We report heteroskedasticity robust standard errors for all regressions.

6.2 Pre Recessionary Time Use Trends

As discussed, potential pre-existing trends in time use prior to the recession make it difficult to separate the cycle from the trend effect. The change observed between the periods, even if significant, could simply reflect tendencies existing before the crisis. To provide more precise interpretations for the comparison of time use across periods, we first test for the presence of pre-existing trends using weighted OLS regressions restricted to only include the years from 2003 to 2007 without the control variables:

$$TimeUse_{ijt} = \beta_0 + \beta_1 Year_t + \beta_2 Male_i + \beta_3 (Male_i \times Year_t) + \varepsilon_{ijt} \quad (1)$$

And with the control variables:

$$TimeUse_{ijt} = \beta_0 + \beta_1 Year_t + \beta_2 Male_i + \beta_3 (Male_i \times Year_t) + \mathbf{X}_i + \varepsilon_{ijt} \quad (2)$$

Where $TimeUse_{ijt}$ is the average weekly hours spent on a time use category j by individual i in year t, $Year_t$ is the variable demonstrating the yearly change of time use in that category for women, $Male_i$ is the gender dummy variable where 1 stands for males and 0 for females, capturing the average effect of being a man, and $(Male_i \times Year_t)$ is an interaction term demonstrating the yearly change in the time use gap prior to the recession by showing an additional effect of the yearly change for men compared to women.

In equation (2), $\mathbf{X}_i$ is a vector of demographic characteristics, including estimates for an individual's age, education, marital status, and an indicator of whether an individual has kids. To capture the corresponding yearly change in time use for men, we additionally calculate $Year_t + Male_i \times Year_t$.

The significance of this term is assessed using the Wald test, developed by Abraham Wald (1943). It allows to test composite linear hypotheses, such as whether combined coefficients are jointly equal to some specified value. This includes testing if the sum of two coefficients is jointly equal to zero. We use it by formulating the following hypothesis, tested against a two-sided alternative, where the test statistic measures the distance between the hypothesized value of a parameter and its estimate, weighted by the standard error:

$$H_0 : \beta_1 + \beta_3 = 0$$
$$H_1 : \beta_1 + \beta_3 \neq 0$$

This model specification allows us to assess whether there was a significant linear trend in time use for women, men, and the gap before the recession by evaluating the coefficients β_1, $(\beta_1 + \beta_3)$, and β_3 respectively. The same regression is estimated using the married parents subsample; however, the vector of observables is modified according to the considerations above, replacing *Married* and *Hv_child* with the *Child_3more* variable.

While the underlying changes in time use before the recession might be non-linear, linearity is assumed to be a good approximation of the trend. Proving this, Aguiar et al. (2013) conclude that estimates from the trend analysis based on linear extrapolation for the 2003–2010 period are similar to those obtained with their main methodology of using cross-state variation of business cycles to remove aggregate trends.

6.3 Baseline Model

To compare changes in time use between all periods pairwise, we first restrict the data to include only two periods for comparison, resulting in 6 pairs: *Pre Recession - Recession, Pre Recession - Recovery, Pre Recession - Post-Recovery, Recession - Recovery, Recession - Post Recovery,* and *Recovery - Post Recovery.* For each pair, we estimate weighted OLS regression without control variables:

$$\text{TimeUse}_{ijt} = \beta_{10} + \beta_{11}\text{Period}_t + \beta_{12}\text{Male}_i + \beta_{13}(\text{Male}_i \times \text{Period}_t) + \varepsilon_{ijt} \tag{3}$$

And with control variables:

$$\text{TimeUse}_{ijt} = \beta_{10} + \beta_{11}\text{Period}_t + \beta_{12}\text{Male}_i + \beta_{13}(\text{Male}_i \times \text{Period}_t) + \mathbf{X}_i + \varepsilon_{ijt} \tag{4}$$

Here, $Period_t$ is a dummy variable indicating whether the observation is in a later period of those being compared. For example, in the *Pre recession - Recession* comparison, if the observation is from the period between 2008 and 2010, $Period_t$ would equal 1; otherwise, it would be 0 (if the observation is from the period between 2003 and 2007). We perform this regression on the general sample, as well as the subsample of married parents, with the modifications discussed for $\mathbf{X}_i$ in equation (4).

By regressing individual time use in category j on the dummy variable indicating a later period in equation (3), we obtain the unconditional difference in time use between the periods for women, men, and the gap from our coefficients of interest β_1, $(\beta_1 + \beta_3)$, and β_3. As before, we assess the significance of the change for men, calculated as $TimeUse_{itj} + Male_i \times Period_t$, using the Wald test. Accordingly, by adding control variables (age, education, marital status, kids) in equation (4), we estimate the conditional differences in average hours per week spent on category j between the periods.

6.4 Trend Decomposition

To separate the effect of the Great Recession on time use from the changes that would have naturally occurred, it would be most appropriate to compare differences in time use from 2008-2019, absent the Great Recession, with those actually observed. Given the lack of a proper counterfactual (discussed in more detail in the next section), we extrapolate the time use trends from Section 6.2 and compare it to the changes identified in Section 6.3, similar to the methodology of Berik and Kongar (2012, 2013, &2014).

In Section 6.2, we fit a linear trend to each time use category on the individual level over the period from 2003 to 2007, with and without controls. Based on previous literature, however, for some time use categories, namely paid work for the general population (Aguiar, 2007), paid work, childcare, and leisure for mothers and fathers, as well as nonmarket work for fathers (Bianchi, 2011), we expect the trend variables ($Year_t$, $Male_i \times Year_t$, and $Year_t + Male_i \times Year_t$) to be insignificant due to previously observed stagnant trends, still proving the extrapolation to be valid.

Next, we fit the models (1) and (2) to the 2008-2019 data for the general sample and married parents subsample to estimate the extrapolated weekly average hours spent on each time use category. To obtain pairwise differences between periods under the assumption that pre-recessionary patterns would persist (or the supposed trend effect), we use models (3) and (4) on the new, extrapolated time use as the dependent variable while retaining the observed vector of demographic characteristics for the regression with controls (matching extrapolation from equation (1) to model (3) and from equation (2) to model (4)):

$$\text{ExtrTimeUse}_{ijt} = \beta_{20} + \beta_{21}\text{Period}_t + \beta_{22}\text{Male}_i + \beta_{23}(\text{Male}_i \times \text{Period}_t) + \varepsilon_{ijt} \quad (5)$$

$$\text{ExtrTimeUse}_{ijt} = \beta_{20} + \beta_{21}\text{Period}_t + \beta_{22}\text{Male}_i + \beta_{23}(\text{Male}_i \times \text{Period}_t) + \mathbf{X}_i + \varepsilon_{ijt} \quad (6)$$

Finally, estimates obtained from Section 6.3 are compared to their exact counterparts from regressions (5) and (6). With a degree of caution, this comparison can be attributed to cycle effects, defined as *Observed change - Trend effect*, for women ($\hat{\beta}_{11} - \hat{\beta}_{21}$), men ($(\hat{\beta}_{11} + \hat{\beta}_{13}) - (\hat{\beta}_{21} + \hat{\beta}_{23})$), and the gap ($\hat{\beta}_{13} - \hat{\beta}_{23}$).

6.5 Limitations

Our dataset and methodology have certain limitations that must be discussed before presenting our results. ATUS, which we use as our only dataset for the study, has itself many known limitations which are sometimes too complicated to resolve. It presents various sampling errors, due to oversampling in certain states and very limited sample size. Over the entire course of our study (2003-2019), 210 586 sample observations have been collected (ATUS, n.d.), of which we use only 162 918 due to our sampling restrictions, meant to give conclusions for the entire U.S. population. Additionally, ATUS presents a number of nonsampling errors related to a yearly response rate of only 40%-50% approximately (BLS, n.d.-b) and mixed interview quality, based on limited or incorrect details given by respondents as well as poor monitoring of responses from the interviewer (ATUS User Guide, 2023, Chapter 10). We hope that including adjusted sampling weights partially addresses these issues.

Another challenge associated with our dataset arises from the limited availability of pre recession data. Before ATUS started, AHTUS was the most reliable and used US national time use survey. It harmonised time use data from 1965 until 2012, collected by a number of different time use surveys, including ATUS (2003-2012), with each sample assembled by grouping multiple years together (AHTUS Codebook 2012). To link more recent years of ATUS to AHTUS, it is necessary to harmonise ATUS data over demographic backgrounds and other variables. To avoid measurement errors, as well as remain consistent with past research on time use during the Great Recession, we decided to only include ATUS data. This data collection choice means that we only had 5 pre recessionary years available, which reduces the accuracy of not only our pre recessionary linear trends, but also of our extrapolated data. We attempt to overcome this difficulty by comparing our results with past research that discusses time use in the U.S. across periods before 2003 as well as from 2003 until the Great Recession.

The main limitation of our methodology is the lack of a proper counterfactual. Our baseline analysis has the aim to understand how time use changed between the periods of study for women, men and the gender gap while controlling for effects of demographic characteristics. This alone does not enable us to draw conclusions about any causal relationship between the Great Recession and changes in time use over different periods. The proper way to address this would have been to perform a cross-country analysis with countries similar to the U.S. in economic indicators during the period of interest. However, excluding the U.S., for other countries time use surveys are inconsistent and do not contain enough years for us to execute a relevant cross-country analysis.

Thus, we have to construct our own counterfactual by extrapolating pre recessionary trends and fit them into our models for later periods, to then compare observed changes with trend estimates and obtain cycle effects based on a number of assumptions that limit the validity of this method. The extrapolated data are based on linear trends from the 5 pre recessionary years we have available, based on the strong assumption that time use categories would continue to follow those exact trends had the Great Recession not occurred. That assumption can be fallacious, and means that cycle effects estimates become less reliable in later periods as the uncertainty of predictions increases with time. With extrapolated data being based on predictions, and traditional statistical tests that we perform treating them as fixed values instead, we are not able to include significance levels or standard errors of our cycle effects estimates, as our model greatly underestimates the variability of the data. We later attempt to address this in our robustness check by using bootstrapping to calculate the estimates for the cycle effect, and to report standard errors of these estimates. Because of our extrapolation method being based on a large number of strong assumptions, we are able to only compare cycle effects with observed changes, but we do not make any strong causal inference conclusion, and rather just discuss how time use changed throughout the business cycle.

7. Results

This section presents the empirical results obtained from applying the models to our general population sample and married parents subsample from the ATUS data. Following the order of the previous section, we first provide results for the trend analysis, then report conditional and unconditional differences, and, third, the difference between the observed changes and changes attributed to the trend. Lastly, we present the results of our robustness check.

7.1 Pre recessionary Time Use Trends

The pre recessionary trends in yearly time use (2003-2007) for the general population and married parents subsample, as well as their corresponding gaps, are shown in Tables 3 and 4 respectively. Unconditional and conditional trends present relatively close estimates for both samples.

Statistically significant pre recessionary trends in time use for the general population exist only for women in market work, nonmarket work, and childcare. On average, women's market work increased by approximately 30 minutes each year (with an unconditional coefficient of 0.49 hours, statistically significant at the 0.1% level, and a conditional coefficient of 0.51 of an hour, significant at the 0.1% level), totaling in an average increase of 2 hours and 30 minutes from 2003 to 2007. At the same time, women experienced a decreasing trend in nonmarket work, displaying an overall decline of 1 hour and 40 minutes over the course of five years with a yearly unconditional and conditional coefficient of -0.33 and -0.35 hours respectively, both significant at the 0.1% level. Women slightly decreased their time spent on childcare (unconditional and conditional coefficients of -0.1 and -0.08 hours, both significant at the 5% level) with a total change of around 30 minutes over this period. Despite being statistically insignificant, pre recessionary trend in leisure for women is negative, which is surprising given findings of prior research (Aguiar et al., 2013). Although men present no evidence of a significant trend in any of the five time use categories, the gaps show significant trends for market and nonmarket work (all

Table 3: Time Use Trends 2003-2007 (*General Sample*)

Time Use Category	Women		Men		Gap	
	(1)	(2)	(3)	(4)	(5)	(6)
Market work	0.49***	0.51***	0.07	0.1	-0.42*	-0.41*
	(0.14)	(0.13)	(0.14)	(0.14)	(0.19)	(0.19)
Nonmarket work	-0.33***	-0.35***	-0.08	-0.07	0.25*	0.28*
	(0.08)	(0.08)	(0.08)	(0.08)	(0.11)	(0.11)
Childcare	-0.1*	-0.08*	-0.04	0.01	0.06	0.09
	(0.04)	(0.04)	(0.04)	(0.04)	(0.06)	(0.06)
Total work	0.07	0.08	-0.05	0.04	-0.12	-0.04
	(0.12)	(0.12)	(0.13)	(0.12)	(0.18)	(0.17)
Leisure	-0.12	-0.13	0.08	0.01	0.21	0.14
	(0.12)	(0.11)	(0.12)	(0.12)	(0.17)	(0.16)

Notes: Columns (1), (3), (5) present unconditional OLS estimates of yearly time use changes for married mothers, fathers, and the gap (men-women). Columns (2), (4), (6) present conditional OLS estimates. Observations are weighted by adjusted ATUS weights. Standard errors are in parentheses. Data: ATUS (2003-2019).
*** p<0.001, ** p<0.01, * p<0.05

Table 4: Time Use Trends 2003-2007 (*Married Parents*)

Time Use Category	Mothers		Fathers		Gap	
	(1)	(2)	(3)	(4)	(5)	(6)
Market work	0.08	0.07	0.23	0.23	0.15	0.17
	(0.22)	(0.21)	(0.22)	(0.22)	(0.3)	(0.3)
Nonmarket work	-0.51***	-0.49***	-0.21	-0.23	0.3	0.26
	(0.13)	(0.13)	(0.13)	(0.13)	(0.18)	(0.18)
Childcare	-0.02	-0.08	0	0.03	0.02	0.11
	(0.09)	(0.09)	(0)	(0.09)	(0.13)	(0.12)
Total work	-0.45*	-0.5**	0.02	0.03	0.47	0.53*
	(0.18)	(0.18)	(0.18)	(0.18)	(0.26)	(0.26)
Leisure	0.44*	0.5**	0.02	0.02	-0.42	-0.48*
	(0.17)	(0.17)	(0.17)	(0.17)	(0.25)	(0.24)

Notes: Columns (1), (3), (5) present simple OLS estimates of yearly time use changes for married mothers, fathers, and the gap (fathers-mothers). Columns (2), (4), (6) present controlled OLS estimates. Observations are weighted by adjusted ATUS weights. Standard errors are in parentheses. Data: ATUS (2003-2019).
*** p<0.001, ** p<0.01, * p<0.05

estimates significant to the 5% level). For market work, with an unconditional trend estimate of -0.42 hours and a conditional estimate of -0.41 hours, we conclude that, due to the increased time spent in market work for women, the market work gap between men and women narrowed during the pre recessionary period. Similarly, with nonmarket work gap estimates of 0.25 hours (unconditional) hours and 0.28 (conditional) hours, during the pre recessionary period the gap in nonmarket work between men and women slightly converged. Figure 2 visualises these results: market, nonmarket, and childcare pre recessionary trends for women show an increase, a decline, and a decline respectively.

The married parents sample again only presents statistically significant trend estimates for mothers, who decreased their nonmarket work by approximately 2 hours and 30 minutes over the course of the five years (unconditional and conditional estimates of -0.51 and -0.49, significant at the 0.1% level). This decrease in nonmarket work is reflected by a corresponding decrease in total work. Additionally, mothers increased their time spent on leisure by a similar amount.

Our results show that many of the pre recessionary trend estimates are not statistically significant, consistent with the past literature. As previously discussed in section 3.2, while all time use categories were changing over the course of the 1970s up until the early 2000s, most of them experienced a period of stagnation as they entered the new century. For both the general population and the married parents sample, a decline in nonmarket work was the most significant trend (Bianchi, 2011; Aguiar et al., 2013).

7.2 Time Use Changes for the General Sample

Table 5 reports conditional and unconditional differences in time use between all periods pairwise for women, men, and the gap (men - women) in average hours per week. While unconditional and conditional differences present similar estimates, controlling for demographic characteristics slightly decreases the effect for most cases and in some cases changes the significance level. Since this table presents thresholds of statistical significance of the estimates (5%, 1%, 0.1%), we additionally provide exact p-values in Appendix IV.

Both men and women experienced a decrease in market work hours during the recession. As this decrease was larger for men, the gap in market work converged, though less so than it would have without the recession. After the recession, men regained their market work hours at a faster rate than women, leading to a divergence in the gap once again.

Conditional on demographic changes between the pre recessionary and recessionary period, men experienced a significant decline of 1.76 hours per week in paid work at the 0.1% level (column 2). Women experienced a smaller decline of 0.79 hours per week, significant at the 5% level, which overall led to narrowing of the paid work gap, yet insignificant. Table 7 shows that under the assumption that pre-existing trends would hold, women experienced a more negative decline in market work hours, reflecting the positive and significant trend in 2003-2007. Thus, while in absolute terms men suffered more from the recession, women decreased their work hours more relatively to what could have been observed. From columns (9), (10) and (11), (12) of Table 5, men started to regain their market work hours only during post recovery (1.14 hours UD, 1.15 hours CD increase compared to the recession, 1.25 hours UD and 1.18 hours CD increase compared to the recovery, all significant at the 5% level). For women, this recovery was slower, as the corresponding estimates are lower and insignificant. As a result, the initial convergence

of the market work gap changed to a divergence in later periods. Nevertheless, the equalising effect was still pronounced (although not as strongly as the estimates were insignificant) in the post-recovery period, since the difference in the gap between the last period and the first one remained negative (columns 5 and 6). It is important to note that, based on the estimates from Table 7, parity could have been even stronger if not for the recession, since the difference between observed changes and the trend effect in all pairwise comparisons of the gap is positive. This is unsurprising given the significant and negative trend in the gap from Table 3.

Men and women experienced a decrease in nonmarket work between all periods except for post-recovery versus recovery (small increase for both). Since the observed change for women was more negative than for men, the gap converged during the recession, with no statistically significant divergence after the recession.

Women experienced large and negative changes in nonmarket work in all periods compared to pre recession (Table 5, columns 1-6) significant at the 0.1% level. This change was negative not only for recession versus pre recession comparison, but also for recovery versus recession, as from columns 7 and 8, the difference between recession and recovery was also negative and significant (0.64 hours UD and 0.5 CD, significant at the 5% level), with a slight following insignificant increase from recovery to post recovery. Interestingly, compared to the negative trend experienced before the recession in this time use category for women, the changes were all positive (with an exception of unconditional difference of -0.12 hours between recession and pre recession), with the largest difference between post recovery and pre recession: a 3.46 hours of unconditional increase, and slightly smaller conditional increase of 2.44 hours (Table 7, columns 5 and 6). This means that in the absence of the recession, there potentially would have been a larger decrease in nonmarket work for women. Such effects were not exactly mirrored by men, whose change in hours spent on nonmarket work were negative in recession compared to pre recession, and recovery compared to recession, also relative to the trend (the cycle effect appears to be positive only when comparing post recovery and pre recession, Table 7, columns 5 and 6). This discussion results in two opposite conclusions for the gap. From the observed changes in columns 3 and 4 of Table 5, the disparity in nonmarket work narrowed by around 1 hour from pre recession to post recovery (significant at the 1% level) as a result of the recession, since women experienced a larger decrease in hours of nonmarket work than men. However, according to Table 7, without the recession, the nonmarket work time use gap would have been even smaller, with an unconditional difference of -3.41 hours between post recovery and recession, and a smaller conditional difference of -2.3 hours, assuming pre-recession trends would hold.

The disparity in childcare narrowed during the recession, and this change persisted in subsequent periods as men increased their time spent with children (also relative to the trend), while women decreased theirs.

Time spent on childcare for women decreased over the period of analysis, yet the change is only statistically significant unconditionally for recession, recovery and post recovery compared to pre recession (Table 5, columns 1, 3, 5). On the contrary, similarly to nonmarket work, the cycle effect on this category for women is positive. For men, both observed change and change relative to the trend for childcare is positive in all periods after pre recession. From columns 7-12 of Table 5, it can also be concluded that men experienced the largest increase in childcare time during the recession with a slight subsequent decrease (insignificant) in further periods, yet not strong

enough to offset the changes that occurred during the recession. Overall, this led to convergence of the childcare gap without controlling for a trend, but a negative cycle effect due to a larger predicted decrease in childcare time for women absent the recession. As discussed, these results should be treated with caution, as the general population sample includes respondents without children, who drive the overall estimates down. More informative conclusions will therefore be discussed with regards to parents.

The total workload decreased for men and women as a result of the recession, with a more pronounced decrease observed for women than for men. Due to the initial negative gap, the disparity in total workload narrowed (insignificant), also relative to the trend, and did not diverge again.
Before the Great Recession, the total workload for women was larger than for men, the gap of -0.91 hours. From Table 5, during and after the recession, observed changes for market work were more negative for men, women experienced a larger decrease in hours spent on nonmarket work, and women decreased their time spent on childcare, while men started having more caregiving time. Combined, this led to a large (around 2-3 hours) negative change in total work for both men and women in all periods compared to pre recession, significant at the 0.1% level, with the estimates being larger for women. This led to a convergence of the total work gap in all subsequent periods compared to each other (except for the unconditional difference of -0.93 hours between recovery and recession in column 7), however such change was insignificant (columns 1 and 2, 7 and 8, 11 and 12). In all periods compared to the recession, therefore, the change in the gap was positive, with the difference between post recovery and pre recession estimates being practically 0, an absolute parity (Table 5, columns 5 and 6). From Table 7, it is clear that the cycle effect dominated these changes, given the weak positive trend in the gap prior to the recession. All changes in the gap compared to the trend are positive, meaning that the gap converged more than it otherwise would have, and more convergence was observed with each period.

Leisure time increased for both men and women during and after the recession, more so than it would have without the recession. The effect was slightly larger for women, resulting in the convergence of the leisure gap, which had previously been positive in favour of men, although the change was not significant.
Both men and women started spending more time on leisure over the period of the analysis, in all periods compared to pre recession (columns 1-8), and in all consequent periods (with an exception of negative and insignificant difference between post recovery and recovery), also relative to the trend (Table 7). Generally, the changes were significant at conventional levels for both men and women, but slightly larger for women, which resulted in a convergence of the leisure gap, whereas prior to the recession men spent 2 more hours on this time use category. Such convergence, though insignificant, is fully attributed to the recession: given larger and more negative estimates from Table 7, absent the recession, there would be divergence, and not convergence of the gap in leisure time. The gap continued to converge all the way to post recovery, with the difference between two last periods being around 0, showing that the gap did not diverge again.

Table 5: Pairwise Time Use Changes 2003-2019 *(General sample)*

Time Use Category	Average 2003-2007	2008-2010 vs 2003-2007		2011-2014 vs 2003-2007		2015-2019 vs 2003-2007		2011-2014 vs 2008-2010		2015-2019 vs 2008-2010		2015-2019 vs 2011-2014	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Women													
Market work	25.34	-0.73	-0.79*	-0.87*	-0.88*	-0.05	-0.15	-0.13	-0.08	0.68	0.62	0.81	0.65
	(30.74)	(0.41)	(0.4)	(0.38)	(0.37)	(0.39)	(0.38)	(0.45)	(0.44)	(0.45)	(0.45)	(0.43)	(0.42)
Nonmarket work	22.85	-1.44***	-1.34***	-2.08***	-1.84***	-2.04***	-1.77***	-0.64*	-0.5*	-0.59*	-0.43	0.045	0.11
	(19.97)	(0.25)	(0.24)	(0.23)	(0.22)	(0.24)	(0.23)	(0.27)	(0.26)	(0.27)	(0.26)	(0.26)	(0.25)
Childcare	6.71	-0.29*	-0.15	-0.44**	-0.19	-0.51***	-0.19	-0.15	-0.04	-0.22	-0.04	-0.06	0
	(12.58)	(0.14)	(0.13)	(0.14)	(0.12)	(0.14)	(0.12)	(0.16)	(0.14)	(0.16)	(0.14)	(0.15)	(0.13)
Total work	54.9	-2.47***	-2.27***	-3.39***	-2.91***	-2.6***	-2.11***	-0.93*	-0.63	-0.13*	0.15	0.79	0.76*
	(28.13)	(0.37)	(0.36)	(0.35)	(0.33)	(0.36)	(0.34)	(0.41)	(0.39)	(0.42)	(0.4)	(0.4)	(0.38)
Leisure	106.03	1.23***	1.12***	2.4***	2.1***	1.8***	1.5***	1.18***	0.96**	0.57	0.38	-0.6	-0.56
	(26.39)	(0.35)	(0.34)	(0.32)	(0.31)	(0.33)	(0.32)	(0.38)	(0.37)	(0.39)	(0.38)	(0.37)	(0.36)
Men													
Market work	36.68	-1.82***	-1.76***	-1.93***	-1.84***	-0.68	-0.61	-0.11	-0.07	1.14*	1.15*	1.25*	1.18*
	(34.88)	(0.5)	(0.49)	(0.47)	(0.46)	(0.47)	(0.46)	(0.54)	(0.53)	(0.54)	(0.53)	(0.51)	(0.5)
Nonmarket work	14.45	-0.48*	-0.44	-0.99***	-0.85***	-0.91***	-0.71**	-0.51*	-0.41	-0.43	-0.27	0.08	0.16
	(18.07)	(0.24)	(0.24)	(0.22)	(0.22)	(0.22)	(0.22)	(0.25)	(0.25)	(0.25)	(0.25)	(0.23)	(0.23)
Childcare	2.86	0.15	0.33***	0.05	0.36***	-0.1	0.26**	-0.1	0.04	-0.26*	-0.05	-0.15	-0.09
	(7.81)	(0.1)	(0.1)	(0.09)	(0.09)	(0.09)	(0.08)	(0.11)	(0.11)	(0.11)	(0.1)	(0.1)	(0.09)
Total work	54	-2.15***	-1.88***	-2.87***	-2.33***	-1.7***	-1.06**	-0.72	-0.44	0.46	0.83	1.18*	1.25**
	(31.98)	(0.46)	(0.45)	(0.44)	(0.41)	(0.43)	(0.41)	(0.51)	(0.49)	(0.5)	(0.48)	(0.48)	(0.45)
Leisure	108.04	1.29**	1.06*	2.11***	1.68***	1.51***	1.01**	0.81	0.61	0.22	-0.07	-0.59	-0.65
	(30.24)	(0.43)	(0.42)	(0.41)	(0.39)	(0.4)	(0.39)	(0.47)	(0.46)	(0.46)	(0.45)	(0.45)	(0.43)
Gap (Men - Women)													
Market work	11.34	-1.09	-0.98	-1.06	-0.96	-0.63	-0.45	0.03	0.01	0.46	0.54	0.44	0.53
	(46.49)	(0.65)	(0.63)	(0.6)	(0.59)	(0.61)	(0.59)	(0.7)	(0.69)	(0.71)	(0.69)	(0.67)	(0.65)
Nonmarket work	-8.4	0.96**	0.9**	1.09***	0.99**	1.13***	1.06***	0.13	0.1	0.16	0.16	0.03	0.06
	(26.93)	(0.34)	(0.34)	(0.32)	(0.31)	(0.32)	(0.31)	(0.37)	(0.36)	(0.37)	(0.36)	(0.35)	(0.34)
Childcare	-3.85	0.44*	0.47**	0.49**	0.55***	0.4*	0.45**	0.05	0.08	-0.04	-0.02	-0.09	-0.1
	(14.8)	(0.18)	(0.16)	(0.16)	(0.15)	(0.16)	(0.15)	(0.19)	(0.17)	(0.19)	(0.17)	(0.18)	(0.16)
Total work	-0.91	0.32	0.39	0.52	0.58	0.9	1.05*	-0.93**	0.19	0.59	0.68	0.38	0.49
	(42.59)	(0.59)	(0.57)	(0.56)	(0.53)	(0.56)	(0.53)	(0.66)	(0.63)	(0.66)	(0.63)	(0.62)	(0.59)
Leisure	2.01	0.06	-0.06	-0.3	-0.42	-0.29	-0.49	-0.37	-0.35	-0.35	-0.44	0.01	-0.09
	(40.14)	(0.55)	(0.54)	(0.52)	(0.5)	(0.52)	(0.5)	(0.61)	(0.59)	(0.61)	(0.59)	(0.58)	(0.56)

Notes: Columns (1), (3), (5), (7), (9), (11) present the unconditional differences in hours per week between the periods. Columns (2), (4), (6), (8), (10), (12) present the conditional differences. Observations are weighted by adjusted ATUS weights. Standard errors are in parentheses. Data: ATUS (2003-2019).
*** p<0.001, ** p<0.01, * p<0.05

Table 6: Pairwise Time Use Changes 2003-2019 *(Married Parents)*

Time Use Category	Average 2003-2007	2008-2010 vs 2003-2007		2011-2014 vs 2003-2007		2015-2019 vs 2003-2007		2011-2014 vs 2008-2010		2015-2019 vs 2008-2010		2015-2019 vs 2011-2014	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Mothers													
Market work	21.47	1.48*	1.36*	0.37	0	1.68**	1.18*	-1.12	-1.4*	0.2	-0.3	1.31*	1.05
	(29.14)	(0.58)	(0.58)	(0.56)	(0.55)	(0.58)	(0.57)	(0.65)	(0.64)	(0.66)	(0.66)	(0.64)	(0.63)
Nonmarket work	26.74	-1.91***	-1.97***	-1.93***	-1.86***	-2.13***	-2.04***	-0.02	0.11	-0.22	-0.03	-0.2	-0.13
	(19.65)	(0.37)	(0.36)	(0.36)	(0.35)	(0.37)	(0.37)	(0.4)	(0.4)	(0.41)	(0.41)	(0.41)	(0.4)
Childcare	14.27	-0.09	-0.03	0.07	0.02	0.57	0.51	0.16	0.08	0.66*	0.57	0.51	0.48
	(15.35)	(0.29)	(0.28)	(0.29)	(0.28)	(0.3)	(0.28)	(0.33)	(0.31)	(0.34)	(0.32)	(0.33)	(0.31)
Total work	62.48	-0.51	-0.63	-1.49**	-1.84***	0.12	-0.35	-0.98	-1.22*	0.64	0.24	1.62**	1.4**
	(25.56)	(0.48)	(0.48)	(0.47)	(0.47)	(0.49)	(0.49)	(0.54)	(0.53)	(0.55)	(0.55)	(0.54)	(0.54)
Leisure	99.47	-0.25	-0.07	0.64	1.1*	-0.1	0.5	0.89	1.15*	0.15	0.59	-0.74	-0.48
	(23.95)	(0.45)	(0.45)	(0.44)	(0.43)	(0.46)	(0.46)	(0.51)	(0.5)	(0.52)	(0.52)	(0.51)	(0.5)
Fathers													
Market work	42.82	-2.75***	-2.76***	-1.17	-1.19	0.03	-0.26	1.58*	1.54*	2.78***	2.43**	1.19	0.84
	(34.93)	(0.71)	(0.71)	(0.68)	(0.68)	(0.69)	(0.69)	(0.79)	(0.78)	(0.8)	(0.79)	(0.76)	(0.76)
Nonmarket work	14.68	-0.36	-0.44	-0.92**	-1.06**	-0.76*	-0.76*	-0.56	0.61	-0.4	0.27	0.16	0.34
	(17.95)	(0.35)	(0.35)	(0.32)	(0.33)	(0.33)	(0.33)	(0.37)	(0.37)	(0.38)	(0.38)	(0.36)	(0.36)
Childcare	6.8	0.59*	0.68**	0.61**	0.82***	0.63**	0.77***	0.02	0.15	0.03	0.12	0.01	-0.04
	(10.79)	(0.25)	(0.24)	(0.22)	(0.21)	(0.2)	(0.2)	(0.28)	(0.27)	(0.27)	(0.26)	(0.24)	(0.23)
Total work	64.31	-2.52***	-2.52***	-1.48**	-1.43**	-0.11	-0.25	1.04	1.08	2.41***	2.28***	1.37*	1.14
	(29.21)	(0.6)	(0.59)	(0.56)	(0.55)	(0.57)	(0.57)	(0.65)	(0.65)	(0.67)	(0.66)	(0.64)	(0.63)
Leisure	98.98	1.38*	1.44*	1.03	1.11*	0.11	0.36	-0.36	-0.34	-1.27*	-1.1	-0.92	-0.68
	(27.64)	(0.56)	(0.56)	(0.53)	(0.53)	(0.54)	(0.54)	(0.62)	(0.61)	(0.63)	(0.62)	(0.6)	(0.6)
Gap (Fathers - Mothers)													
Market work	21.35	-4.23***	-4.13***	-1.53	-1.19	-1.65	-1.44	2.7**	2.94**	2.58*	2.73**	-0.12	-0.21
	(45.49)	(0.92)	(0.91)	(0.87)	(0.87)	(0.9)	(0.89)	(1.02)	(1)	(1.04)	(1.03)	(0.99)	(0.99)
Nonmarket work	-12.05	1.55**	1.53**	1.01*	0.8	1.37**	1.28**	-0.54	-0.71	-0.18	-0.24	0.36	0.48
	(26.62)	(0.51)	(0.5)	(0.48)	(0.48)	(0.49)	(0.49)	(0.55)	(0.55)	(0.56)	(0.56)	(0.54)	(0.54)
Childcare	-7.47	0.68	0.71	0.55	0.8*	0.05	0.26	-0.14	0.07	-0.63	-0.45	-0.5	-0.53
	(18.77)	(0.38)	(0.37)	(0.36)	(0.35)	(0.06)	(0.34)	(0.43)	(0.41)	(0.43)	(0.41)	(0.5)	(0.39)
Total work	1.83	-2**	-1.89*	0.02	0.42	-0.23	0.1	2.03*	2.3**	1.77*	2.04*	-0.25	-0.26
	(38.82)	(0.77)	(0.76)	(0.73)	(0.72)	(0.75)	(0.75)	(0.85)	(0.84)	(0.87)	(0.86)	(0.84)	(0.83)
Leisure	-0.49	1.63*	1.51*	0.39	0	0.21	-0.14	-1.24	-1.49	-1.42	-1.69*	-0.18	-0.2
	(36.57)	(0.72)	(0.72)	(0.69)	(0.68)	(0.71)	(0.7)	(0.8)	(0.79)	(0.82)	(0.81)	(0.79)	(0.78)

Notes: Columns (1), (3), (5), (7), (9), (11) present the unconditional differences in hours per week between the periods. Columns (2), (4), (6), (8), (10), (12) present the conditional differences. Observations are weighted by adjusted ATUS weights. Standard errors are in parentheses. Data: ATUS (2003-2019).
*** p<0.001, ** p<0.01, * p<0.05

7.3 Time Use Changes for the Married Parents Subsample

In Table 6, we present pairwise time use differences - conditional and unconditional - between all periods for the married parents sample in average weekly hours. Similar to Table 5, this table only shows thresholds of statistical significance (5%, 1%, and 0.1%), while exact p-values for each estimate can be found in Appendix V.

The market work gap between married fathers and mothers followed a U-shaped curve over the period of the analysis, decreasing during the Great Recession due to a decline in fathers' market work and an increase in mothers'. The gap in later periods is larger than the gap during the recession but smaller than the gap in the pre-recession period.

The Great Recession brought an increase in market work for mothers (Table 6, columns 1 and 2) compared to the pre recession, with a rise of 1.48 hours (UD) or 1.36 hours (CD), both significant at the 5% level. In the same period, fathers decreased their market work by 2.75 hours (UD) or 2.76 hours (CD) at a 0.1% significance level, which brought a large narrowing of the market work gap between mothers and fathers of 4.23 hours (UD) or 4.13 hours (CD) (columns 1 and 2). Cycle effects almost fully drove the narrowing of the market work gap (Table 8, columns 1 and 2): with pre recessionary insignificant market work trends for both mothers and fathers, the Great Recession brought a shift in both mothers' market work by approximately 1 hour, and fathers' market work by approximately -3.7 hours. During the recovery period, mothers decreased their market work time compared to 2008-2010 (Table 6, column 8) by 1.4 hours (CD, significant at the 5% level). This market work decrease, coupled with a statistically significant (5% level) increase in fathers' market work of 1.54 hours (CD) widened the fathers-mothers market work gap again (by 2.7 hours - unconditional difference - or 2.94 hours - CD) (all in columns 7 and 8 of Table 6), although still keeping it lower than in the pre recession. While for married mothers time spent on market work was still higher in the recovery period compared to the pre recessionary period and it was lower for fathers (Table 6, columns 3 and 4), these values are statistically insignificant. During post recovery, mothers increased their market work time compared to the pre recession by 1.68 hours (UD, significant at 1% level) or 1.18 hours (CD, significant at 5% level), no significant change compared to the Great recession, and increased market work time by 1.31 hours (UD, significant at 5% level) compared to the recovery period (Table 6, columns 5, 6, 9, 10, 11, 12). Fathers experienced no significant change in market work time in the post recovery period compared to the pre recession, indicating that they had picked up most of their lost market work time by that period (Table 6, columns 5 and 6). Columns 5 and 6 of Table 8 show that although fathers returned to pre recessionary trends, mothers' increased market work time happened as a consequence of the Great Recession narrowed the market work time use gap more compared to the pre recessionary gap (and less compared to the recessionary gap).

Although not as significant as for market work, the Great Recession, coupled with pre recessionary trends, brought a converging gap between mothers and fathers' nonmarket work hours.

Columns 1 and 2 of Table 6 show that compared to the pre recessionary period, married mothers decreased their nonmarket work by 1.91 hours (UD) or 1.97 hours (CD) significantly at the 0.1% level during the Great Recession, which together with a statistically insignificant decrease in fathers' nonmarket work time use by 0.36 or 0.44 hours (UD or CD) narrowed the nonmarket work gap. In Table 8, columns 1 and 2, we see that the decrease in mothers' nonmarket work in 2008-2010 compared to 2003-2007 was mostly driven by pre recessionary trends, while fathers'

experienced a smaller decrease in nonmarket work than would have happened if pre recessionary trends remained, thus narrowing the gap. In Table 6, columns 3 through 6 show that for mothers, the decreased nonmarket work in all periods compared to the pre recession was kept relatively constant at approximately -2 hours, with all estimates being significant at the 0.1% level. Fathers' nonmarket work decrease became statistically significant in 2011-2014 compared to 2003-2007 (at the 1% and 5% levels), and also remained constant throughout the rest of the periods at approximately -0.7 to -1 hour (columns 3-6, Table 6). After the Great Recession, nonmarket work gaps started widening again although not significantly (columns 7 to 10, Table 6). Over time, as mothers' nonmarket work did not decrease significantly compared to previous periods, and as pre recessionary trends would continue to decrease, cycle effects appear to be larger (Table 8, columns 3 to 6). The cycle effects shown in Table 8 for the nonmarket work gaps provide evidence that - absent the recession - the convergence would have been larger.

The childcare time use gap between married fathers and mothers slightly narrowed during and after the Great Recession, persisting over time.

Married fathers present statistically significant constant increases in childcare over all periods (Table 6, columns 1 to 6). For each period, they increased their childcare by around 0.7-0.8 hours compared to the pre recession (all estimates are either significant at the 5%, 1%, and 0.1% levels). Because mothers did not change their childcare in either 2008-2010 or 2011-2014 compared to 2003-2007, while fathers increased their childcare time use during these periods, the gaps in time use appear to be narrowing, yet statistically insignificant. In post recovery, compared to pre recession (Table 6, columns 5 and 6), mothers are shown to have increased their childcare time by 0.57 (UD) or 0.53 (CD) weekly hours, but the change is insignificant. From column 7 to 12 in Table 6, the gaps remain statistically insignificant but this time show to be widening (however still remain positive compared to the pre recessionary period), as both mothers and fathers slightly increased their childcare time use in the recovery and post recovery periods compared to the recession and recovery periods respectively. From Table 8, we see that for both mothers and fathers, the cycle effects on their childcare time are positive throughout the entire business cycle, indicating that both of their childcare time was larger than it would have been absent the recession. The cycle effect on childcare gaps is positive only for recessionary versus pre recessionary and unconditional recovery versus pre recessionary periods (Table 8, columns 1-3), due to mothers' childcare time remaining rather stagnant during this period (compared to slight negative trend prior to the recession), and fathers' childcare time increasing only slightly.

Total work, much similar to market work, presents a U-shaped curve gap for married mothers and fathers, narrowing during the Great Recession, and widening in other periods. Fathers worked more than mothers in all periods except for the Great Recession.

During the recession, total work for mothers decreased insignificantly compared to the pre recession by 0.51 and 0.63 hours (UD and CD, columns 1 and 2 of Table 6), and during the recovery period, it significantly decreased at the 1% or 0.1% level compared to the pre recession, by 1.49 hours or 1.84 hours (UD and CD, columns 3 and 4 of Table 6). Columns (5) and (6) of Table 6 show that over the business cycle, total work for married mothers did not change significantly, with the exception of during the recovery period. For fathers, the 2008-2010 period compared to the 2003-2007 period presented a statistically significant decrease at the 0.1% level in total work by 2.52 hours (both UD and CD) (Table 6 columns 1 and 2), driven by their loss in market work

time. Fathers started gaining total work hours back in the recovery period, when they worked approximately 1.4 hours less compared to 2003-2007 (Table 6, columns 3 and 4, statistically significant at the 1% level). Finally, they gained back almost all of their pre recessionary total work in the post recovery period (Table 6, columns 9 and 10). During the Great Recession compared to the pre recession, the fathers-mothers total work gap significantly (at 1% - UD - and 5% - CD - levels) narrowed by approximately 2 hours driven by fathers' decrease in total work, while returning to pre recessionary estimates in the recovery and post recovery periods (Table 6, columns 3-6 and 7-12). In Table 8, we see that cycle effects narrowed the fathers-mothers total work gap by more than pre recessionary trends would have, driven by an increase in mothers' total work by more than the trend, and a decrease in fathers' total work by more than the trend would have shown. In general though, excluding the Great Recession's period, fathers are reported to work more than mothers, and this trend reverted after the recession narrowed the total work gap.

Mothers and fathers experienced a change in the leisure gap during the Great Recession, mostly driven by fathers' increase in leisure time during that period. In the following periods, it reversed to the pre recessionary estimates, with mothers having more leisure time than fathers.
From Table 6, columns 1 and 2, during the Great Recession compared to 2003-2007, fathers significantly (at the 5% level) increased their leisure time by 1.38 hours per week (UD) or 1.44 hours per week (CD). With mothers reducing their leisure time in that same period by approximately 2 hours compared to pre recessionary increasing trends (Table 8, columns 1 and 2), the fathers-mothers gap showed higher leisure time for fathers by approximately 1 hour, compared to a pre recessionary leisure gap in favour of mothers. Compared to 2008-2010, fathers' leisure time decreased in post recovery compared to recession by 1.27 hours (UD, significant at 5% level). Conversely, mothers' leisure time increased during the recovery period compared to the recession by 1.15 hours (CD, significant at 5% level). Although the Great Recession had switched leisure trends to married fathers having more leisure, during the recovery and post recovery period leisure gaps show a slow reverting of trends, with mothers enjoying more leisure time compared to fathers again (Table 6, columns 1-6). Mothers' leisure advantage turned out to be smaller than would have been if pre recessionary increasing (for mothers) and stagnant (for fathers) trends remained (Table 8, columns 1-6).

7.4 Cycle Effects Robustness Check

As discussed in Section 6.5, due to trend estimates being predictions and not fixed values, sample statistics obtained using traditional methods of inference are unreliable as they do not take into account variability associated with the extrapolation. Instead, to confirm reported estimates and additionally calculate corresponding standard errors, we use bootstrapping, a technique invented by Bradley Efron (1979, 1981, 1982) and later developed by Efron and Tibshirani (1993). Bootstrapping is a method to calculate sample statistics using resampling with replacement from the original dataset, where the statistic is re-evaluated with each bootstrap sample. In our case, the bootstrapping involved several steps. First, from our sample, which contains both true and extrapolated time use, observations are selected with replacement, with the number of draws corresponding to our sample size for the general population and married parents. Second, for each sample, parameters of interest are calculated by fitting our baseline model (4) and trend model (6). We chose to perform the bootstrapping only on the models with demographic controls,

Table 7: Trend Decomposition *(General sample)*

Time Use Category	2008-2010 vs 2003-2007		2011-2014 vs 2003-2007		2015-2019 vs 2003-2007		2011-2014 vs 2008-2010		2015-2019 vs 2008-2010		2015-2019 vs 2011-2014	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Women												
Market work	-2.71	-2.84	-4.58	-4.73	-5.98	-6.3	-1.86	-1.87	-3.27	-3.48	-1.41	-1.65
Nonmarket work	-0.12	0.07	0.4	0.8	3.46	2.44	0.52	0.73	2.05	2.38	1.53	1.69
Childcare	0.09	0.16	0.28	0.39	0.64	0.74	0.18	0.23	0.54	0.58	0.37	0.35
Total work	-2.74	-2.6	-3.9	-3.54	-3.42	-3.11	-1.17	-0.92	0.03	-0.52	0.48	0.38
Leisure	1.71	1.65	3.31	3.09	3.25	3.09	1.6	1.42	1.54	1.44	-0.06	1.15
Men												
Market work	-2.08	-2.18	-2.42	-2.62	-1.47	-1.86	-0.34	-0.43	-1.66	0.32	0.96	0.71
Nonmarket work	-0.16	-0.16	-0.39	-0.32	0.05	0.14	-0.23	-0.16	0.21	0.29	0.44	0.48
Childcare	0.3	0.12	0.33	0.3	0.35	0.16	0.03	0.01	0.04	-0.12	0.02	-0.13
Total work	-1.94	-2.05	-2.48	-2.64	-1.08	-2.2	-0.54	-0.87	0.88	0.49	1.41	1.06
Leisure	0.95	1.26	1.48	1.63	0.5	0.93	0.52	0.59	-0.45	-0.12	-0.97	-0.68
Gap (Men - Women)												
Market work	0.63	0.66	2.16	2.11	4.51	4.44	1.52	1.44	1.61	3.8	2.37	2.36
Nonmarket work	-0.04	-0.23	-0.79	-1.12	-3.41	-2.3	-0.75	-0.89	-1.84	-2.09	-1.09	-1.21
Childcare	0.21	-0.04	0.05	-0.09	-0.29	-0.58	-0.15	-0.22	-0.5	-0.7	-0.35	-0.48
Total work	0.8	2.6	1.42	0.9	2.34	0.91	0.63	0.05	0.85	1.01	0.93	0.68
Leisure	-0.76	-0.39	-1.83	-1.46	-3.05	-2.16	-1.08	-0.83	-1.99	-1.56	-0.91	-1.83

Notes: Columns (1), (3), (5), (7), (9), (11) present the difference in hours per week between the observed changes and the trend effect in the models without controls. Columns (2), (4), (6), (8), (10), (12) present the differences for the models with controls. Observations are weighted by adjusted ATUS weights. Data: ATUS (2003-2019).

Table 8: Trend Decomposition *(Married Parents)*

Time Use Category	2008-2010 vs 2003-2007		2011-2014 vs 2003-2007		2015-2019 vs 2003-2007		2011-2014 vs 2008-2010		2015-2019 vs 2008-2010		2015-2019 vs 2011-2014	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Mothers												
Market work	1.16	1.09	-0.23	-0.5	0.71	0.38	-1.4	-1.63	-0.44	-0.83	0.95	0.75
Nonmarket work	0.12	-0.03	1.88	1.77	3.96	3.77	1.76	1.81	3.84	3.84	2.08	2.04
Childcare	0.09	0.16	0.28	0.39	0.64	0.74	0.18	0.23	0.54	0.58	0.37	0.35
Total work	1.3	1.36	4.88	1.89	5.54	5.61	0.61	0.52	4.25	4.21	1.29	3.63
Leisure	-2.02	-2.06	-3.39	-2.63	-5.41	-5.47	-0.66	-0.59	-3.39	-3.39	-2.73	-2.71
Fathers												
Market work	-3.66	-3.7	-2.87	-2.94	-2.68	-3.05	0.79	0.72	0.97	0.57	0.17	-0.2
Nonmarket work	0.48	1.36	1.13	0.67	1.45	2	0.17	1.42	1.27	4.27	1.1	1.87
Childcare	0.59	0.56	0.62	0.6	0.64	0.41	0.02	0.05	0.04	-0.12	0.01	-0.17
Total work	-2.58	-2.65	-1.6	-1.67	-0.3	-0.64	0.98	0.97	2.28	2.01	1.3	0.99
Leisure	1.29	1.36	0.86	0.95	-0.16	0.11	-0.44	-0.41	-1.45	-1.27	-1.02	-0.77
Gap (Fathers - Mothers)												
Market work	-4.82	-4.79	-2.64	-2.44	-3.39	-3.43	2.19	2.35	1.41	1.4	-0.78	-0.95
Nonmarket work	0.36	1.39	-0.75	-1.1	-2.51	-1.77	-1.59	-0.39	-2.57	0.43	-0.98	-0.17
Childcare	0.58	0.27	0.37	-0.01	-0.22	-1.05	-0.23	-0.31	-0.82	-1.32	-0.61	-1
Total work	-3.88	-4.01	-6.48	-3.56	-5.84	-6.25	0.37	0.45	-1.97	-2.2	0.01	-2.64
Leisure	3.31	3.42	4.25	3.58	5.25	5.52	0.22	0.18	1.94	2.12	1.71	1.94

Notes: Columns (1), (3), (5), (7), (9), (11) present the difference in hours per week between the observed changes and the trend effect in the models without controls. Columns (2), (4), (6), (8), (10), (12) present the differences for the models with controls. Observations are weighted by adjusted ATUS weights. Data: ATUS (2003-2019).

since results for them are comparable with absolute changes in the population, while being more robust in capturing the effects of the recession compared to the effect of changes in demographic characteristics. For each sample, the difference in the parameters of interest is calculated for women ($\hat{\beta}_{11} - \hat{\beta}_{21}$), men ($(\hat{\beta}_{11} + \hat{\beta}_{13}) - (\hat{\beta}_{21} + \hat{\beta}_{23})$), and the gap ($\hat{\beta}_{13} - \hat{\beta}_{23}$).

We perform resampling 1000 times. This way, the distribution of differences is built, which allows for a better account of the variability in the estimates. We report the obtained differences in the coefficients, which represent the cycle effect, as well as standard error associated with them.

The results are provided in Appendix VI and VII, for the general population and married parents samples respectively. The estimated cycle effects obtained by bootstrapping are almost identical to the ones from a simple difference of the coefficients of interest between regressions (4) and (6). However, with the standard errors appearing to be quite large, this once again highlights the difficulty in precise estimation of the effects of the Great Recession. Therefore, while Tables 7 and 8 provide valuable insights into the difference between the observed changes and the projected trend, they could be interpreted as only indicative of the possible cycle effect on time use.

8. Discussion

In the following section we discuss the results of this study for the general population sample as well as married parents subsample, concluding that the impact of the Great Recession extends beyond the economy and differs by gender. We first contextualise our findings within previous literature and our hypotheses. Thereafter, we propose potential directions for future research.

8.1 Interpretation of Our Findings

The Great Recession brought an equalisation of hours in market work for both the general population and the subsample of married parents, yet for different reasons, broadly consistent with the changes in the labour market. Men lost more jobs immediately after the Great Recession started due to their prevalence in cyclical industries while women lost their jobs at slower rates during this stage (Pissarides, 2013). Within the general population sample, during the Great Recession, men worked significantly less hours than they used to before the crisis. Similarly, women also lost market work hours in 2008-2010 compared to 2003-2007, although by 1 hour less than men. In contrast, within the subsample of married parents, not only did fathers significantly decrease their market work time, but mothers also gained more market work hours, resulting in fathers losing double the weekly hours mothers gained in market work, which is consistent with the added-worker effect described by Sahin et al. (2010). However, these effects did not prove to be long-lasting. As men regained employment at a faster rate compared to women who experienced a slower recovery (Hartmann et al., 2014), a similar trend was reflected in the hours worked. Men significantly increased their market work hours after the recession, while for women these estimates were lower and insignificant. Moreover, mothers decreased their market work hours after the increase observed during 2008-2010. This phenomenon created a U-shaped curve for market work, with the effect more pronounced for married parents due to larger and more significant male losses and female gains in market work during periods of crisis, providing support for the first part of Hypothesis 1.

The question addressed by Berik and Kongar (2012, 2013, & 2014), which we further investigate

with additional years of data, concerns whether changes in market work during and after the Great Recession were reflected in a more equal distribution of responsibilities, particularly if men took on more unpaid work hours. Our findings present mixed results on this question. For the general population, the gap in nonmarket work and childcare significantly narrowed during the Great Recession by approximately 1 weekly hour and 0.5 weekly hours (respectively), and there does not appear to be an inverted U-shaped curve, as the equalising effects do not indicate to significantly diminish in the later periods. However, for both nonmarket work and childcare, women increased their time spent in these categories more than they would have otherwise based on pre recession trends, resulting in a convergence less pronounced than expected, assuming that pre-existing trends would have continued at the same rate. For married parents, a similar convergence was observed. Although there is some statistically insignificant evidence of gaps diverging again after the recession, contrary to the results of Berik and Kongar (2012, 2013, & 2014), pairwise comparisons of all subsequent periods with the pre recession period indicate that the effects persisted over time. Additionally, as with the general population, assuming the pre recession trends would hold, greater parity could have been achieved without the recession, particularly in the recovery and post recovery periods. Therefore, as per Hypothesis 1, gender disparity narrowed in unpaid work in terms of observed changes. However, we do not find strong support for Hypothesis 2.

In the general sample, both men and women spent significantly more time on leisure during the Great Recession, also relative to the trend. This finding aligns with Aguiar et al.'s (2013) conclusion that leisure absorbs most of the foregone market work during the Great Recession, irrespective of gender. While there is some evidence suggesting a convergence in the leisure time gap between men and women, the change was insignificant, providing partial support for Hypothesis 1. For married parents, the dynamics differ. Fathers significantly increased their leisure time during the recession, resulting in the leisure gap shifting from an advantage for mothers to one favouring fathers, before returning to pre recession levels in the post recovery period. Conversely, mothers decreased their leisure time during the recession and started increasing it again in the recovery period, consistent with findings from previous literature (Berik and Kongar, 2012, 2013, & 2014) and supporting the last point of Hypothesis 1.

In terms of observed changes, the Great Recession had an equalising effect on total workloads for the general population, with women working by approximately 1 hour more than men prior to the recession. Men lost more market hours than women and also began allocating more time to childcare, while the decline in non-market work was relatively larger than that for women. While descriptively this conclusion holds true, the changes in the total work gap are mostly statistically insignificant. For married mothers and fathers, there was a negative and significant change in total workloads during the Great Recession, largely driven by mothers increasing their workload. The double burden hypothesis of Hochschild and Machung (1989) still does not seem entirely accurate for the crisis. Before the recession, fathers spent 2 more hours on work than mothers did, and these estimates returned to their original values after the recession, reflecting the regained working hours. This conclusion aligns with Berik and Kongar (2014), who claimed that mothers' work burden increased during the recession relative to fathers as they took on more working hours, while fathers compensated with an increase in non-paid hours to a relative extent and allocated more time to leisure than mothers. However, it is inconsistent with the notion

of mothers being overworked – at least in terms of working hours – in general, given fathers' larger total burden prior to the recession. This difference warrants further investigation and may be attributed to differences in definitions, although quantifying this difference is challenging since Berik and Kongar (2012, 2013, & 2014) do not provide detailed definitions of which ATUS codes they include in each category. Nonetheless while stronger conclusions could be drawn for individual time-use categories, the question of whether *second shift* versus *iso-work* prevails remains inconclusive.

8.2 Opportunities for Future Research

Our study raises several questions for further examination. Despite our attempts to separate pre recessionary trends and determine cycle effects on gendered time use, the estimation of the effects of the recession remains uncertain. Harmonising ATUS data with AHTUS would give the opportunity to make more precise conclusions on pre recessionary trends and aid in the trend extrapolation estimation. At the moment, our pre recessionary trends have to be treated with much caution, and we are not fully able to discern why women's leisure time appears to be different compared to what past research concluded, therefore including more years would give us the chance to understand pre recessionary and, indirectly, recessionary time use patterns better. Analysis of married parents reveals the difference between this group and the general population, characterised by more pronounced allocation of responsibilities. Fathers tend to undertake more paid work while mothers engage in more unpaid work overall. However, in situations where mothers take on more paid work, there is no proportional increase in fathers' unpaid work, posing a challenge for gender equality at the household level due to a less pronounced substitution effect between different activities. It remains of interest to explore in more detail whether increased labour force participation grants married mothers greater bargaining power in the household (as concluded by Berik & Kongar, 2013), and whether it does so even in the case of a temporary crisis like the Great Recession. While our results do show that during and after the recession certain time use characteristics significantly changed and protracted through the long term, we hope that future research is able to bring more insights into the reasons why these changes occurred. Specifically, a deeper conversation into why married parents do not share their responsibilities equally even if theoretically – with mothers' increased market work hours – they would start doing so.

We realise that our results are also dependent on the data being exclusively from the U.S. and concentrated only on the Great Recession's business cycle, and that while our conclusions might start a conversation on how Western countries react to economic crises in terms of time use, actual empirics from other countries, as well as from other crises, might show different results. Effects of the Great Recession started later globally compared to in the U.S. (by 2009, most countries had started feeling the effects of the crisis, as per Pissarides, 2013), which would already give different results in gender differences in time use. Additionally, comparing economically similar countries to the U.S. could give potentially contrasting results due to differences in societal norms affecting time use. Lastly, because of the lack of proper time use data for periods intersecting past recessions, performing a gendered analysis on time use comparing two global crises – the Great Recession and the COVID-19 crisis – will be possible once enough post crisis data is collected.

Our results do not allow us to make precise conclusions on which demographic groups within

the samples we studied were the main drivers of change in time use, which as shown by some researchers, could be an important contribution to research. Comparing the effects of an economic crisis for different demographic groups of men and women could give more clarity on who is most affected by crises and how. According to Berik and Kongar (2013), depending on the age of children, married mothers were increasing their labour market participation differently, with mothers of older children (from 6 to 18 years old) driving their increase in labour market participation. Sampling for different groups of a population could show how they respond differently to economic crises.

Lastly, while we focused solely on examining the time women (mothers) and men (fathers) spend on certain activities, this focus does not provide a complete picture of the total work the population undertakes throughout the week. According to Bittman and Wajcman (2000), while it might be true that over the last few decades total work has been equalising between genders, women experience a higher sense of pressure due to their leisure being often interrupted and due to their childcare time involving more "working" activities while that of men involving enriching activities. Our expectation, given past literature's findings and our results, is that gendered time use changes during periods of economic crisis will be given a larger space in economics research.

9. Conclusion

In this paper, we explored how time allocation in five different categories evolved over the course of the U.S. business cycle (2003-2019) intersecting the Great Recession. The Great Recession created a unique situation in which women and men were affected differently in terms of the labour market, with men facing higher unemployment rates but also experiencing a quicker recovery (Hartmann et al, 2014). Using data from the American Time Use Survey (ATUS) spanning the entire business cycle, we aimed to examine how this event reflected on individual-level time use and, consequently, on responsibility sharing, particularly given the increase in women's labour market participation in this period after the stagnation in the 2000s (Blau & Kahn, 2007). This paper's contribution lies in examining pairwise differences in time use across periods, providing a comprehensive analysis of how individual time allocation responded to shifts in the labour market based on gender. It explores whether the patterns of time allocation prior to the recession underwent change and whether such changes were long-lasting or temporary, thus demonstrating that the impact of the Great Recession extends well beyond the economy.

Our results are consistent with Berik and Kongar (2012, 2013, & 2014) as we find that both of our samples, but especially the married parents subsample, experienced a convergence in market work time use gaps during the Great Recession, as well as narrowing of unpaid work gaps (nonmarket work and childcare). We find support for Berik and Kongar's conclusions (2012, 2013, & 2014) that fathers increased their time spent on leisure during the Great Recession, and confirm Aguiar et al.'s (2013) finding that, irrespective of gender, leisure time increased during the recession. Thanks to the availability of a larger number of post recessionary years and the calculation of pairwise differences in time use for all periods, we have addressed our initial uncertainties regarding Berik and Kongar's (2012, 2013, & 2014) conclusions, which predicted an inverse U-shaped curve pattern for the gap in unpaid work time. Our results instead show that the narrowing trends in unpaid work gaps persisted over time for both of our samples. Finally,

we are able to partially confirm Berik and Kongar's (2012, 2013, & 2014) findings regarding mothers experiencing a *second shift* during economic crises (although we reject that *iso-work* is reached otherwise, due to fathers working more in total in other periods) as well as bringing new, yet statistically insignificant, evidence that confirms *iso-work* being achieved during and after the recession for the general population.

As discussed in earlier sections, there are many directions in which time use research can progress before gaining a definitive understanding of how gender differences in time allocation react to the state of the economy. While we have found evidence for decreased gender inequality arising after the surge of the Great Recession, the recession in the U.S. brought increased job insecurity, lower wages, and overall higher household instability, which does not give the ideal starting point for men and women to start equally sharing their responsibilities. We hope that future research can contribute to achieving stable *iso-work* across all time periods and demographic groups, as well as across different countries, and that more attention will be paid to the mental toll of time use, rather than solely focusing on the absolute number of hours allocated to specific activities.

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11. Appendices

Appendix I: Time Use Categories' Codes According to the ATUS Activity Code Lexicon

Following the time use specifications by Aguiar et al. (2013), we used their definitions of *market work*, *nonmarket work*, *childcare*, and *leisure* for the definitions of our four time use categories. In their Online Appendix, a detailed definition of each time use category is reported. We report the ATUS Activity Code Lexicon codes relevant to our four time use categories in the table below.
Note: "travel", the category classified as 18 in the first-tier, changed from 2003, where it was classified as 17 in the first-tier.

1. **Market Work**: 05-01 → "work - main job", 05-02 → "work - other jobs", 05-99 → "working - nec, or not elsewhere classified", 18-05-01 → "travel related to working", 18-05-02 → "travel related to work-related activities", 18-05-99 → "travel related to work, nec".

2. **Nonmarket Work**:

   (a) Core home production: 02-01 → "housework", 02-02 → "food and drink preparation, presentation, and clean-up", 02-03 (excluding 02-03-01) → "interior maintenance, repair, and decoration", 02-07 → "vehicles", 02-08 → "appliances, tools, and toys", 02-09 (excluding 02-09-03 and 02-09-04) → "household management", 02-99 → "household activities, nec", 18-02-01 → "travel related to housework", 18-02-02 → "travel related to food and drink preparation, presentation, and clean-up", 18-02-03 → "travel related to interior maintenance, repair, and decoration", 18-02-07 → "travel related to vehicles", 18-02-08 → "travel related to appliances, tools, and toys", 18-02-09 → "travel related to household management", 18-02-99 → "travel related to household activities, nec";

   (b) Home ownership activities: 02-03-01 → "interior arrangement, decoration, and repairs", 02-04 → "exterior maintenance, repair, and decoration", 02-05 → "lawn, garden, and houseplants", 18-02-04 → "travel related to exterior maintenance, repair, and decoration", 18-02-05 → "travel related to lawn, garden, and houseplants";

   (c) Obtaining goods and services: 07 → "consumer purchases", 08 (excluding 08-04) → "professional and personal care services", 09 → "household services", 10 → "government services and civic obligations", 18-07 → "travel related to consumer purchases", 18-08 (excluding 18-08-04) → "travel related to professional and personal care services", 18-09 → "travel related to household services", 18-10 → "travel related to government services and civic obligations";

   (d) Others Care: 03-04 → "caring for household adults", 03-05 → "helping household adults", 03-99 → "caring for and helping household members, nec", 04-04 → "caring for non household adults", 04-05 → "helping non household adults", 04-99 → "caring for and helping non household members, nec", 18-03-04 → "travel related to caring for household adults", 18-03-05 → "travel related to helping household adults", 18-03-99 → "travel related to caring for and helping household members, nec", 18-04-04 → "travel related to caring for non household adults", 18-04-05 → "travel related to

helping non household adults", 18-04-99 → "travel related to caring for and helping non household members, nec".

3. **Childcare**: 03-01 → "caring for and helping household children", 03-02 → "activities related to household children's education", 03-03 → "activities related to household children's health", 04-01 → "caring for and helping non-household children", 04-02 → "activities related to non household children's education", 04-03 → "activities related to non household children's health", 18-03-01 → "travel related to caring for and helping household children 2003 and 2004", 18-03-02 → "travel related to caring for and helping household children 2005+", 18-03-03 → "travel related to household children's education", 18-04-01 → "travel related to caring for and helping non household children 2003 and 2004", 18-04-02 → "travel related to caring for and helping non household children 2005+", 18-04-03 → "travel related to non household children's education".

4. **Leisure**:

   (a) TV Watching: 12-03-03 → "television and movies - not religious", 12-03-04 → "television - religious";

   (b) Socialising: 12-01 → "socialising and communicating", 12-02 → "attending or hosting social events", 12-03-07 → "playing games", 12-05-01 → "waiting associated with socialising and communicating", 12-05-02 → "waiting associated with attending or hosting social events", 16 → "telephone calls", 18-12-01 → "travel related to socialising and communicating", 18-12-02 → "travel related to attending or hosting social events", 18-16 → "travel related to telephone calls";

   (c) Sleep: 01-01 → "sleeping";

   (d) Eating and Personal Care: 01-02 → "grooming", 01-04 → "personal activities", 01-05 → "personal care emergencies", 01-99 → "personal care, nec", 11 → "eating and drinking", 18-01 → "travel related to personal care", 18-11 → "travel related to eating and drinking";

   (e) Other Leisure: 02-06 → "animals and pets", 02-09-03 → "household and personal mail and messages except email", 02-09-04 → "household and personal email and messages", 12-03 (excluding 12-03-03, 12-03-04, 12-03-07) → "relaxing and leisure", 12-04 → "arts and entertainment other than sports", 12-05 (excluding 12-05-01, 12-05-02) → "waiting associated with socialising, relaxing, and leisure", 12-99 → "socialising, relaxing, and leisure, nec".

Appendix II: Share of respondents by demographic and household characteristics, in % *(General sample)*

Demographic Group	Men				Women			
	Pre recession	*Recession*	*Recovery*	*Post recovery*	*Pre recession*	*Recession*	*Recovery*	*Post recovery*
Age 18-27	20.63	20.72	21.07	20.82	21.28	21.05	21.62	21.61
Age 28-37	21.46	20.46	20.72	21.43	22.13	21.26	20.72	21.44
Age 38-47	23.97	22.60	20.41	19.91	23.79	22.76	20.96	20.00
Age 48-57	21.58	22.47	22.58	21.26	21.25	21.66	22.33	20.94
Age 58-64	12.36	13.74	15.23	16.58	11.54	13.27	14.37	16.01
Below High school	12.02	11.17	9.93	9.48	13.71	12.78	11.67	10.56
High school	30.54	28.04	27.26	25.26	32.18	31.66	31.20	30.71
Some college/associate	29.28	29.07	29.76	28.26	26.28	26.12	26.69	25.46
Bachelor's and higher	28.17	31.72	33.05	37.00	27.83	29.44	30.43	33.27
Married	59.18	56.42	53.34	53.29	58.78	56.56	54.28	53.01
Have child	47.68	46.34	45.36	43.89	42.26	40.60	39.43	38.32
N	32338	17036	20254	20232	25370	13761	16746	17181

Notes: Authors' calculations from ATUS 2003-2019 data files. All observations are weighted by adjusted ATUS weights.

Appendix III: Share of respondents by demographic and household characteristics, in % *(Married Parents)*

Demographic Group	Men				Women			
	Pre recession	*Recession*	*Recovery*	*Post recovery*	*Pre recession*	*Recession*	*Recovery*	*Post recovery*
Age 18-27	11.87	9.48	9.00	7.01	7.84	6.32	5.45	4.30
Age 28-37	37.48	36.79	36.37	37.03	32.90	31.74	30.46	30.52
Age 38-47	37.97	37.45	38.23	38.03	39.80	38.95	38.23	40.16
Age 48-57	11.11	13.99	13.95	15.55	16.79	19.14	21.60	20.52
Age 58-66	1.57	2.29	2.46	2.38	2.67	3.85	4.26	4.50
Below High school	11.41	11.67	9.61	9.04	13.65	12.17	12.36	11.04
High school	28.25	24.31	23.09	20.98	28.88	29.07	27.88	25.21
Some college/associate	26.66	25.45	24.80	22.89	23.81	23.18	22.69	21.68
Bachelor's and higher	33.67	38.57	42.50	47.09	33.66	35.58	37.07	42.08
More than 3 children	23.13	22.99	22.23	22.65	23.09	23.87	24.08	22.03
N	11870	6174	6729	6560	10423	5407	6090	6070

Notes: Authors' calculations from ATUS 2003-2019 data files. All observations are weighted by adjusted ATUS weights.

Appendix IV: P-values for Baseline Regression Estimates (*General Sample*)

Time Use Category	2008-2010 vs 2003-2007		2011-2014 vs 2003-2007		2015-2019 vs 2003-2007		2011-2014 vs 2008-2010		2015-2019 vs 2008-2010		2015-2019 vs 2011-2014	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
						Women						
Market work	0.073	0.05	0.022	0.018	0.889	0.689	0.763	0.846	0.136	0.167	0.058	0.121
Nonmarket work	5.76e-09	2.02e-08	<2.2e-16	<2.2e-16	<2.2e-16	1.42e-14	0.016	0.049	0.029	0.101	0.856	0.669
Childcare	0.044	0.242	0.001	0.11	0.0002	0.12	0322	0.779	0.165	0.781	0.67	0.98
Total work	3.67e-11	2.34e-10	<2.2e-16	<2e.16	3.53e-13	7.72e-10	0.025	0.111	0.754	0.716	0.046	0.045
Leisure	0.0004	0.001	5.49e-14	2.01e-06	2.89e-08	3.38e-06	0.002	0.01	0.139	0.324	0.099	0.115
						Men						
Market work	0.0002	0.0003	3.92e-05	6.05e-05	0.143	0.186	0.844	0.893	0.035	0.03	0.015	0.018
Nonmarket work	0.044	0.06	7.61e-06	0.0001	3.17e-05	0.001	0.044	0.104	0.088	0.279	0.728	0.484
Childcare	0.136	0.001	0.576	4.85e-05	0.222	0.002	0.357	0.707	0.017	0.603	0.107	0.312
Total work	3.34e-06	2.51e-05	6.34e-11	1.95e-08	8.31e-05	0.01	0.158	0.366	0.365	0.085	0.015	0.01
Leisure	0.003	0.011	2.24e-07	1.81e-05	0.0002	0.01	0.084	0.182	0.635	0.879	0.184	0.13
						Gap (Men - Women)						
Market work	0.0917	0.124	0.078	0.102	0.302	0.447	0.97	0.986	0.512	0.439	0.514	0.416
Nonmarket work	0.005	0.008	0.001	0.001	0.0004	0.001	0.723	0.785	0.656	0.652	0.92	0.869
Childcare	0.012	0.003	0.002	0.0002	0.013	0.002	0.792	0.65	0.835	0.928	0.612	0.544
Total work	0.595	0.493	0.349	0.277	0.107	0.049	0.752	0.764	0.371	0.277	0.543	0.407
Leisure	0.908	0.914	0.559	0.404	0.573	0.333	0.547	0.548	0.559	0.452	0.984	0.872

Notes: Columns (1), (3), (5), (7), (9), (11) present the p-values of unconditional differences from Table 5. Columns (2), (4), (6), (8), (10), (12) present the p-values of conditional differences. All p-values are based on robust standard errors. Data: ATUS (2003-2019).

Appendix V: P-values for Baseline Regression Estimates (*Married Sample*)

Time Use Category	2008-2010 vs 2003-2007		2011-2014 vs 2003-2007		2015-2019 vs 2003-2007		2011-2014 vs 2008-2010		2015-2019 vs 2008-2010		2015-2019 vs 2011-2014	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					Mothers							
Market work	0.011	0.018	0.507	0.999	0.004	0.039	0.084	0.028	0.768	0.648	0.041	0.094
Nonmarket work	2.15e-07	6.3e-08	6.82e-08	1.29e-07	8.33e-09	3.24e-08	0.958	0.789	0.593	0.938	0.622	0.739
Childcare	0.758	0.927	0.819	0.938	0.055	0.074	0.635	0.805	0.048	0.073	0.129	0.125
Total work	0.287	0.188	0.002	8.12e-05	0.801	0.469	0.067	0.022	0.247	0.668	0003	0.009
Leisure	0.581	0.877	0.148	0.011	0.827	0.275	0.079	0.022	0.774	0.253	0.148	0.337
					Fathers							
Market work	0.0001	9.88e-05	0.084	0.078	0.969	0.708	0.044	0.048	0.0005	0.002	0.117	0.27
Nonmarket work	0.3	0.211	0.004	0.001	0.021	0.022	0.134	0.104	0.292	0.472	0.647	0.339
Childcare	0.017	0.004	0.004	0.0001	0.002	0.0001	0.943	0.589	0.906	0.645	0.961	0.851
Total work	2.38e-05	2.14e-05	0.008	0.01	0.852	0.661	0.111	0.096	0.0003	0.001	0.032	0.07
Leisure	0.014	0.01	0.054	0.035	0.84	0.505	0.569	0.577	0.044	0.078	0.129	0.251
					Gap (Men - Women)							
Market work	4.35e-06	6.41e-06	0.079	0.17	0.065	0.105	0.008	0.003	0.013	0.008	0.904	0.831
Nonmarket work	0.002	0.002	0.037	0.094	0.006	0.009	0.327	0.192	0.753	0.666	0.501	0.374
Childcare	0.073	0.055	0.128	0.021	0.882	0.447	0.752	0.866	0.141	0.27	0.227	0.179
Total work	0.009	0.013	0.978	0.566	0.76	0.894	0.017	0.006	0.04	0.017	0.764	0.753
Leisure	0.024	0.035	0.574	0.996	0.768	0.846	0.121	0.059	0.082	0.036	0.821	0.796

Notes: Columns (1), (3), (5), (7), (9), (11) present the p-values of unconditional differences from Table 6. Columns (2), (4), (6), (8), (10), (12) present the p-values of conditional differences. All p-values are based on robust standard errors. Data: ATUS (2003-2019).

Appendix VI: Robustness Check (*General Sample*)

Time Use Category	2008-2010 vs 2003-2007 (1)	2011-2014 vs 2003-2007 (2)	2015-2019 vs 2003-2007 (3)	2011-2014 vs 2008-2010 (4)	2015-2019 vs 2008-2010 (5)	2015-2019 vs 2011-2014 (6)
			Women			
Market work	-2.9	-4.83	-6.39	-1.95	-3.54	-1.64
	(0.32)	(0.28)	(0.3)	(0.43)	(0.45)	(0.41)
Nonmarket work	-0.04	0.59	2.23	0.62	2.26	1.67
	(0.19)	(0.17)	(0.18)	(0.25)	(0.26)	(0.24)
Childcare	0.11	0.3	0.63	0.18	0.52	0.34
	(0.1)	(0.09)	(0.1)	(0.14)	(0.14)	(0.13)
Total work	-2.82	-3.94	-3.53	-1.15	-0.75	0.37
	(0.29)	(0.26)	(0.27)	(0.4)	(0.4)	(0.37)
Leisure	1.83	3.42	3.41	1.61	1.63	0.04
	(0.28)	(0.25)	(0.25)	(0.39)	(0.39)	(0.36)
			Men			
Market work	-2.16	-2.62	-1.81	-0.42	0.37	0.74
	(0.39)	(0.37)	(0.35)	(0.53)	(0.55)	(0.51)
Nonmarket work	-0.15	-0.29	0.24	-0.15	0.38	0.55
	(0.19)	(0.16)	(0.16)	(0.23)	(0.25)	(0.22)
Childcare	0.3	0.32	0.2	0.02	-0.09	-0.1
	(0.08)	(0.07)	(0.07)	(0.11)	(0.11)	(0.1)
Total work	-2	-2.6	-1.37	-0.56	0.66	1.19
	(0.35)	(0.34)	(0.31)	(0.5)	(0.5)	(0.47)
Leisure	1.01	1.58	0.76	0.56	-0.24	-0.79
	(0.33)	(0.32)	(0.3)	(0.46)	(0.48)	(0.44)
			Gap (Men - Women)			
Market work	0.73	2.2	4.58	1.53	3.91	2.38
	(0.51)	(0.47)	(0.45)	(0.69)	(0.7)	(0.63)
Nonmarket work	-0.11	-0.88	-1.99	-0.77	-1.88	-1.12
	(0.28)	(0.23)	(0.24)	(0.34)	(0.36)	(0.33)
Childcare	0.19	0.02	-0.43	-0.17	-0.61	-0.44
	(0.13)	(0.12)	(0.11)	(0.17)	(0.17)	(0.16)
Total work	0.81	1.35	2.15	0.6	1.41	0.82
	(0.45)	(0.44)	(0.41)	(0.63)	(0.63)	(0.59)
Leisure	-0.82	-1.84	-2.65	-1.06	-1.87	-0.83
	(0.42)	(0.42)	(0.39)	(0.6)	(0.61)	(0.56)

Notes: Bootstrapped estimates of differences between the conditional observed changes and extrapolated trends in hours per week. Observations are weighted by adjusted ATUS weights. Standard errors are in parentheses. Data: ATUS (2003-2019).

Appendix VII: Robustness Check (*Married Parents*)

Time Use Category	2008-2010 vs 2003-2007 (1)	2011-2014 vs 2003-2007 (2)	2015-2019 vs 2003-2007 (3)	2011-2014 vs 2008-2010 (4)	2015-2019 vs 2008-2010 (5)	2015-2019 vs 2011-2014 (6)
			Mothers			
Market work	1.08	-0.51	0.36	-1.67	-0.84	0.76
	(0.47)	(0.45)	(0.46)	(0.65)	(0.66)	(0.61)
Nonmarket work	-0.03	1.78	3.76	1.8	3.84	2.05
	(0.29)	(0.28)	(0.3)	(0.4)	(0.41)	(0.39)
Childcare	0.3	0.61	1.46	0.39	1.22	0.83
	(0.23)	(0.22)	(0.24)	(0.32)	(0.32)	(0.31)
Total work	1.35	1.88	5.58	0.51	4.22	3.63
	(0.37)	(0.39)	(0.4)	(0.54)	(0.56)	(0.53)
Leisure	-2.05	-2.63	-5.44	-0.59	-3.4	-2.72
	(0.36)	(0.36)	(0.38)	(0.49)	(0.53)	(0.51)
			Fathers			
Market work	-3.7	-2.96	-3.09	0.71	0.59	-0.61
	(0.59)	(0.52)	(0.57)	(0.78)	(0.79)	(0.46)
Nonmarket work	0.49	0.67	2.01	0.2	1.57	1.37
	(0.28)	(0.26)	(0.26)	(0.39)	(0.39)	(0.36)
Childcare	0.58	0.6	0.42	0.05	-0.12	-0.17
	(0.21)	(0.18)	(0.16)	(0.26)	(0.25)	(0.23)
Total work	-2.64	-1.68	-0.66	0.96	2.04	1.02
	(0.49)	(0.41)	(0.47)	(0.65)	(0.66)	(0.62)
Leisure	1.36	0.95	0.12	-0.4	-1.29	-0.81
	(0.46)	(0.4)	(0.44)	(0.62)	(0.63)	(0.59)
			Gap (Fathers - Mothers)			
Market work	-4.79	-2.45	-3.46	2.38	1.43	-0.94
	(0.73)	(0.71)	(0.72)	(1.01)	(0.99)	(0.99)
Nonmarket work	0.52	-1.1	-1.76	-1.59	-2.27	-0.67
	(0.4)	(0.39)	(0.38)	(0.)	(0.55)	(0.53)
Childcare	0.28	-0.01	-1.04	-0.34	-1.34	-1
	(0.3)	(0.28)	(0.28)	(0.41)	(0.4)	(0.39)
Total work	-3.99	-3.56	-6.25	0.44	-2.19	-2.61
	(0.6)	(0.57)	(0.62)	(0.83)	(0.84)	(0.82)
Leisure	3.4	3.58	5.56	0.19	2.12	1.91
	(0.57)	(0.54)	(0.58)	(0.77)	(0.8)	(0.78)

Notes: Bootstrapped estimates of differences between the conditional observed changes and extrapolated trends in hours per week. Observations are weighted by adjusted ATUS weights. Standard errors are in parentheses. Data: ATUS (2003-2019).